7 Layer 2

7.1 MAC

General

If not otherwise mentioned, the same procedures as used in RRC test specification (TS 34.123-1 clause 8) or in the generic setup procedures (TS 34.108 clause 7) applies to reach initial conditions for MAC testing.

If not explicitly described, the same message contents and settings are applied as described in the RRC test description default settings.

In some MAC test cases, which are explicitly mentioned, the RLC in the system simulator is operated in Transparent Mode (RLC TM) for the tested channel. Accordingly, no RLC header will be added by the RLC entity. Also, there is no header included by the MAC protocol in the system simulator. The UE, however, shall always be configured as specified in TS 34.108 for the respective test case.

Where RLC TM is used, the payload size in the system simulator is set to the value that corresponds to the transport block size expected by the UE for the respective configuration. The bit positions which are interpreted as RLC and MAC headers by the UE are included into the RLC payload by the system simulator.

For test cases where AM RLC is employed in either UE, SS, or both, the default parameter settings as defined in clause 7.2.3.1 are applicable if not mentioned otherwise.

7.1.1 Mapping between logical channels and transport channels

7.1.1.1 CCCH mapped to RACH/FACH / Invalid TCTF

7.1.1.1.1 Definition

This tests that the MAC applies the correct header to the MAC PDU according to the type of logical channel carried on the RACH/FACH transport channel. Incorrect application of MAC headers would result in inoperation of the UE.

7.1.1.1.2 Conformance requirement

CCCH mapped to RACH/FACH:

- TCTF field is included in MAC header.

TCTF	MAC SDU

The following fields are defined for the MAC header:

- Target Channel Type Field
  …

Coding of the Target Channel Type Field on FACH for FDD

TCTF	Designation
00	BCCH
01000000	CCCH
01000001-01111111	Reserved (PDUs with this coding will be discarded by this version of the protocol)
10000000	CTCH
10000001-10111111	Reserved (PDUs with this coding will be discarded by this version of the protocol)
11	DCCH or DTCH over FACH

Coding of the Target Channel Type Field on FACH for TDD

TCTF	Designation
000	BCCH
001	CCCH
010	CTCH
01100	DCCH or DTCH over FACH
01101-01111	Reserved (PDUs with this coding will be discarded by this version of the protocol)
100	SHCCH
101-111	Reserved (PDUs with this coding will be discarded by this version of the protocol)

Reference(s)

TS 25.321 clauses 9.2.1 and 9.2.1.4.

7.1.1.1.3 Test purpose

1. To verify that the UE discards PDUs with reserved or incorrect values in the TCTF field.
2. To verify that the TCTF field is correctly applied when a CCCH is mapped to the RACH/FACH.

7.1.1.1.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

The SCCPCH is configured as specified in TS 34.108 clause 6.10.2.4.3.3 (FDD) , 6.11.5.4.4.3(1.28Mcps TDD) (Interactive/Background 32 kbps RAB + SRB for PCCH + SRB for CCCH + SRB for DCCH + SRB for BCCH) with the following exceptions for the FACH:

FDD:

Higher layer	RAB/signalling RB		SRB#0
	User of Radio Bearer		Test
RLC	Logical channel type		CCCH
	RLC mode		TM
	Payload sizes, bit		168
	Max data rate, bps		33600 (alt. 50400)
	RLC header, bit		0
MAC	MAC header, bit		0 (note)
	MAC multiplexing		Simulated by SS
Layer 1	TrCH type		FACH
	TB sizes, bit		168
	TFS	TF0, bits	0 x 168
		TF1, bits	1 x 168
		TF2, bits	2 x 168
		TF3, bits	N/A (alt. 3 x 168)
	TTI, ms		10
	Coding type		CC 1/2
	CRC, bit		16
	Max number of bits/TTI before rate matching		752 (alt. 1136)
	RM attribute		200-240
NOTE:	The SS MAC layer must be configured not to add a MAC header so that the header can be added by the test case in order to create the necessary invalid values.		

TDD:

Higher layer	RAB/signalling RB		SRB#0
	User of Radio Bearer		Test
RLC	Logical channel type		CCCH
	RLC mode		TM
	Payload sizes, bit		171
	Max data rate, bps		33600 (alt. 50400)
	RLC header, bit		0
MAC	MAC header, bit		0 (note)
	MAC multiplexing		Simulated by SS
Layer 1	TrCH type		FACH
	TB sizes, bit		171
	TFS	TF0, bits	0 x 171
		TF1, bits	1 x 171
		TF2, bits	2 x 171
		TF3, bits	3 x 171
		TF4, bits	4x 171
		TF5, bits	N/A (alt. 5x 171)
		TF6, bits	N/A (alt. 6 x 171)
	TTI, ms		20
	Coding type		CC 1/2
	CRC, bit		16
	Max number of bits/TTI before rate matching		1528 (alt. 2292)
	RM attribute		200-240
NOTE:	The SS MAC layer must be configured not to add a MAC header so that the header can be added by the test case in order to create the necessary invalid values.		

And using the configuration in TS 34.108 clause 6.10.2.4.3.3 (FDD), 6.11.5.4.4.3(1.28Mcps TDD) for the PCH.

The TFCS should be configured as specified in clause 6.10.2.4.3.3.1.4 (FDD), 6.11.5.4.4.3.1.4(1.28Mcps TDD).

User Equipment:

The UE shall operate under normal test conditions, Ciphering Off.

The Test-USIM shall be inserted.

The SS starts broadcasting the System Information as specified in TS 34.108 clause 6.1, using the configuration for the PRACH and SCCPCH (signalled in SYSTEM INFORMATION 5) as follows:

1. The SCCPCH is configured as specified in TS 34.108 clause 6.10.2.4.3.3 (FDD), 6.11.5.4.4.3(1.28Mcps TDD) (Interactive/Background 32 kbps RAB + SRB for PCCH + SRB for CCCH + SRB for DCCH + SRB for BCCH).

2. The PRACH is configured as specified in TS 34.108 clause 6.10.2.4.4.1(FDD), 6.11.5.4.5.2(TDD).

The SS follows the procedure in TS 34.108 clause 7.2.2.1 (CS UE) or 7.2.2.2 (PS UE) so that the UE shall be in idle mode and registered.

Test procedure

a) The SS pages the UE.

b) The SS waits for the first RRC CONNECTION REQUEST message to arrive on the PRACH/CCCH.

c) The SS responds with an RRC CONNECTION SETUP message (specified in TS 34.108 clause 9: Contents of RRC CONNECTION SETUP message: UM (Transition to CELL_FACH)(FDD), or UM (Transition to CELL_FACH) (1.28 Mcps TDD option). In this case the SS will transmit the message in 152 bit for FDD and 160 bits for TDD (note) segments, with a valid UM RLC header and with the MAC header set as follows:

FDD:

Field	Value
TCTF	01000001'B

TDD:

Field	Value
TCTF	101'B

d) The SS waits for retransmission of the RRC CONNECTION REQUEST on the PRACH/CCCH due to expiry of timer T300. If no retransmission is received steps a) and b) are repeated.

e) The SS repeats steps c) and d), with the TCTF field set as follows:

FDD:

Iteration	TCTF Value
2	(void)
3	10000000'B
4	10000001'B
5	(void)

TDD:

Iteration	TCTF Value
2	010'B
3	01111'B
4	(void)'
5	(void)
6	(void)

f) The SS repeats steps c) and d), with the TCTF field set as to 01000000'B(FDD), 001’B(TDD).

Expected sequence

FDD:

Step	Direction UE SS	Message	Comments
1	←	PAGING TYPE 1	
2	→	RRC CONNECTION REQUEST	
3	-	Void	
4	-	Void	
5	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 1))	Sent with incorrect TCTF = 0100 0001'B
	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 2))	Sent with incorrect TCTF = 0100 0001'B
		…	
	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT n))	Sent with incorrect TCTF = 0100 0001'B
6	→	RRC CONNECTION REQUEST	If this message is not received then the PAGING TYPE 1 message as in step 1 shall be sent again.
7	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 1))	Sent with incorrect TCTF = 1000 0000'B
	←	MAC PDU(TCTF, UE-ID, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 2))	Sent with incorrect TCTF = 1000 0000'B
		…	
	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT n))	Sent with incorrect TCTF = 1000 0000'B
8	→	RRC CONNECTION REQUEST	If this message is not received then the PAGING TYPE 1 message as in step 1 shall be sent again.
9	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 1))	Sent with incorrect TCTF = 1000 0001'B
	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 2))	Sent with incorrect TCTF = 1000 0001'B
		…	
	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT n))	Sent with incorrect TCTF = 1000 0001'B
10	→	RRC CONNECTION REQUEST	If this message is not received then the PAGING TYPE 1 message as in step 1 shall be sent again.
11	-	Void	
12	-	Void	
13	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 1))	Sent with correct TCTF = 0100 0000'B
	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 2))	Sent with correct TCTF = 0100 0000'B
		…	
	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT n))	Sent with correct TCTF = 0100 0000'B
14	→	RRC CONNECTION SETUP COMPLETE	TCTF Field is recognised as correct for the DCCH

TDD:

Step	Direction UE SS	Message	Comments
1	←	PAGING TYPE 1	
2	→	RRC CONNECTION REQUEST	
3	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 1))	Sent with incorrect TCTF = 101'B
	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 2))	Sent with incorrect TCTF =101'B
		…	
	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT n))	Sent with incorrect TCTF = 101'B
4	→	RRC CONNECTION REQUEST	
5	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 1))	Sent with incorrect TCTF = 010'B
	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 2))	Sent with incorrect TCTF = 010'B
		…	
	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT n))	Sent with incorrect TCTF = 010'B
6	→	RRC CONNECTION REQUEST	
7	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 1))	Sent with incorrect TCTF = 01111'B
	←	MAC PDU(TCTF, UE-ID, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 2))	Sent with incorrect TCTF =01111'B
		…	
	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT n))	Sent with incorrect TCTF = 01111'B
8	→	RRC CONNECTION REQUEST	
9	-	void	
	-	void	
		…	
	-	void	
10	-	void	
11	-	void	
	-	void	
		…	
	-	void	
12	-	void	
13	-	void	
	-	void	
		…	
	-	void	
14	-	void	
15	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 1))	Sent with correct TCTF = 001'B
	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT 2))	Sent with correct TCTF = 001'B
		…	
	←	MAC PDU(TCTF, RLC UM PDU(SN, RRC CONNECTION SETUP SEGMENT n))	Sent with correct TCTF = 001'B
16	→	RRC CONNECTION SETUP COMPLETE	TCTF Field is recognised as correct for the CCCH

Specific Message Contents

None.

7.1.1.1.5 Test Requirement

On the first iteration, and on each iteration in step e) the UE should not recognise the RRC CONNECTION SETUP message and therefore should either retransmit the RRC CONNECTION REQUEST after each expiry of T300 (the UE should send up to N300=3 RRC CONNECTION REQUESTs before abandoning the procedure) or not respond (if N300 RRC CONNECTION REQUESTs have already been sent).

On the final iteration the UE should respond with an RRC CONNECTION SETUP COMPLETE message.

7.1.1.2 DTCH or DCCH mapped to RACH/FACH / Invalid TCTF

7.1.1.2.1 Definition

This tests that the MAC applies the correct header to the MAC PDU according to the type of logical channel carried on the RACH/FACH transport channel. Incorrect application of MAC headers would result in inoperation of the UE.

7.1.1.2.2 Conformance requirement

DTCH or DCCH mapped to RACH/FACH:

TCTF field, C/T field, UE-Id type field and UE-Id are included in the MAC header.

The following fields are defined for the MAC header:

- Target Channel Type Field
  …

Coding of the Target Channel Type Field on FACH for FDD

TCTF	Designation
00	BCCH
01000000	CCCH
01000001-01111111	Reserved (PDUs with this coding will be discarded by this version of the protocol)
10000000	CTCH
10000001-10111111	Reserved (PDUs with this coding will be discarded by this version of the protocol)
11	DCCH or DTCH over FACH

Coding of the Target Channel Type Field on FACH for TDD

TCTF	Designation
000	BCCH
001	CCCH
010	CTCH
01100	DCCH or DTCH over FACH
01101-01111	Reserved (PDUs with this coding will be discarded by this version of the protocol)
100	SHCCH
101-111	Reserved (PDUs with this coding will be discarded by this version of the protocol)

Reference(s)

TS 25.321 clauses 9.2.1 and 9.2.1.1 c).

7.1.1.2.3 Test purpose

1. To verify that the UE discards PDUs with reserved or incorrect values in the TCTF field.
2. To verify that the TCTF field, C/T field, UE-Id type and UE-Id field are correctly applied when a DTCH or DCCH is mapped to the RACH/FACH.

7.1.1.2.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

The SCCPCH is configured as specified in TS 34.108 clause 6.10.2.4.3.3(FDD) and 6.11.5.4.4.3(1.28Mcps TDD) (Interactive/Background 32 kbps RAB + SRB for PCCH + SRB for CCCH + SRB for DCCH + SRB for BCCH) with the following exceptions for the FACH:

FDD:

Higher layer	RAB/signalling RB		RB#3 (SRB#3)
	User of Radio Bearer		Test
RLC	Logical channel type		DCCH
	RLC mode		TM
	Payload sizes, bit		168
	Max data rate, bps		33600 (alt. 50400)
	RLC header, bit		0
MAC	MAC header, bit		0 (note)
	MAC multiplexing		Simulated by SS
Layer 1	TrCH type		FACH
	TB sizes, bit		168
	TFS	TF0, bits	0 x 168
		TF1, bits	1 x 168
		TF2, bits	2 x 168
		TF3, bits	N/A (alt. 3 x 168)
	TTI, ms		10
	Coding type		CC ½
	CRC, bit		16
	Max number of bits/TTI before rate matching		752 (alt. 1136)
	RM attribute		200-240
NOTE:	The SS MAC layer must be configured not to add a MAC header so that the header can be added by the test case in order to create the necessary invalid values.		

TDD:

Higher layer	RAB/signalling RB	RB#3 (SRB#3)
	User of Radio Bearer	Test
RLC	Logical channel type	DCCH
	RLC mode	TM
	Payload sizes, bit	171
	Max data rate, bps	33600 (alt. 50400)

	RLC header, bit		0
MAC	MAC header, bit		0 (note)
	MAC multiplexing		Simulated by SS
Layer 1	TrCH type		FACH
	TB sizes, bit		171
	TFS	TF0, bits	0 x 171
		TF1, bits	1 x 171
		TF2, bits	2 x 171
		TF3, bits	3 x 171
		TF4, bits	4x 171
		TF5, bits	N/A (alt. 5x 171)
		TF6, bits	N/A (alt. 6 x 171)
	TTI, ms		20
	Coding type		CC 1/2
	CRC, bit		16
	Max number of bits/TTI before rate matching		1528 (alt. 2292)
	RM attribute		200-240
NOTE:	The SS MAC layer must be configured not to add a MAC header so that the header can be added by the test case in order to create the necessary invalid values.		

and using the configuration in TS 34.108 clause 6.10.2.4.3.3 (FDD), 6.11.5.4.4.3(1.28Mcps TDD) for the PCH.

The TFCS should be configured as specified in clause 6.10.2.4.3.3.1.4 (FDD), 6.11.5.4.4.3.1.4(1.28Mcps TDD).

User Equipment:

The UE shall operate under normal test conditions, Ciphering Off.

The Test-USIM shall be inserted.

The SS starts broadcasting the System Information as specified in TS 34.108 clause 6.1, using the configuration for the PRACH and SCCPCH (signalled in SYSTEM INFORMATION 5) as follows:

1. The SCCPCH is configured as specified in TS 34.108 clause 6.10.2.4.3.3 (FDD), 6.11.5.4.4.3(1.28Mcps TDD) (Interactive/Background 32 kbps RAB + SRB for PCCH + SRB for CCCH + SRB for DCCH + SRB for BCCH).

2. The PRACH is configured as specified in TS 34.108 clause 6.10.2.4.4.1 (FDD), 6.11.5.4.5.2(1.28Mcps TDD).

The SS follows the procedure in TS 34.108 clause 7.4.2.1.1 (Mobile Terminated for CS) so that the UE shall be in state BGP 6-2 (CS-CELL_FACH_INITIAL) or clause 7.4.2.2.1 (Mobile Terminated for PS) so that the UE shall be in state BGP 6-4 PS-CELL_FACH_INITIAL.

Test procedure

a) The SS receives the PAGING RESPONSE or SERVICE REQUEST (depending on domain) message from the UE and checks the TCTF field.

b) The SS transmits MAC PDUs containing RLC AM PDUs containing a DIRECT TRANSFER message containing an AUTHENTICATION REQUEST message.

   1. Dummy octet string for NAS Message, of size sufficient enough to fit in one RLC PDU of 144 bits, including the correct RLC AM header.

   2. The IE CN Domain Identity is Set to PS Domain (if UE initial state is 6-2) or CS Domain (if UE initial state is 6-4) (no signalling connection for this domain exists).

   3. The polling bit in RLC header is set for transmission of RLC STATUS PDU.

The MAC header shall be set as follows:

Field	Value
TCTF	01000001'B(FDD), 101(TDD)
UE ID Type	C-RNTI
UE ID	As set in RRC CONNECTION SETUP message.
C/T	Logical Channel ID for SRB #3 (AM-DCCH NAS High Priority)

Where a TCTF size of 8-bits is used, 6-bits from the RLC payload shall be discarded.

c) The SS checks that UE shall neither transmit RRC Status message on SRB2 nor RLC Status PDU on SRB3.

d) The SS again transmits MAC PDUs as in b) above, but this time uses the correct TCTF of 11'B for FDD, 01100'B for TDD. The sequence numbers in the RLC headers shall be identical with those sent in b).

e) SS Receives RLC Status PDU on SRB #3 acknowledging the receipt of the above RLC PDU.

f) The SS receives a RRC STATUS message on the uplink DCCH using AM RLC on SRB # 2.

g) The SS repeats steps b), c), d) e) and f), with the TCTF field set as follows in step b):

FDD:

Iteration	TCTF Value
2	01111111'B
3	10000000'B
4	10000001'B
5	10111111'B

TDD:

Iteration	TCTF Value
2	110'B
3	010'B
4	01111'B
5	01101'B

Expected sequence

FDD:

Step	Direction UE	Direction SS	Message	Comments
1	→		PAGING RESPONSE/SERVICE REQUEST	Check TCTF
2	←		MAC PDU(TCTF, UE-ID, C/T, RLC AM PDU(SN=x, DIRECT TRANSFER))	Sent with incorrect TCTF = 01000001'B, 01111111'B, 10000000'B, 10000001'B, or 10111111'B
2a			wait for T = 3 s	SS checks that UE shall neither transmit RRC-Status message on SRB 2 nor RLC Status PDU on SRB 3 See note 1 below
3	←		MAC PDU(TCTF, UE-ID, C/T, RLC AM PDU(SN=x, DIRECT TRANSFER))	Sent with correct TCTF = 11'B
4	→		RLC-STATUS-PDU	ACK PDUs with SN = x and TCTF Field is recognised as correct for the DCCH. See note 2 below
5	→		RRC Status message	
NOTE 1: UE will Transmit Signalling Connection Release Indication on expiry of MM Timer T3240 or GMM Timer T3317. NOTE 2: RRC Status message may be received before RLC Status PDU.				

TDD:

Step	Direction		Message	Comments
	UE	SS		
1	→		PAGING RESPONSE	Check TCTF
2	←		MAC PDU(TCTF, UE-ID, C/T, RLC AM PDU(SN=x, DIRECT TRANSFER))	Sent with incorrect TCTF = 101'B, 110'B, 010'B, 01111'B, or 01101'B
2	←		MAC PDU(TCTF, UE-ID, C/T, RLC AM PDU(SN=x, DIRECT TRANSFER))	Sent with incorrect TCTF = 010101'B, 110'B, 010'B, 01111'B, or 01101'B
2a			wait for T = 3 s	SS checks that UE shall neither transmit RRC-Status message on SRB 2 nor RLC Status PDU on SRB 3 See note 1 below
3	←		MAC PDU(TCTF, UE-ID, C/T, RLC AM PDU(SN=x, DIRECT TRANSFER))	Sent with correct TCTF = 01100'B
4	→		RLC-STATUS-PDU	ACK PDUs with SN = x and TCTF Field is recognised as correct for the DCCH. See note 2 below
5	→		RRC Status message	
NOTE 1: UE will Transmit Signalling Connection Release Indication on expiry of MM Timer T3240 or GMM Timer T3317. NOTE 2: RRC Status message may be received before RLC Status PDU.				

Steps 2 – 5 of above expected sequence are repeated for iterations 2 to 5. Note: For iteration k the SN in steps 2 and 4 starts with x + (k –1).

Specific Message Contents

None

7.1.1.2.5 Test Requirement

In step a) the TCTF field should have the value '01'B. Note that this may be implied from receipt of the PAGING RESPONSE/SERVICE REQUEST message correctly by the SS test script.

During the test the SS shall request an RLC status report with every transmitted PDU by setting of the Polling Bit. The UE shall not send any STATUS PDUs indicating missing PDUs.

At the end of each iteration (steps 4 and 5 of expected sequence) the SS shall receive an RRC Status message on SRB # 2, and RLC Status PDU on SRB # 3 with TCTF field set to value '01' B for FDD, '0100' B for TDD.

7.1.1.3 DTCH or DCCH mapped to RACH/FACH / Invalid C/T Field

7.1.1.3.1 Definition

This tests that the MAC applies the correct header to the MAC PDU according to the type of logical channel carried on the RACH/FACH transport channel. Incorrect application of MAC headers would result in inoperation of the UE.

7.1.1.3.2 Conformance requirement

DTCH or DCCH mapped to RACH/FACH:

TCTF field, C/T field, UE-Id type field and UE-Id are included in the MAC header.

The following fields are defined for the MAC header:

- C/T field
  The C/T field provides identification of the logical channel instance when multiple logical channels are carried on the same transport channel…

Structure of the C/T field

C/T field	Designation
0000	Logical channel 1
0001	Logical channel 2
...	...
1110	Logical channel 15
1111	Reserved (PDUs with this coding will be discarded by this version of the protocol)

Reference(s)

TS 25.321 clauses 9.2.1 and 9.2.1.1 c).

7.1.1.3.3 Test purpose

1. To verify that the UE discards PDUs with reserved or incorrect values in C/T field.
2. To verify that the TCTF field, C/T field, UE-Id type and UE-Id field are correctly applied when a DTCH or DCCH is mapped to the RACH/FACH.

7.1.1.3.4 Method of test

Initial conditions

System Simulator:

See clause 7.1.1.2.4.

User Equipment:

See clause 7.1.1.2.4.

Test procedure

a) The SS receives the PAGING RESPONSE or SERVICE REQUEST (depending on domain) message from the UE and checks the C/T field.

b) The SS transmits MAC PDUs containing RLC AM PDUs containing a DIRECT TRANSFER message containing.

   1. Dummy octet string for NAS Message, of size sufficient enough to fit in one RLC PDU of 144 bits, including the correct RLC AM header.
   2. The IE CN Domain Identity is Set to PS Domain (no signalling connection for this domain exists).
   3. The polling bit in RLC header is set for Transmission of RLC STATUS PDU.

The MAC header shall be set as follows:

Field	Value
TCTF	11'B
UE ID Type	C-RNTI
UE ID	As set in RRC CONNECTION SETUP message.
C/T	0111'B

c) The SS checks that UE shall neither transmit RRC Status message on SRB2 nor RLC Status PDU on.

d) The SS again transmits MAC PDUs as in b) above, but this time uses the correct C/T value for AM-DCCH NAS High Priority of 0010'B. The sequence numbers in the RLC headers shall be identical with those sent in b).

e) SS receives RLC Status PDU on SRB #3 acknowledging the receipt of the above RLC PDU.

f) The SS receives a RRC STATUS message on the uplink DCCH using AM RLC on SRB # 2.

g) The SS repeats steps b), c), d), e) and f), with the C/T field set as follows:

Iteration	C/T Value
2	1111'B

Expected sequence

<table>
<tr><th rowspan="2">Step</th><th colspan="2">Direction</th><th rowspan="2">Message</th><th rowspan="2">Comments</th></tr>
<tr><th>UE</th><th>SS</th></tr>
<tr><td>1</td><td colspan="2">→</td><td>PAGING RESPONSE/SERVICE REQUEST</td><td>Check C/T field</td></tr>
<tr><td>2</td><td colspan="2">←</td><td>MAC PDU(TCTF, UE-ID, C/T, RLC AM PDU(SN=x, DIRECT TRANSFER))</td><td>Sent with incorrect C/T = 0111'B, or 1111'B.</td></tr>
<tr><td>2a</td><td colspan="2"></td><td>wait for T = 5 s</td><td>SS checks that UE shall neither transmit RRC-Status message on SRB 2 nor RLC Status PDU on SRB 3.
See note 1 below.</td></tr>
<tr><td>3</td><td colspan="2">←</td><td>MAC PDU(TCTF, UE-ID, C/T, RLC AM PDU(SN=x, DIRECT TRANSFER))</td><td>Sent with correct C/T = 0010'B</td></tr>
<tr><td>4</td><td colspan="2">→</td><td>RLC-STATUS-PDU</td><td>ACK PDUs with SN = x
C/T Field is recognised as correct for the DCCH.
See note 2 below.</td></tr>
<tr><td>5</td><td colspan="2">→</td><td>RRC Status message</td><td></td></tr>
<tr><td colspan="5">NOTE 1: UE will Transmit Signalling Connection Release Indication on expiry of MM Timer T3240 or GMM Timer T3317.
NOTE 2: RRC Status message may be received before RLC Status PDU.</td></tr>
</table>

Steps 2 to 5 of the expected sequence are repeated for iteration 2. Note: For iteration k the SN in steps 2 and 4 starts with x + (k – 1).

Specific Message Contents

None

7.1.1.3.5 Test Requirement

In step a) the C/T field should be set to the Logical Channel ID for SRB #3 (0010'B). Note that this may be implied from receipt of the PAGING RESPONSE/SERVICE REQUEST message correctly by the SS test script.

During the test the SS shall request RLC status report with every transmitted PDU by setting of the Polling Bit. The UE shall not send any STATUS PDUs indicating missing PDUs.

At the end of each iteration (steps 4 and 5 of expected sequence) the SS shall receive a RLC Status PDU on SRB # 3, with C/T field set to value '0010'B and RRC Status message on SRB # 2.

7.1.1.4 DTCH or DCCH mapped to RACH/FACH / Invalid UE ID Type Field

7.1.1.4.1 Definition

This tests that the MAC applies the correct header to the MAC PDU according to the type of logical channel carried on the RACH/FACH transport channel. Incorrect application of MAC headers would result in inoperation of the UE.

7.1.1.4.2 Conformance requirement

DTCH or DCCH mapped to RACH/FACH:

TCTF field, C/T field, UE-Id type field and UE-Id are included in the MAC header.

The following fields are defined for the MAC header:

- UE-Id Type
  The UE-Id Type field is needed to ensure correct decoding of the UE-Id field in MAC Headers.

Table 9.2.1.7: UE-Id Type field definition

UE-Id Type field 2 bits	UE-Id Type
00	U-RNTI
01	C-RNTI
10	Reserved (PDUs with this coding will be discarded by this version of the protocol)
11	Reserved (PDUs with this coding will be discarded by this version of the protocol)

Reference(s)

TS 25.321 clauses 9.2.1 and 9.2.1.1 c).

7.1.1.4.3 Test purpose

1. To verify that the UE discards PDUs with reserved values in UE-Id type field.
2. To verify that the TCTF field, C/T field, UE-Id type and UE-Id field are correctly applied when a DTCH or DCCH is mapped to the RACH/FACH.

7.1.1.4.4 Method of test

Initial conditions

System Simulator:

See clause 7.1.1.2.4.

User Equipment:

See clause 7.1.1.2.4.

Test procedure

a) The SS receives the PAGING RESPONSE or SERVICE REQUEST (depending on domain) message from the UE and checks the UE-Id Type field.

b) The SS transmits MAC PDUs containing RLC AM PDUs containing a DIRECT TRANSFER message containing.

   1. Dummy octet string for NAS Message, of size sufficient enough to fit in one RLC PDU of 144 bits, including the correct RLC AM header.
   2. The IE CN Domain Identity is Set to PS Domain (no signalling connection for this domain exists)
   3. The polling bit in RLC header is set for transmission of RLC STATUS PDU.

   The MAC header shall be set as follows:

Field	Value
TCTF	11'B
UE ID Type	10'B
UE ID	As set in RRC CONNECTION SETUP message.
C/T	Logical Channel ID for SRB #3 (AM-DCCH NAS High Priority): 0010'B

c) The SS checks that UE shall neither transmit RRC Status message on SRB2 nor RLC Status PDU on SRB3.

d) The SS again transmits MAC PDUs as in b) above, but this time uses the correct UE-Id type value for C-RNTI of 01'B. The sequence numbers in the RLC headers shall be identical with those sent in b).

e) SS Receives RLC Status PDU on SRB #3 acknowledging the receipt of the above RLC PDU.

f) The SS receives a RRC STATUS message on the uplink DCCH using AM RLC on SRB # 2

g) The SS repeats steps b), c), d), e) and f), with the UE-Id type field set as follows in step b):

Iteration	UE-Id type Value
2	11'B

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	→		PAGING RESPONSE/SERVICE REQUEST	Check UE-Id Type
2	←		MAC PDU(TCTF, UE-ID, C/T, RLC AM PDU(SN=x, DIRECT TRANSFER))	Sent with incorrect UE-Id Type = 10'B, or 11'B.
2a			wait for T = 5 s	SS checks that UE shall neither transmit RRC-Status message on SRB 2 nor RLC Status PDU on SRB 3. See note 1 below.
3	←		MAC PDU(TCTF, UE-ID, C/T, RLC AM PDU(SN=x, DIRECT TRANSFER))	Sent with correct UE-Id Type = 01'B
4	→		RLC-STATUS-PDU	ACK PDU with SN = x UE-Id is recognised as correct for the UE. See note 2 below.
5	→		RRC Status message	RRC
NOTE 1: UE will Transmit Signalling Connection Release Indication on expiry of MM Timer T3240 or GMM Timer T3317. NOTE 2: RRC Status message may be received before RLC Status PDU.				

Steps 2 to 5 of the expected sequence are repeated for iteration 2. Note: For iteration k the SN in step 2 and 4 starts with x + (k – 1).

Specific Message Contents

None

7.1.1.4.5 Test Requirement

In step a) the UE-Id Type field should be set to 01'B. Note that this may be implied from receipt of the PAGING RESPONSE/SERVICE REQUEST message correctly by the SS test script.

During the test the SS request an RLC status report with every transmitted PDU by setting of the Polling Bit. The UE shall not send any STATUS PDUs indicating missing PDUs.

At the end of each iteration (steps 4 and 5 of expected sequence) the SS shall receive a RLC Status PDU on SRB # 3, with UE Id type correctly set to '01'B and RRC Status message on SRB # 2.

7.1.1.5 DTCH or DCCH mapped to RACH/FACH / Incorrect UE ID

7.1.1.5.1 Definition

This tests that the MAC applies the correct header to the MAC PDU according to the type of logical channel carried on the RACH/FACH transport channel. Incorrect application of MAC headers would result in inoperation of the UE.

7.1.1.5.2 Conformance requirement

DTCH or DCCH mapped to RACH/FACH:

TCTF field, C/T field, UE-Id type field and UE-Id are included in the MAC header.

The following fields are defined for the MAC header:

- UE-Id
  The UE-Id field provides an identifier of the UE on common transport channels…

Lengths of UE Id field

UE Id type	Length of UE Id field
U-RNTI	32 bits
C-RNTI	16 bits

Reference(s)

TS 25.321 clauses 9.2.1 and 9.2.1.1 c).

7.1.1.5.3 Test purpose

1. To verify that the UE ignores PDUs with UE-Ids that do not match the Id allocated to it.
2. To verify that the TCTF field, C/T field, UE-Id type and UE-Id field are correctly applied when a DTCH or DCCH is mapped to the RACH/FACH.

7.1.1.5.4 Method of test

Initial conditions

System Simulator:

See clause 7.1.1.2.4.

User Equipment:

See clause 7.1.1.2.4.

Test procedure

a) The SS receives the PAGING RESPONSE or SERVICE REQUEST (depending on domain) message from the UE and checks the UE-Id field.

b) The SS transmits MAC PDUs containing RLC AM PDUs containing a DIRECT TRANSFER message containing.

   1. Dummy Octet String for NAS Message, of size sufficient enough to fit in one RLC PDU of 144 bits, including the correct RLC AM header.
   2. The IE CN Domain Identity is Sset to PS Domain (no signalling connection for this domain exists)
   3. The polling bit in RLC header is set for transmission of RLC STATUS PDU.

   The MAC header shall be set as follows:

Field	Value
TCTF	11'B
UE ID Type	C-RNTI
UE ID	Address allocated in RRC CONNECTION SETUP message + 1.
C/T	Logical Channel ID for SRB #3 (AM-DCCH NAS High Priority): 0010'B

c) The SS checks that UE shall neither transmit RRC Status message on SRB2 nor RLC Status PDU on SRB3.

d) The SS again transmits MAC PDUs as in b) above, but this time uses the correct UE-Id value of the address allocated in the RRC CONNECTION SETUP message. The sequence numbers in the RLC headers shall be identical with those sent in b).

e) SS Receives RLC Status PDU on SRB #3 acknowledging the receipt of the above RLC PDU

f) The SS receives a RRC STATUS message on the uplink DCCH using AM RLC on SRB # 2.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	→		PAGING RESPONSE/SERVICE REQUEST	Check UE-Id
2	←		MAC PDU(TCTF, UE-ID, C/T, RLC AM PDU(SN=x, DIRECT TRANSFER))	Sent with incorrect UE-Id = C-RNTI+1
2a			wait for T = 10 s	SS checks that UE shall neither transmit RRC-Status message on SRB 2 nor RLC Status PDU on SRB 3. See note 1 below.
3	←		MAC PDU(TCTF, UE-ID, C/T, RLC AM PDU(SN=x, DIRECT TRANSFER))	Sent with correct UE-Id = C-RNTI
4	→		RLC-STATUS-PDU	ACK PDUs with SN = x UE-Id is recognised as correct for the UE. See note 2 below.
5	→		RRC Status message	
NOTE 1: UE will Transmit Signalling Connection Release Indication on expiry of MM Timer T3240 or GMM Timer T3317. NOTE 2: RRC Status message may be received before RLC Status PDU.				

Specific Message Contents

None

7.1.1.5.5 Test Requirement

In step a) the UE-Id field should be set to the C-RNTI allocated in the RRC CONNECTION SETUP message. Note that this may be implied from receipt of the PAGING RESPONSE/SERVICE REQUEST message correctly by the SS test script.

During the test the SS shall request an RLC status report with every transmitted PDU by setting of the Polling Bit. The UE shall not send any STATUS PDUs indicating missing PDUs.

At the end of the expected sequence (steps 4 and 5) the SS shall receive RLC Status PDU on SRB # 3 with correct C-RNTI and RRC Status message on SRB # 2.

7.1.1.6 DTCH or DCCH mapped to DSCH or USCH

7.1.1.6.1 Definition and applicability

Applicable for if mode TDD only or FDD only is supported. In FDD applicable only to R99 and Rel-4 UEs.

7.1.1.6.2 Conformance requirement

The TCTF field is included in the MAC header for TDD only. The UE-Id type and UE-Id are included in the MAC header for FDD only. The C/T field is included if multiplexing on MAC is applied.

Reference(s)

TS 25.321 clause 9.2.1.1.

7.1.1.6.3 Test purpose

To verify when DTCH or DCCH is mapped to DSCH or USCH, the TCTF field is applied for TDD only, the UE-Id type and UE-Id are applied for FDD only. If multiplexing on MAC is applied, C/T field is included, otherwise, the C/T field is not included in the MAC header.

7.1.1.6.4 Method of test

Initial conditions

System Simulator:

- 1 cell, default parameters. Ciphering Off.

User Equipment:

- The UE shall operate under normal test conditions, Ciphering Off.
- The Test-USIM shall be inserted.

The UE is in Connected mode and a connection is established as described in the TS 34.123-1, 7.3 PDCP testing, clause "Setup a UE originated PS session using IP Header compression in AM RLC (using Loop back test mode 1).

Related ICS/IXIT Statement(s)

TBD

Foreseen Final State of the UE

Test procedure

a) The SS sends a certain data block to the UE.

b) After having received the data block via configured mapped channels, the UE forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its MAC configuration to the SS.

c) The SS receives the returned data block and checks its MAC header whether the TCTF is applied for TDD only, or the UE-Id type and UE-Id are applied for FDD only, and the C/T field shall not be applied.

d) The SS configures the RLC.

e) The SS starts a Radio Bearer Reconfiguration procedure to be connected in RLC transparent mode and configures the Radio Bearer for multiplexing.

f) The SS sends a certain data block to the UE.

g) After having received the data block via configured mapped channels, the UE forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its MAC configuration to the SS.

h) The SS receives the returned data block and checks its MAC header whether the TCTF is applied for TDD only, or the UE-Id type and UE-Id are applied for FDD only and the C/T field is applied.

i) The SS reconfigures its RLC mode to be in AM.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	DATA BLOCK	The SS sends one data block with MAC header, sets TCTF as "DCCH or DTCH over USCH or DSCH" for TDD only, or sets UE-Id type as "C-RNTI", and UE-Id as C-RNTI of UE for FDD only.
2	→	LOOP BACK DATA BLOCK	SS receives the loop back data block from the Uplink RB and checks the MAC header.
3			SS sends CMAC_MAC_HEADER_REQ with enable_mac_header and CRLC_CONFIG_REQ with RLC mode as "AM mode".
4	←	RADIO BEARER RECONFIGURE	Reconfigures the downlink and uplink radio bearer as multiplexing .
5	→	RADIO BEARER RECONFIGURATION COMPLETE	
6			SS sends CMAC_MAC_HEADER_REQ with disable_mac_header and CRLC_CONFIG_REQ with RLC mode as "Transparent mode".
7	←	DATA BLOCK	The SS sends one data block with MAC header, sets TCTF as "DCCH or DTCH over USCH or DSCH" for TDD only, or sets UE-Id type as "C-RNTI", and UE-Id as C-RNTI of UE for FDD only and C/T field is included.
8	→	LOOP BACK DATA BLOCK	SS receives the loop back data block from the Uplink RB and checks the MAC header.
9			SS sends CMAC_MAC_HEADER_REQ with enable_mac_header and CRLC_CONFIG_REQ with RLC mode as "AM mode".

Specific Message Contents

RADIO BEARER SET UP:

Information Element	Value/remark
RLC info - RLC mode	 AM RLC
RB mapping info -Downlink - Number of logical channels - Downlink transport channel type	 1 DSCH
-Uplink - Number of logical channels - Uplink transport channel type	 1 USCH

RADIO BEARER RECONFIGURE:

Information Element	Value/remark
RLC info - RLC mode	 AM RLC
RB mapping info -Downlink - Number of logical channels - Downlink transport channel type -Uplink - Number of logical channels - Uplink transport channel type	 2 DSCH 2 USCH

7.1.1.6.5 Test requirements

TCTF field in the MAC header of loop back data block is "DTCH or DCCH over DSCH or USCH" for TDD only. The UE-ID type and UE-Id are applied in the MAC header for FDD only. If multiplexing on MAC is applied, C/T field is included, otherwise, C/T field is not included.

7.1.1.7 DTCH or DCCH mapped to CPCH

7.1.1.7.1 Definition and applicability

All UEs which support CPCH.

7.1.1.7.2 Conformance requirement

UE-Id type field and UE-Id are included in the MAC header. The C/T field is included in the MAC header if multiplexing on MAC is applied.

Reference(s)

TS 25.321 clauses 9.2.1.1 and 11.3.

TS 25.214 clause 6.2.

TS 25.211 clause 5.3.3.11.

7.1.1.7.3 Test purpose

To verify when DTCH or DCCH mapped to CPCH, UE-Id type field and UE-Id are included in the MAC header. if multiplexing on MAC is applied, the C/T field is included in the MAC header, otherwise, C/T field is not included.

7.1.1.7.4 Method of test

Initial conditions

System Simulator:

- 1 cell, default parameters, Ciphering Off.

User Equipment:

- The UE shall operate under normal test conditions, Ciphering Off.
- The Test-USIM shall be inserted.

The UE is in Connected mode and a connection is established as described in the TS 34.123-1, 7.3 PDCP testing, clause "Setup a UE originated PS session using IP Header compression in UM RLC (using Loop back test mode 1).

Related ICS/IXIT Statement(s)

TBD

Foreseen Final State of the UE

Test procedure

a) The SS sends SIBs 7, 8, and 9, sends CSICH information and waits 30 s.

b) The SS reconfigures its RLC mode to be in transparent mode RLC. Afterwards its sends a certain data block to the UE.

c) After having received the data block via configured mapped channels, the UE forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its MAC configuration to the SS.

d) The SS receives the returned data block and checks its MAC header, whether a UE-Id type and a UE-Id are included.

e) The SS reconfigures its RLC mode to be in AM.

f) The SS starts a Radio Bearer Reconfiguration procedure to be connected in RLC transparent mode and configures the Radio Bearer for multiplexing.

g) The SS sends the next data block via its MAC entity with MAC header, including the UE-Id type as "C-RNTI" and UE-Id as C-RNTI of the UE.C/T field.

h) After having received the data block via configured mapped channels, the UE forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its MAC configuration to the SS.

i) The SS receives the returned data block and checks its MAC header, whether UE-Id type, UE-Id field are included and C/T field is applied or not.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		SIBs 7, 8 and 9 and CSICH information	Containing default settings for CPCH.
2	←		DATA BLOCK	The SS sends one data block with MAC header, sets UE-Id type as "C-RNTI", and UE-Id as C-RNTI of UE.
3	→		LOOP BACK DATA BLOCK	SS receives the loop back data block from the Uplink RB and checks the MAC header.
4				SS sends CMAC_MAC_HEADER_REQ with enable_mac_header and CRLC_CONFIG_REQ with RLC mode as "AM mode".
5	←		RADIO BEARER RECONFIGURE	Reconfigures the downlink and uplink radio bearer as multiplexing.
6	→		RADIO BEARER RECONFIGURATION COMPLETE	
7				SS sends CMAC_MAC_HEADER_REQ with disable_mac_header and CRLC_CONFIG_REQ with RLC mode as "Transparent mode".
8	←		DATA BLOCK	The SS sends one data block with MAC header, sets UE-Id type as "C-RNTI", and UE-Id as C-RNTI of UE.
9	→		LOOP BACK DATA BLOCK	SS receives the loop back data block from the Uplink RB and checks the MAC header.
10				SS sends CMAC_MAC_HEADER_REQ with enable_mac_header and CRLC_CONFIG_REQ with RLC mode as "AM mode".

Specific Message Contents

RADIO BEARER SET UP:

Information Element	Value/remark
RLC info	
- RLC mode	AM RLC
RB mapping info	
-Downlink	
- Number of logical channels	1
- Downlink transport channel type	FACH
-Uplink	
- Number of logical channels	1
- Uplink transport channel type	CPCH

RADIO BEARER RECONFIGURE:

Information Element	Value/remark
RLC info	
- RLC mode	AM RLC
RB mapping info	
-Downlink	
- Number of logical channels	2
- Downlink transport channel type	FACH
-Uplink	
- Number of logical channels	2
- Uplink transport channel type	CPCH

PRACH persistence level info in System Information Block type 7

Information Element	Value/Remark
PRACHs listed in SIB 5	
- Dynamic persistence level	All set to 8, which maps to minimum persistence value, no access allowed
PRACHs listed in SIB 6	
- Dynamic persistence level	All set to 8, which maps to minimum persistence value, no access allowed

CPCH parameters in System Information Block type 8

Information Element	Value/Remark
Back off control parameters	
- $N_{\_ap\_retrans\_max}$	15
- $N_{\_access\_fails}$	15
- $NF_{\_bo\_no\ aich}$	15
- $NS_{\_bo\_busy}$	15
- $NF_{\_bo\_all\_busy}$	15
- $NF_{\_bo\_mismatch}$	15
- $T_{\_CPCH}$	0
Power Control Algorithm	algorithm 1
TPC step size	1
DL DPCCH BER	15

CPCH set info in System Information Block type 8

Information Element	Value/Remark
AP preamble scrambling code	16
AP-AICH channelisation code	15
CD preamble scrambling code	17
CD/CA-ICH channelisation code	16
DeltaPp-m	0
UL DPCCH Slot Format	1
N_start_message	8
CPCH status indication mode	PA mode
PCPCH Channel #1 info	
- UL scrambling code	18
- DL channelisation code	15
- PCP length	8
- UCSM info	
- Minimum spreading factor	64
- NF_max	64
- AP signature	15
PCPCH Channel #2 info	
- UL scrambling code	19
- DL channelisation code	14
- PCP length	8
- UCSM info	
- Minimum spreading factor	64
- NF_max	64
- AP signature	14

PCPCH persistence level info in System Information Block type 9

Information Element	Value/Remark
CPCH set persistence levels	
- PCPCH persistence level	Both set to 1, immediate access allowed

CSICH Information broadcast by SS PHY

Information Element	Value/Remark
PCPCH Channel Availability (PCA) :	
-PCA1	Available
-PCA2	Available

7.1.1.7.5 Test requirements

The UE-Id type and UE-Id field are included in the MAC header. When multiplexing on MAC is not applied, C/T field is included in the MAC header. Otherwise, C/T field is not included.

7.1.1.8 DTCH or DCCH mapped to DCH / Invalid C/T Field

7.1.1.8.1 Definition

This tests that the MAC applies the correct header to the MAC PDU according to the type of logical channel carried on the DCH transport channel. Incorrect application of MAC headers would result in inoperation of the UE.

7.1.1.8.2 Conformance requirement

DTCH or DCCH mapped to DCH, no multiplexing of dedicated channels on MAC: -no MAC header is required.

DTCH or DCCH mapped to DCH, with multiplexing of dedicated channels on MAC: -C/T field is included in MAC header.

The following fields are defined for the MAC header:

- C/T field
  The C/T field provides identification of the logical channel instance when multiple logical channels are carried on the same transport channel…

Structure of the C/T field

C/T field	Designation
0000	Logical channel 1
0001	Logical channel 2
...	...
1110	Logical channel 15
1111	Reserved (PDUs with this coding will be discarded by this version of the protocol)

Reference(s)

TS 25.321 clauses 9.2.1 and 9.2.1.1 b).

7.1.1.8.3 Test purpose

1. To verify that the UE discards PDUs with reserved or incorrect values in C/T field.
2. To verify that the C/T field is correctly applied when a DTCH or DCCH is mapped to a DCH.

7.1.1.8.4 Method of test

Initial conditions

System Simulator:

- 1 cell, default parameters, Ciphering Off.

  The DCH/DPCH is configured as specified in TS 34.108 clause 6.10.2.4.1.2 (FDD), 6.11.5.4.1.2(1.28Mcps TDD): (Stand-alone UL:3.4 DL:3.4 kbps SRBs for DCCH) with the following exception:

Higher layer	RAB/signalling RB		RB#3 (SRB#3)
	User of Radio Bearer		NAS_DT High prio
RLC	Logical channel type		DCCH
	RLC mode		TM
	Payload sizes, bit		148
	Max data rate, bps		3700
	RLC header, bit		0
MAC	MAC header, bit		0 (note)
	MAC multiplexing		Simulated by SS
Layer 1	TrCH type		DCH
	TB sizes, bit		148
	TFS	TF0, bits	0 x 148
		TF1, bits	1 x 148
	TTI, ms		40
	Coding type		CC 1/3
	CRC, bit		16
	Max number of bits/TTI before rate matching		516
	Uplink: Max number of bits/radio frame before rate matching		129
	RM attribute		155-165
NOTE: The SS MAC layer must be configured not to add a MAC header so that the header can be added by the test case in order to create the necessary invalid values.			

The TFCS should be configured as specified in clause 6.10.2.4.1.2.1.1.2 (FDD), 6.11.5.4.1.2.1.1.2(1.28 Mcps TDD).

User Equipment:

The UE shall operate under normal test conditions, Ciphering Off.

The Test-USIM shall be inserted.

The SS starts broadcasting the System Information as specified in TS 34.108 clause 6.1, using the configuration for the PRACH and SCCPCH (signalled in SYSTEM INFORMATION 5) as follows:

1. The SCCPCH is configured as specified in TS 34.108 clause 6.10.2.4.3.3 (FDD), 6.11.5.4.4.3(1.28Mcps TDD) (Interactive/Background 32 kbps RAB + SRB for PCCH + SRB for CCCH + SRB for DCCH + SRB for BCCH).

2. The PRACH is configured as specified in TS 34.108 clause 6.10.2.4.4.1 (FDD), 6.11.5.4.5.2(1.28Mcps TDD).

The SS follows the procedure in TS 34.108 clause 7.4.2.1 (Mobile Terminated for CS) so that the UE shall be in state BGP 6-1 (CS-CELL_DCH_INITIAL) or clause 7.4.2.2 (Mobile Terminated for PS) so that the UE shall be in state BGP 6-3 (PS-CELL_DCH_INITIAL). During this procedure the RRC CONNECTION SETUP message shall allocate a DCH to carry the signalling radio bearers as follows:

1. The DCH/DPCH is configured as specified in TS 34.108 clause 6.10.2.4.1.2 (FDD), 6.11.5.4.1.2(1.28Mcps TDD): Stand-alone UL:3.4 DL:3.4 kbps SRBs for DCCH).

Test procedure

a) The SS receives the PAGING RESPONSE or SERVICE REQUEST (depending on domain) message from the UE and checks the C/T field.

b) The SS transmits MAC PDUs containing RLC AM PDUs containing a DIRECT TRANSFER message containing

   1. Dummy octet string for NAS Message, of size sufficient enough to fit in one RLC PDU of 144 bits, including the correct RLC AM header.

   2. The IE CN Domain Identity is Set to PS Domain (no signalling connection for this Domain exists).

   3. The polling bit in RLC header is set for transmission of RLC STATUS PDU.

   The MAC header shall be set as follows:

Field	Value
C/T	'0111'B

c) The SS checks that UE shall neither transmit RRC Status message on SRB2 nor RLC Status PDU on SRB3.

d) The SS again transmits MAC PDUs as in b) above, but this time uses the correct C/T value for AM-DCCH NAS High Priority of 0010'B. The sequence numbers in the RLC headers shall be identical with those sent in b).

e) SS Receives RLC Status PDU on SRB #3 acknowledging the receipt of the above RLC PDU.

f) The SS receives a RRC STATUS message on the uplink DCCH using AM RLC on SRB # 2.

g) The SS repeats steps b), c), d), e) and f), with the C/T field set as follows in step b):

Iteration	C/T Value
2	1111'B

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	→		PAGING RESPONSE/SERVICE REQUEST	Check C/T field
2	←		MAC PDU(C/T, RLC AM PDU(SN=x, DIRECT TRANSFER))	Sent with incorrect C/T = 0111'B, or 1111'B
2a			wait for T = 5 s	SS checks that UE shall neither transmit RRC-Status message on SRB 2 nor RLC Status PDU on SRB 3. See note 1 below.
3	←		MAC PDU(C/T, RLC AM PDU(SN=x, DIRECT TRANSFER))	Sent with correct C/T = 0010'B
4	→		RLC-STATUS-PDU	ACK PDUs with SN = x C/T Field is recognised as correct for the DCCH. See note 2 below.
5	→		RRC Status message	
NOTE 1: UE will Transmit Signalling Connection Release Indication on expiry of MM Timer T3240 or GMM Timer T3317. NOTE 2: RRC Status message may be received before RLC Status PDU.				

Steps 2 to 5 of the expected sequence are repeated for iteration 2.

NOTE: For iteration 2 the SN in steps 2 and 4 starts with x+1.

Specific Message Contents

None

7.1.1.8.5 Test Requirement

In step a) the C/T field should be set to the Logical Channel ID for SRB #3 (0010'B). Note that this may be implied from receipt of the PAGING RESPONSE or SERVICE REQUEST message correctly by the SS test script.

During the test the SS shall request RLC status reports with every transmitted PDU by setting of the Polling Bit. The UE shall not send any STATUS PDUs indicating missing PDUs.

At the end of each iteration (steps 4 and 5 of expected sequence) the SS shall receive a RLC Status PDU on SRB # 3 with C/T field set to '0010'B and RRC Status message on SRB # 2.

7.1.1.9 MTCH mapped to FACH / Invalid TCTF (TDD MBSFN)

7.1.1.9.1 Definition

This tests that the MAC applies the correct header to the MAC PDU according to the type of logical channel carried on the FACH transport channel. Incorrect application of MAC headers would result in inoperation of the UE.

7.1.1.9.2 Conformance requirement

MTCH mapped to FACH:

The TCTF field and MBMS-Id field are included in the MAC header for MTCH

…

Table 9.2.1.1: Coding of the Target Channel Type Field on FACH for TDD

TCTF	Designation
000	BCCH
001	CCCH
010	CTCH
01100	DCCH or DTCH over FACH
01101	MCCH
01110	MTCH
01111	MSCH
100	SHCCH
101-111	Reserved (PDUs with this coding will be discarded by this version of the protocol)

Reference(s)

TS 25.321 clauses 9.2.1 and 9.2.1.8.

7.1.1.9.3 Test purpose

1. To verify that the UE discards PDUs with reserved or incorrect values in the TCTF field.
2. To verify that the TCTF field is correctly applied when a MTCH is mapped to the FACH.

7.1.1.9.4 Method of test

Initial conditions

System Simulator:

Unicast carrier: 1 cell, Cell 1 with default configuration.

- MBSFN carriers: 1 cell, Cell 31 has default parameters. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 and Default1 MCCH scheduling (No ongoing session) according to subclause 11.2 of TS 34.108.

The configuration of the S-CCPCH which will carry the MTCH is based upon that specified in TS 34.108 clause 6.11.1c (3.84 Mcps TDD), 6.11.1d (7.68 Mcps TDD) and 6.11.5.4.4.13 (1.28 Mcps TDD) 8kbps RB for MBSFN MTCH with the following exceptions for the FACH:

Higher layer	RAB/signalling RB		RAB
	User of Radio Bearer		Test
RLC	Logical channel type		MTCH
	RLC mode		TM
	Payload sizes, bit		345
	Max data rate, bps		8200
	UMD PDU header, bit		0
MAC	MAC header, bit		0 (note)
	MAC multiplexing		Simulated by SS
Layer 1	TrCH type		FACH
	TB sizes, bit		345
	TFS	TF0, bits	0x345
		TF1, bits	1x345
	TTI, ms		40
	Coding type		TC
	CRC, bit		16
	Max number of bits/TTI after channel coding		1095
	Max number of bits/radio frame before rate matching		274
	RM attribute		128
NOTE: The SS MAC layer must be configured not to add a MAC header so that the header can be added by the test case in order to create the necessary invalid values.			

User Equipment:

- On the unicast carrier cell the UE is in registered Idle Mode on PS (state 3) if the UE only supports PS domain or registered Idle Mode on CS/PS (state 7) if the UE supports both CS and PS domains, as specified in clause 7.2.2 of TS 34.108.
- The UE is in MBSFN Idle mode with one activated service as specified in clause 7.6.4 of TS 34.108. The UE has selected (i.e. it is included in MBMS_ACTIVATED_SERVICES variable) a national service for which there will be a session starting on MBSFN Cell 31 (see TS 34.108 clause 11.2.4).

Related ICS/IXIT statements

- MBMS Broadcast services in MBSFN mode available on UE Yes/No.
- Support of TDD transmit and receive functions available on UE Yes/No.
- Support of TDD MBSFN receive only function available on UE Yes/No.

Test procedure

a) The UE is camping on Cell 1 and Cell 31. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 (no session ongoing) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108.

b) The SS sends ACTIVATE RB TEST MODE on the unicast carrier and the UE responds with ACTIVATE RB TEST MODE COMPLETE.

c) The SS sends CLOSE UE TEST LOOP to activate RLC SDU counting on Cell 31 MTCH (Transmission identity indicating the MBMS activated service).

d) The SS notifies on MCCH about the start of an MBMS session for one modification period. MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C4 (one PTM session starting) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108.

e) MCCH messages are then transmitted by the SS on Cell 31 using MBMS configuration C2 (one PTM session ongoing) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108.

f) The SS waits for the UE to start reception of the MBMS data on MTCH according to the specified service activation time. The UE closes the test loop. The UE sends CLOSE UE TEST LOOP COMPLETE.

g) The SS transmits MAC PDUs containing RLC UM PDUs containing an octet string representing dummy traffic data, of size sufficient enough to fit in one RLC PDU of 338 bits, including the correct RLC UM header.

   The MAC header shall be set as follows:

Field	Value
TCTF	101'B
MBMS-Id	0000'B

h) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE corresponds to zero received RLC SDUs. The SS records the value.

i) The SS again transmits MAC PDUs as in b) above, but this time uses the correct TCTF of 01110’B. Where a TCTF size of 5-bits is used, 2-bits from the RLC payload (specified above as 338 bits) shall be discarded. The sequence numbers in the RLC headers shall be identical with those sent in b).

j) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is > 0. The SS records the value.

k) The SS repeats steps g), h), i) and j), with the TCTF field set as follows in step g):

Iteration	TCTF Value
2	110'B
3	111'B
4	001'B
5	010'B
6	100'B
7	01100'B

NOTE 1: For a UE in UE test loop mode 3 the RLC SDU counter value is only reset upon reception of the CLOSE UE TEST LOOP message configuring UE test loop mode 3. To enable the SS to measure the number of received RLC SDUs for the different sub-tests the SS needs to record the reported values for each sub-test and perform the checking of the reported value relative to the previously reported value.

Expected sequence

Step	Direction		Carrier	Message	Comment
	UE	SS			
1	←		U	ACTIVATE RB TEST MODE	
2	→		U	ACTIVATE RB TEST MODE COMPLETE	
3	←		U	CLOSE UE TEST LOOP	Loop back mode 3 is activated on Cell 31 for the selected national service on MTCH.
4	←		M	MBMS MCCH Message Configuration C4	Includes the national service activated at UE in the modified services list for one modification period.
5	←		M	MBMS MCCH Message Configuration C2	No modified services. One ongoing service corresponding to that activated at the UE.
6	→		U	CLOSE UE TEST LOOP COMPLETE	The UE establishes the MTCH according to the activation time and closes the test loop.
7	SS		M		The SS repeats steps 8 - 15 for each invalid TCTF value.
8				MAC PDU(TCTF, MBMS-Id, RLC UM PDU(SN=x))	Sent with invalid TCTF = 101'B, 110'B, 111'B, 001'B, 010'B, 100'B and 01100'B
9					SS waits for T = 2 s
10	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
11	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to zero. The SS records the value.
12				MAC PDU(TCTF, MBMS-Id, RLC UM PDU(SN=x))	Sent with correct TCTF = 01110'B
13					SS waits for T = 2 s
14	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
15	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is greater than zero. The SS records the value.
16	←		U	OPEN UE TEST LOOP	
17	→		U	OPEN UE TEST LOOP COMPLETE	
18	←		U	DEACTIVATE RB TEST MODE	
19	→		U	DEACTIVATE RB TEST MODE COMPLETE	

Steps 8 – 15 of the above expected sequence are repeated for iterations 2 to 7. Note: For iteration k the SN in steps 8 and 12 starts with x + (k –1).

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

MBMS COMMON P-T-M RB INFORMATION (Step 4 and Step 5) (3.84 Mcps)

Information Element	Value/remark	Version
Message type		Rel-6
RB information list	1 entry in the list	Rel-6
- RB identity		
- MBMS Common RB identity	14	
- PDCP info		
- Support for lossless SRNS relocation	Not Present	
- Max PDCP SN window size	Not Present	
- PDCP PDU header	absent	
- Header compression information	Not Present	

Information Element	Value/remark	Version
- RLC info		
- DL UM RLC LI size	7	
- DL Duplication Avoidance and Reordering info	Not Present	
- DL Out of sequence delivery info	Not Present	
TrCh information for each TrCh	1 entry in the list	Rel-6
- Transport channel identity		
- MBMS Common TrCh identity	1	
- TFS		
- CHOICE *Transport channel type*	Common transport channels	
- Dynamic Transport Format Information		
- RLC Size	Refer to TrCh parameters defined above	
- Number of TBs and TTI List	(This IE is repeated for each TFI)	
- Number of Transport blocks	Refer to TrCh parameters defined above	
- CHOICE *mode*	TDD	
- Transmission Time Interval	Not Present	
- CHOICE *Logical Channel List*	ALL	
- no data		
- Semi-static Transport Format information		
- Transmission time interval	Refer to TrCh parameters defined above	
- Type of channel coding	Turbo	
- Coding Rate	Not Present	
- Rate matching attribute	Refer to TrCh parameters defined above	
- CRC size	Refer to TrCh parameters defined above	
TrCh information for each CCTrCh	Not Present (Default TFCS applies for each CCTrCh)	Rel-6
PhyCh information	1 entry in list	Rel-6
- PhyCh identity		
- MBMS Common PhyCh identity	23	
- Secondary CCPCH info MBMS		
- CHOICE *mode*	1.28/3.84 Mcps TDD	
- Common timeslot info MBMS		
- 2nd interleaving mode	Frame	
- TFCI coding	Reference to clause 6.11.1c	
- Puncturing limit	Reference to clause 6.11.1c	
- Downlink Timeslots and Codes		
- First individual timeslot info		
- Timeslot number		
- CHOICE *TDD option*	3.84 Mcps	
- Timeslot number	1	
- TFCI existence	TRUE	
- Midamble Shift and burst type		
- CHOICE *TDD option*	3.84 Mcps TDD	
- CHOICE Burst Type	MBSFN Burst Type	Rel-7
- no data		Rel-7
- CHOICE *TDD option*	3.84Mcps TDD	
- no data		
- First timeslot channelisation codes		
- CHOICE *codes representation*	Consecutive codes	
- First channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- Last channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- CHOICE *more timeslots*	No more timeslots	
- no data		
- Modulation	Reference to clause 6.11.1c	Rel-7

MBMS COMMON P-T-M RB INFORMATION (Step 4 and Step 5) (7.68 Mcps)

Information Element	Value/remark	Version
Message type		Rel-7
RB information list	1 entry in the list	Rel-7
- RB identity		
- MBMS Common RB identity	14	
- PDCP info		
- Support for lossless SRNS relocation	Not Present	
- Max PDCP SN window size	Not Present	
- PDCP PDU header	absent	
- Header compression information	Not Present	

Information Element	Value/remark	Version
- RLC info		
- DL UM RLC LI size	7	
- DL Duplication Avoidance and Reordering info	Not Present	
- DL Out of sequence delivery info	Not Present	
TrCh information for each TrCh	1 entry in the list	Rel-7
- Transport channel identity		
- MBMS Common TrCh identity	1	
- TFS		
- CHOICE *Transport channel type*	Common transport channels	
- Dynamic Transport Format Information		
- RLC Size	Refer to TrCh parameters defined above	
- Number of TBs and TTI List	(This IE is repeated for each TFI)	
- Number of Transport blocks	Refer to TrCh parameters defined above	
- CHOICE *mode*	TDD	
- Transmission Time Interval	Not Present	
- CHOICE *Logical Channel List*	ALL	
- no data		
- Semi-static Transport Format information		
- Transmission time interval	Refer to TrCh parameters defined above	
- Type of channel coding	Turbo	
- Coding Rate	Not Present	
- Rate matching attribute	Refer to TrCh parameters defined above	
- CRC size	Refer to TrCh parameters defined above	
TrCh information for each CCTrCh	Not Present (Default TFCS applies for each CCTrCh)	Rel-7
PhyCh information	1 entry in list	Rel-7
- PhyCh identity		
- MBMS Common PhyCh identity	23	
- Secondary CCPCH info MBMS		
- CHOICE *mode*	7.68 Mcps TDD	
- Common timeslot info MBMS		
- 2nd interleaving mode	Frame	
- TFCI coding	Reference to clause 6.11.1d	
- Puncturing limit	Reference to clause 6.11.1d	
- Downlink Timeslots and Codes VHCR		
- First Individual timeslot info		
- Timeslot number		
- CHOICE *TDD option*	7.68 Mcps option	
Timeslot number	1	
- TFCI existence	TRUE	
- Midamble Shift and burst type		
- CHOICE *TDD option*	7.68 Mcps TDD	
- CHOICE *Burst Type*	MBSFN Burst Type	
- no data	Default	
- CHOICE *TDD option*	7.68Mcps TDD	
- no data		
- First timeslot channelisation codes VHCR		
- CHOICE *codes representation*	Consecutive codes	
- First channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- Last channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- CHOICE more timeslots	No more timeslots	
- no data		
- Modulation	Reference to clause 6.11.1d	

MBMS COMMON P-T-M RB INFORMATION (Step 4 and Step 5) (1.28 Mcps)

Information Element	Value/remark	Version
Message type		Rel-6
RB information list	1 entry in the list	Rel-6
- RB identity		
- MBMS Common RB identity	14	
- PDCP info		
- Support for lossless SRNS relocation	Not Present	
- Max PDCP SN window size	Not Present	
- PDCP PDU header	absent	
- Header compression information	Not Present	

Information Element	Value/remark	Version
- RLC info		
- DL UM RLC LI size	7	
- DL Duplication Avoidance and Reordering info	Not Present	
- DL Out of sequence delivery info	Not Present	
TrCh information for each TrCh	1 entry in the list	Rel-6
- Transport channel identity		
- MBMS Common TrCh identity	1	
- TFS		
- CHOICE *Transport channel type*	Common transport channels	
- Dynamic Transport Format Information		
- RLC Size	Refer to TrCh parameters defined above	
- Number of TBs and TTI List	(This IE is repeated for each TFI)	
- Number of Transport blocks	Refer to TrCh parameters defined above	
- CHOICE *mode*	TDD	
- Transmission Time Interval	C	
- CHOICE *Logical Channel List*	ALL	
- no data		
- Semi-static Transport Format information		
- Transmission time interval	Refer to TrCh parameters defined above	
- Type of channel coding	Turbo	
- Coding Rate	Not Present	
- Rate matching attribute	Refer to TrCh parameters defined above	
- CRC size	Refer to TrCh parameters defined above	
TrCh information for each CCTrCh	Not Present (Default TFCS applies for each CCTrCh)	Rel-6
PhyCh information	1 entry in list	Rel-6
- PhyCh identity		
- MBMS Common PhyCh identity	23	
- Secondary CCPCH info MBMS		
- CHOICE *mode*	1.28/3.84 Mcps TDD	
- Common timeslot info MBMS		
- 2nd interleaving mode	Frame	
- TFCI coding	Reference to clause 6.11.5.4.4.13	
- Puncturing limit	Reference to clause 6.11.5.4.4.13	
- Downlink Timeslots and Codes		
- First individual timeslot info		
- Timeslot number		
- CHOICE *TDD option*	1.28 Mcps	
- Timeslot number	1	
- TFCI existence	TRUE	
- Midamble Shift and burst type		
- CHOICE *TDD option*	1.28 Mcps TDD	
- Midamble Allocation Mode	Common midamble	
- Midamble configuration	2	
- CHOICE *TDD option*	1.28Mcps TDD	
- Modulation	Reference to clause 6.11.5.4.4.13	
- SS-TPC Symbols	1	
- Additional TPC-SS Symbols	Not Present	
- First timeslot channelisation codes		
- CHOICE *codes representation*	Consecutive codes	
- First channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- Last channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- CHOICE *more timeslots*	No more timeslots	
- no data		
- MBSFN Special Time Slot	TS7	Rel-7
- Modulation	Reference to clause 6.11.5.4.4.13	Rel-7
LCR TDD MBSFN information	Not Present	Rel-7

MBMS CURRENT CELL P-T-M RB INFORMATION (Step 4 and Step 5)

Information Element	Value/remark	Version
Message type		Rel-6
S-CCPCH list	Contains 1 S-CCPCH	Rel-6
- S-CCPCH identity	Not Present	
- Secondary CCPCH info	23	
- MBMS Soft Combining Timing Offset	Not Present	
- TrCh information common for all TrCh	Not Present (MD)	
- TrCH information list		
- TrCh information	1	
- RB information list		
- RB information		
- RB information	14	
- MBMS short transmission ID	Reference to the service which is being provided on this RB.	
- MBMS logical channel identity	1	
- L1 combining status	Not Present	
- MSCH configuration information	Not Present	
S-CCPCH in SIB type 5	Not Present	Rel-6
MBSFN TDM Info List	Not Present	Rel-7

7.1.1.9.5 Test Requirement

1) At step 11 on each iteration, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to zero received RLC SDUs for Cell 31 MTCH.

2) At step 15 on each iteration, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to > 0 received RLC SDUs for Cell 31 MTCH.

7.1.1.9a MTCH mapped to FACH / Invalid TCTF (3.84 Mcps TDD IMB)

7.1.1.9a.1 Definition

This tests that the MAC applies the correct header to the MAC PDU according to the type of logical channel carried on the FACH transport channel. Incorrect application of MAC headers would result in inoperation of the UE.

7.1.1.9a.2 Conformance requirement

MTCH mapped to FACH:

The TCTF field and MBMS-Id field are included in the MAC header for MTCH

Table 9.2.1.1a: Coding of the Target Channel Type Field on FACH for 3.84 Mcps TDD IMB

TCTF	Designation
00	BCCH
01000000	CCCH
01000001-01001111	Reserved (PDUs with this coding will be discarded by this version of the protocol)
01010000	MCCH
01010001-01011110	Reserved (PDUs with this coding will be discarded by this version of the protocol)
01011111	MSCH
0110	MTCH
0111	Reserved (PDUs with this coding will be discarded by this version of the protocol)
10000000	CTCH
10000001-10111111	Reserved (PDUs with this coding will be discarded by this version of the protocol)
11	DCCH or DTCH over FACH

Reference(s)

TS 25.321 [6] clauses 9.2.1 and 9.2.1.8.

7.1.1.9a.3 Test purpose

1. To verify that the UE discards PDUs with reserved or incorrect values in the TCTF field.
2. To verify that the TCTF field is correctly applied when a MTCH is mapped to the FACH.

7.1.1.9a.4 Method of test

Initial conditions

System Simulator:

Unicast carrier: 1 cell, Cell 1 with default configuration.

- MBSFN carriers: 1 cell, Cell 31 has default parameters. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 and Default1 MCCH scheduling (No ongoing session) according to subclause 11.2 of TS 34.108 [9].

The configuration of the S-CCPCH which will carry the MTCH is based upon that specified in TS 34.108 [9], clause 6.11.1e (3.84 Mcps TDD IMB) 8kbps RB for MBSFN MTCH with the following exceptions for the FACH:

Higher layer	RAB/signalling RB		RAB
	User of Radio Bearer		Test
RLC	Logical channel type		MTCH
	RLC mode		TM
	Payload sizes, bit		344
	Max data rate, bps		8200
	UMD PDU header, bit		0
MAC	MAC header, bit		0 (NOTE)
	MAC multiplexing		Simulated by SS
Layer 1	TrCH type		FACH
	TB sizes, bit		344
	TFS	TF0, bits	0x344
		TF1, bits	1x344
	TTI, ms		40
	Coding type		TC
	CRC, bit		16
	Max number of bits/TTI after channel coding		1092
	Max number of bits/radio frame before rate matching		273
	RM attribute		128
NOTE: The SS MAC layer must be configured not to add a MAC header so that the header can be added by the test case in order to create the necessary invalid values.			

User Equipment:

- On the unicast carrier cell the UE is in registered Idle Mode on PS (state 3) if the UE only supports PS domain or registered Idle Mode on CS/PS (state 7) if the UE supports both CS and PS domains, as specified in clause 7.2.2 of TS 34.108 [9].
- The UE is in MBSFN Idle mode with one activated service as specified in clause 7.6.4 of TS 34.108 [9]. The UE has selected (i.e. it is included in MBMS_ACTIVATED_SERVICES variable) a service for which there will be a session starting on MBSFN Cell 31 (see TS 34.108 [9], clause 11.2.4).

Related ICS/IXIT statements

- MBMS Broadcast services in MBSFN mode available on UE Yes/No.
- Support of TDD or FDD transmit and receive functions available on UE Yes/No.
- Support of 3.84 Mcps TDD IMB receive function available on UE Yes/No.

Test procedure

a) The UE is camping on Cell 1 and Cell 31. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 (no session ongoing) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108 [9].

b) The SS sends ACTIVATE RB TEST MODE on the unicast carrier and the UE responds with ACTIVATE RB TEST MODE COMPLETE.

c) The SS sends CLOSE UE TEST LOOP to activate RLC SDU counting on Cell 31 MTCH (Transmission identity indicating the MBMS activated service).

d) The SS notifies on MCCH about the start of an MBMS session for one modification period. MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C4 (one PTM session starting) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108 [9].

e) MCCH messages are then transmitted by the SS on Cell 31 using MBMS configuration C2 (one PTM session ongoing) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108 [9].

f) The SS waits for the UE to start reception of the MBMS data on MTCH according to the specified service activation time. The UE closes the test loop. The UE sends CLOSE UE TEST LOOP COMPLETE.

g) The SS transmits MAC PDUs containing RLC UM PDUs containing an octet string representing dummy traffic data, of size sufficient enough to fit in one RLC PDU of 332 bits, including the correct RLC UM header.

The MAC header shall be set as follows:

Field	Value
TCTF	01000001'B
MBMS-Id	0000'B

h) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE corresponds to zero received RLC SDUs. The SS records the value.

i) The SS again transmits MAC PDUs as in g) above, but this time uses the correct TCTF of 0110'B. Where a TCTF size of 4-bits is used, 4-bits to the RLC payload (specified above as 332 bits) shall be added. The sequence numbers in the RLC headers shall be identical with those sent in g).

j) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is > 0. The SS records the value.

k) The SS repeats steps g), h), i) and j), with the TCTF field set as follows in step g):

Iteration	TCTF Value
2	01000010'B
3	01001111'B
4	01000000'B
5	01010001'B
6	01010010'B
7	01011110'B
8	0111'B
9	10000000'B
10	10000001'B
11	10000010'B
12	10111111'B
13	11'B

NOTE 1: For a UE in UE test loop mode 3 the RLC SDU counter value is only reset upon reception of the CLOSE UE TEST LOOP message configuring UE test loop mode 3. To enable the SS to measure the number of received RLC SDUs for the different sub-tests the SS needs to record the reported values for each sub-test and perform the checking of the reported value relative to the previously reported value.

Expected sequence

Step	Direction		Carrier	Message	Comment
	UE	SS			
1	←		U	ACTIVATE RB TEST MODE	
2	→		U	ACTIVATE RB TEST MODE COMPLETE	
3	←		U	CLOSE UE TEST LOOP	Loop back mode 3 is activated on Cell 31 for the selected national service on MTCH.
4	←		M	MBMS MCCH Message Configuration C4	Includes the national service activated at UE in the modified services list for one modification period.
5	←		M	MBMS MCCH Message Configuration C2	No modified services. One ongoing service corresponding to that activated at the UE.
6	→		U	CLOSE UE TEST LOOP COMPLETE	The UE establishes the MTCH according to the activation time and closes the test loop.
7	SS		M		The SS repeats steps 8 - 15 for each invalid TCTF value.
8				MAC PDU(TCTF, MBMS-Id, RLC UM PDU(SN=x))	Sent with invalid TCTF = 01000001'B, 01000010'B, 01001111'B, 01000000'B, 01010001'B, 01010010'B, 01011110'B, 0111'B, 10000000'B, 10000001'B, 10000010'B, 10111111'B, 11'B
9					SS waits for T = 2 s
10	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
11	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to zero. The SS records the value.
12				MAC PDU(TCTF, MBMS-Id, RLC UM PDU(SN=x))	Sent with correct TCTF = 0110'B
13					SS waits for T = 2 s
14	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
15	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is greater than zero. The SS records the value.
16	←		U	OPEN UE TEST LOOP	
17	→		U	OPEN UE TEST LOOP COMPLETE	
18	←		U	DEACTIVATE RB TEST MODE	
19	→		U	DEACTIVATE RB TEST MODE COMPLETE	

Steps 8 – 15 of the above expected sequence are repeated for iterations 2 to 13. Note: For iteration k the SN in steps 8 and 12 starts with x + (k –1).

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 [9], clause 9.1.3 for the MBSFN carriers and in TS 34.108 [9], clause 9.1.1 or 9.1.2 for the unicast carrier:

Contents of MBMS COMMON P-T-M RB INFORMATION message: UM (3.84 Mcps TDD IMB)

Information Element	Value/remark	Version

Message type		Rel-6
RB information list	1 entry in the list	Rel-6
- RB identity		Rel-6
- MBMS Common RB identity	14	
- PDCP info		
- Support for lossless SRNS relocation	Not Present	
- Max PDCP SN window size	Not Present	
- PDCP PDU header	absent	
- Header compression information	Not Present	
- RLC info		
- DL UM RLC LI size	7	
- DL Duplication Avoidance and Reordering info	Not Present	
- DL Out of sequence delivery info	Not Present	
TrCh information for each TrCh	1 entry in the list	Rel-6
- Transport channel identity		Rel-6
- MBMS Common TrCh identity	1	
- TFS		
- CHOICE Transport channel type	Common transport channels	
- Dynamic Transport format information		
- RLC Size	Refer to TrCh parameters defined above	
- Number of TBs and TTI List	(This IE is repeated for TFI number.)	
- Number of Transport blocks	Refer to TrCh parameters defined above	
- CHOICE mode	FDD	
- CHOICE Logical channel list	All	
- no data		
- Semi-static Transport Format information		
- Transmission time interval	Refer to TrCh parameters defined above	
- Type of channel coding	Turbo	
- Coding Rate	Not present	
- Rate matching attribute	Refer to TrCh parameters defined above	
- CRC size	Refer to TrCh parameters defined above	
TrCh information for each CCTrCh	Not Present (Default TFCS applies for each CCTrCh)	Rel-6
PhyCh information	1 entry in list	Rel-6
- PhyCh identity		Rel-6
- MBMS Common PhyCh identity	23	
CHOICE mode	3.84 Mcps TDD IMB	
- Secondary CCPCH frame type 2 info		Rel-8
- Sub-frame number	2(check in 5.5.2)	Rel-8
- Downlink channelisation codes		Rel-8
- First channelisation code	(1..15) or reference to 6.10 "parameter set"	
- Last channelisation code	(1..15) or reference to 6.10 "parameter set"	
- CHOICE modulation	16QAM(check in6.10 "parameter set")	Rel-8
- CPICH secondary CCPCH power offset	0dB	Rel-8
LCR TDD MBSFN information	Not present	Rel-7

MBMS CURRENT CELL P-T-M RB INFORMATION (Step 4 and Step 5)

Information Element	Value/remark	Version
Message type		Rel-6
S-CCPCH list	Contains 1 S-CCPCH	Rel-6
- S-CCPCH identity	Not Present	
- Secondary CCPCH info	23	
- MBMS Soft Combining Timing Offset	Not Present	
- TrCh information common for all TrCh	Not Present (MD)	
- TrCH information list		
- TrCh information	1	
- RB information list		
- RB information		
- RB information	14	
- MBMS short transmission ID	Reference to the service which is being provided on this RB.	
- MBMS logical channel identity	1	
- L1 combining status	Not Present	
- MSCH configuration information	Not Present	
S-CCPCH in SIB type 5	Not Present	Rel-6
MBSFN TDM Info List	Not Present	Rel-7

7.1.1.9a.5 Test Requirement

1) At step 11 on each iteration, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to zero received RLC SDUs for Cell 31 MTCH.

2) At step 15 on each iteration, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to > 0 received RLC SDUs for Cell 31 MTCH.

7.1.1.10 MTCH mapped to FACH / Invalid MBMS-Id (TDD MBSFN)

7.1.1.10.1 Definition

This tests that the MAC applies the correct header to the MAC PDU according to the type of logical channel carried on the FACH transport channel. Incorrect application of MAC headers would result in inoperation of the UE.

7.1.1.10.2 Conformance requirement

MTCH mapped to FACH:

The TCTF field and MBMS-Id field are included in the MAC header for MTCH

…

Table 9.2.1.8: Structure of the MBMS-Id field

MBMS-Id field	MBMS logical channel identity [7]
0000	1
0001	2
...	...
1110	15
1111	Reserved (PDUs with this coding will be discarded by this version of the protocol)

Reference(s)

TS 25.321 clauses 9.2.1 and 9.2.1.8.

7.1.1.10.3 Test purpose

1. To verify that the UE discards PDUs with reserved or incorrect values in the MBMS-Id field.
2. To verify that the MBMS-Id field is correctly applied when a MTCH is mapped to the FACH.

7.1.1.10.4 Method of test

Initial conditions

System Simulator:

Unicast carrier: 1 cell, Cell 1 with default configuration.

- MBSFN carriers: 1 cell, Cell 31 has default parameters. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 and Default1 MCCH scheduling (No ongoing session) according to subclause 11.2 of TS 34.108.

The configuration of the S-CCPCH which will carry the MTCH is based upon that specified in TS 34.108 clause 6.11.1c (3.84 Mcps TDD) and 6.11.1d (7.68 Mcps TDD) 8kbps RB for MBSFN MTCH with the following exceptions for the FACH:

Higher layer	RAB/signalling RB		RAB
	User of Radio Bearer		Test
RLC	Logical channel type		MTCH
	RLC mode		TM
	Payload sizes, bit		345
	Max data rate, bps		8200
	UMD PDU header, bit		0
MAC	MAC header, bit		0 (note)
	MAC multiplexing		Simulated by SS
Layer 1	TrCH type		FACH
	TB sizes, bit		345
	TFS	TF0, bits	0x345
		TF1, bits	1x345
	TTI, ms		40
	Coding type		TC
	CRC, bit		16
	Max number of bits/TTI after channel coding		1095
	Max number of bits/radio frame before rate matching		274
	RM attribute		128
NOTE: The SS MAC layer must be configured not to add a MAC header so that the header can be added by the test case in order to create the necessary invalid values.			

User Equipment:

- On the unicast carrier cell the UE is in registered Idle Mode on PS (state 3) if the UE only supports PS domain or registered Idle Mode on CS/PS (state 7) if the UE supports both CS and PS domains, as specified in clause 7.2.2 of TS 34.108.
- The UE is in MBSFN Idle mode with one activated service as specified in clause 7.6.4 of TS 34.108. The UE has selected (i.e. it is included in MBMS_ACTIVATED_SERVICES variable) a national service for which there will be a session starting on MBSFN Cell 31 (see TS 34.108 clause 11.2.4).

Related ICS/IXIT statements

- MBMS Broadcast services in MBSFN mode available on UE Yes/No.
- Support of TDD transmit and receive functions available on UE Yes/No.
- Support of TDD MBSFN receive only function available on UE Yes/No.

Test procedure

a) The UE is camping on Cell 1 and Cell 31. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 (no session ongoing) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108.

b) The SS sends ACTIVATE RB TEST MODE on the unicast carrier and the UE responds with ACTIVATE RB TEST MODE COMPLETE.

c) The SS sends CLOSE UE TEST LOOP to activate RLC SDU counting on Cell 31 MTCH (Transmission identity indicating the MBMS activated service).

d) The SS notifies on MCCH about the start of an MBMS session for one modification period. MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C4 (one PTM session starting) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108.

e) MCCH messages are then transmitted by the SS on Cell 31 using MBMS configuration C2 (one PTM session ongoing) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108.

f) The SS waits for the UE to start reception of the MBMS data on MTCH according to the specified service activation time. The UE closes the test loop. The UE sends CLOSE UE TEST LOOP COMPLETE.

g) The SS transmits MAC PDUs containing RLC UM PDUs containing an octet string representing dummy traffic data, of size sufficient enough to fit in one RLC PDU of 336 bits, including the correct RLC UM header.

   The MAC header shall be set as follows:

Field	Value
TCTF	01110'B
MBMS-Id	1111'B

h) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE corresponds to zero received RLC SDUs. The SS records the value.

i) The SS again transmits MAC PDUs as in b) above, but this time uses a valid MBMS-Id of 1110'B. The sequence numbers in the RLC headers shall be identical with those sent in b).

j) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE corresponds to > 0 received RLC SDUs

Expected sequence

Step	Direction		Carrier	Message	Comment
	UE	SS			
1	←		U	ACTIVATE RB TEST MODE	
2	→		U	ACTIVATE RB TEST MODE COMPLETE	
3	←		U	CLOSE UE TEST LOOP	Loop back mode 3 is activated on Cell 31 for the selected national service on MTCH.
4	←		M	MBMS MCCH Message Configuration C4	Includes the national service activated at UE in the modified services list for one modification period.
5	←		M	MBMS MCCH Message Configuration C2	No modified services. One ongoing service corresponding to that activated at the UE.
6	→		U	CLOSE UE TEST LOOP COMPLETE	The UE establishes the MTCH according to the activation time and closes the test loop.
7				MAC PDU(TCTF, MBMS-Id, RLC UM PDU(SN=x))	Sent with reserved MBMS-Id = 1111'B
8					SS waits for T = 2 s
9	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
10	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to zero. The SS records the value.
11				MAC PDU(TCTF, MBMS-Id, RLC UM PDU(SN=x))	Sent with valid MBMS-Id = 1110'B
12					SS waits for T = 2 s
13	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
14	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is greater than zero.
15	←		U	OPEN UE TEST LOOP	
16	→		U	OPEN UE TEST LOOP COMPLETE	
17	←		U	DEACTIVATE RB TEST MODE	
18	→		U	DEACTIVATE RB TEST MODE COMPLETE	

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

MBMS COMMON P-T-M RB INFORMATION (Step 4 and Step 5) (3.84 Mcps)

Information Element	Value/remark	Version
Message type		Rel-6
RB information list	1 entry in the list	Rel-6
- RB identity		
- MBMS Common RB identity	14	
- PDCP info		
- Support for lossless SRNS relocation	Not Present	
- Max PDCP SN window size	Not Present	
- PDCP PDU header	absent	
- Header compression information	Not Present	

Information Element	Value/remark	Version
- RLC info		
- DL UM RLC LI size	15	
- DL Duplication Avoidance and Reordering info	Not Present	
- DL Out of sequence delivery info	Not Present	
TrCh information for each TrCh	1 entry in the list	Rel-6
- Transport channel identity		
- MBMS Common TrCh identity	1	
- TFS		
- CHOICE *Transport channel type*	Common transport channels	
- Dynamic Transport Format Information		
- RLC Size	Refer to TrCh parameters defined above	
- Number of TBs and TTI List	(This IE is repeated for each TFI)	
- Number of Transport blocks	Refer to TrCh parameters defined above	
- CHOICE *mode*	TDD	
- Transmission Time Interval	Not Present	
- CHOICE *Logical Channel List*	ALL	
- no data		
- Semi-static Transport Format information		
- Transmission time interval	Refer to TrCh parameters defined above	
- Type of channel coding	Turbo	
- Coding Rate	Not Present	
- Rate matching attribute	Refer to TrCh parameters defined above	
- CRC size	Refer to TrCh parameters defined above	
TrCh information for each CCTrCh	Not Present (Default TFCS applies for each CCTrCh)	Rel-6
PhyCh information	1 entry in list	Rel-6
- PhyCh identity		
- MBMS Common PhyCh identity	23	
- Secondary CCPCH info MBMS		
- CHOICE *mode*	1.28/3.84 Mcps TDD	
- Common timeslot info MBMS		
- 2nd interleaving mode	Frame	
- TFCI coding	Reference to clause 6.11.1c	
- Puncturing limit	Reference to clause 6.11.1c	
- Downlink Timeslots and Codes		
- First individual timeslot info		
- Timeslot number		
- CHOICE *TDD option*	3.84 Mcps	
- Timeslot number	1	
- TFCI existence	TRUE	
- Midamble Shift and burst type		
- CHOICE *TDD option*	3.84 Mcps TDD	
- CHOICE Burst Type	MBSFN Burst Type	Rel-7
- no data		Rel-7
- CHOICE *TDD option*	3.84Mcps TDD	
- no data		
- First timeslot channelisation codes		
- CHOICE *codes representation*	Consecutive codes	
- First channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- Last channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- CHOICE *more timeslots*	No more timeslots	
- no data		
- Modulation	Reference to clause 6.11.1c	Rel-7

MBMS COMMON P-T-M RB INFORMATION (Step 4 and Step 5) (7.68 Mcps)

Information Element	Value/remark	Version
Message type		Rel-7
RB information list	1 entry in the list	Rel-7
- RB identity		
- MBMS Common RB identity	14	
- PDCP info		
- Support for lossless SRNS relocation	Not Present	
- Max PDCP SN window size	Not Present	
- PDCP PDU header	absent	
- Header compression information	Not Present	

Information Element	Value/remark	Version
- RLC info		
- DL UM RLC LI size	15	
- DL Duplication Avoidance and Reordering info	Not Present	
- DL Out of sequence delivery info	Not Present	
TrCh information for each TrCh	1 entry in the list	Rel-7
- Transport channel identity		
- MBMS Common TrCh identity	1	
- TFS		
- CHOICE *Transport channel type*	Common transport channels	
- Dynamic Transport Format Information		
- RLC Size	Refer to TrCh parameters defined above	
- Number of TBs and TTI List	(This IE is repeated for each TFI)	
- Number of Transport blocks	Refer to TrCh parameters defined above	
- CHOICE *mode*	TDD	
- Transmission Time Interval	Not Present	
- CHOICE *Logical Channel List*	ALL	
- no data		
- Semi-static Transport Format information		
- Transmission time interval	Refer to TrCh parameters defined above	
- Type of channel coding	Turbo	
- Coding Rate	Not Present	
- Rate matching attribute	Refer to TrCh parameters defined above	
- CRC size	Refer to TrCh parameters defined above	
TrCh information for each CCTrCh	Not Present (Default TFCS applies for each CCTrCh)	Rel-7
PhyCh information	1 entry in list	Rel-7
- PhyCh identity		
- MBMS Common PhyCh identity	23	
- Secondary CCPCH info MBMS		
- CHOICE *mode*	7.68 Mcps TDD	
- Common timeslot info MBMS		
- 2nd interleaving mode	Frame	
- TFCI coding	Reference to clause 6.11.1d	
- Puncturing limit	Reference to clause 6.11.1d	
- Downlink Timeslots and Codes VHCR		
- First Individual timeslot info		
- Timeslot number		
- CHOICE *TDD option*	7.68 Mcps option	
Timeslot number	1	
- TFCI existence	TRUE	
- Midamble Shift and burst type		
- CHOICE *TDD option*	7.68 Mcps TDD	
- CHOICE *Burst Type*	MBSFN Burst Type	
- no data	Default	
- CHOICE *TDD option*	7.68Mcps TDD	
- no data		
- First timeslot channelisation codes VHCR		
- CHOICE *codes representation*	Consecutive codes	
- First channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- Last channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- CHOICE more timeslots	No more timeslots	
- no data		
- Modulation	Reference to clause 6.11.1d	

MBMS COMMON P-T-M RB INFORMATION (Step 4 and Step 5) (1.28 Mcps)

Information Element	Value/remark	Version
Message type		Rel-6
RB information list	1 entry in the list	Rel-6
- RB identity		
- MBMS Common RB identity	14	
- PDCP info		
- Support for lossless SRNS relocation	Not Present	
- Max PDCP SN window size	Not Present	
- PDCP PDU header	absent	
- Header compression information	Not Present	

Information Element	Value/remark	Version
- RLC info		
- DL UM RLC LI size	15	
- DL Duplication Avoidance and Reordering info	Not Present	
- DL Out of sequence delivery info	Not Present	
TrCh information for each TrCh	1 entry in the list	Rel-6
- Transport channel identity		
- MBMS Common TrCh identity	1	
- TFS		
- CHOICE *Transport channel type*	Common transport channels	
- Dynamic Transport Format Information		
- RLC Size	Refer to TrCh parameters defined above	
- Number of TBs and TTI List	(This IE is repeated for each TFI)	
- Number of Transport blocks	Refer to TrCh parameters defined above	
- CHOICE *mode*	TDD	
- Transmission Time Interval	Not Present	
- CHOICE *Logical Channel List*	ALL	
- no data		
- Semi-static Transport Format information		
- Transmission time interval	Refer to TrCh parameters defined above	
- Type of channel coding	Turbo	
- Coding Rate	Not Present	
- Rate matching attribute	Refer to TrCh parameters defined above	
- CRC size	Refer to TrCh parameters defined above	
TrCh information for each CCTrCh	Not Present (Default TFCS applies for each CCTrCh)	Rel-6
PhyCh information	1 entry in list	Rel-6
- PhyCh identity		
- MBMS Common PhyCh identity	23	
- Secondary CCPCH info MBMS		
- CHOICE *mode*	1.28/3.84 Mcps TDD	
- Common timeslot info MBMS		
- 2nd interleaving mode	Frame	
- TFCI coding	Reference to clause 6.11.5.4.4.13	
- Puncturing limit	Reference to clause 6.11.5.4.4.13	
- Downlink Timeslots and Codes		
- First individual timeslot info		
- Timeslot number		
- CHOICE *TDD option*	1.28 Mcps	
- Timeslot number	1	
- TFCI existence	TRUE	
- Midamble Shift and burst type		
- CHOICE *TDD option*	1.28 Mcps TDD	
- Midamble Allocation Mode	Common midamble	
- Midamble configuration	2	
- CHOICE *TDD option*	1.28Mcps TDD	
- Modulation	Reference to clause 6.11.5.4.4.13	
- SS-TPC Symbols	1	
- Additional TPC-SS Symbols	Not Present	
- First timeslot channelisation codes		
- CHOICE *codes representation*	Consecutive codes	
- First channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- Last channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- CHOICE *more timeslots*	No more timeslots	
- no data		
- MBSFN Special Time Slot	TS7	Rel-7
- Modulation	Reference to clause 6.11.5.4.4.13	Rel-7
LCR TDD MBSFN information	Not Present	Rel-7

MBMS CURRENT CELL P-T-M RB INFORMATION (Step 4 and Step 5)

Information Element	Value/remark	Version
Message type		Rel-6
S-CCPCH list	Contains 1 S-CCPCH	Rel-6
- S-CCPCH identity	Not Present	
- Secondary CCPCH info	23	
- MBMS Soft Combining Timing Offset	Not Present	
- TrCh information common for all TrCh	Not Present (MD)	
- TrCH information list		
- TrCh information	1	
- RB information list		
- RB information		
- RB information	14	
- MBMS short transmission ID	Reference to the service which is being provided on this RB.	
- MBMS logical channel identity	1	
- L1 combining status	Not Present	
- MSCH configuration information	Not Present	
S-CCPCH in SIB type 5	Not Present	Rel-6
MBSFN TDM Info List	Not Present	Rel-7

7.1.1.10.5 Test Requirement

1) At step 10 on each iteration, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to zero received RLC SDUs for Cell 31 MTCH.

2) At step 14 on each iteration, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to > 0 received RLC SDUs for Cell 31 MTCH.

7.1.1.10a MTCH mapped to FACH / Invalid MBMS-Id (3.84 Mcps TDD IMB)

7.1.1.10a.1 Definition

This tests that the MAC applies the correct header to the MAC PDU according to the type of logical channel carried on the FACH transport channel. Incorrect application of MAC headers would result in inoperation of the UE.

7.1.1.10a.2 Conformance requirement

MTCH mapped to FACH:

The TCTF field and MBMS-Id field are included in the MAC header for MTCH

…

Table 9.2.1.8a: Structure of the MBMS-Id field

MBMS-Id field	MBMS logical channel identity [7]
0000	1
0001	2
...	...
1110	15
1111	Reserved (PDUs with this coding will be discarded by this version of the protocol)

Reference(s)

TS 25.321[6], clauses 9.2.1 and 9.2.1.8.

7.1.1.10a.3 Test purpose

1. To verify that the UE discards PDUs with reserved or incorrect values in the MBMS-Id field.

2. To verify that the MBMS-Id field is correctly applied when a MTCH is mapped to the FACH.

7.1.1.10a.4 Method of test

Initial conditions

System Simulator:

Unicast carrier: 1 cell, Cell 1 with default configuration.

- MBSFN carriers: 1 cell, Cell 31 has default parameters. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 and Default1 MCCH scheduling (No ongoing session) according to subclause 11.2 of TS 34.108 [9].

  The configuration of the S-CCPCH which will carry the MTCH is based upon that specified in TS 34.108 [9], clause 6.11.1e (3.84 Mcps TDD IMB) 8kbps RB for MBSFN MTCH with the following exceptions for the FACH:

Higher layer	RAB/signalling RB		RAB
	User of Radio Bearer		Test
RLC	Logical channel type		MTCH
	RLC mode		TM
	Payload sizes, bit		344
	Max data rate, bps		8200
	UMD PDU header, bit		0
MAC	MAC header, bit		0 (NOTE)
	MAC multiplexing		Simulated by SS
Layer 1	TrCH type		FACH
	TB sizes, bit		344
	TFS	TF0, bits	0x344
		TF1, bits	1x344
	TTI, ms		40
	Coding type		TC
	CRC, bit		16
	Max number of bits/TTI after channel coding		1092
	Max number of bits/radio frame before rate matching		273
	RM attribute		128
NOTE: The SS MAC layer must be configured not to add a MAC header so that the header can be added by the test case in order to create the necessary invalid values.			

User Equipment:

- On the unicast carrier cell the UE is in registered Idle Mode on PS (state 3) if the UE only supports PS domain or registered Idle Mode on CS/PS (state 7) if the UE supports both CS and PS domains, as specified in clause 7.2.2 of TS 34.108 [9].
- The UE is in MBSFN Idle mode with one activated service as specified in clause 7.6.4 of TS 34.108 [9]. The UE has selected (i.e. it is included in MBMS_ACTIVATED_SERVICES variable) a national service for which there will be a session starting on MBSFN Cell 31 (see TS 34.108 [9], clause 11.2.4).

Related ICS/IXIT statements

- MBMS Broadcast services in MBSFN mode available on UE Yes/No.
- Support of TDD or FDD transmit and receive functions available on UE Yes/No.
- Support of 3.84 Mcps TDD IMB receive only function available on UE Yes/No.

Test procedure

a) The UE is camping on Cell 1 and Cell 31. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 (no session ongoing) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108 [9].

b) The SS sends ACTIVATE RB TEST MODE on the unicast carrier and the UE responds with ACTIVATE RB TEST MODE COMPLETE.

c) The SS sends CLOSE UE TEST LOOP to activate RLC SDU counting on Cell 31 MTCH (Transmission identity indicating the MBMS activated service).

d) The SS notifies on MCCH about the start of an MBMS session for one modification period. MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C4 (one PTM session starting) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108 [9].

e) MCCH messages are then transmitted by the SS on Cell 31 using MBMS configuration C2 (one PTM session ongoing) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108 [9].

f) The SS waits for the UE to start reception of the MBMS data on MTCH according to the specified service activation time. The UE closes the test loop. The UE sends CLOSE UE TEST LOOP COMPLETE.

g) The SS transmits MAC PDUs containing RLC UM PDUs containing an octet string representing dummy traffic data, of size sufficient enough to fit in one RLC PDU of 336 bits, including the correct RLC UM header.

   The MAC header shall be set as follows:

Field	Value
TCTF	0110'B
MBMS-Id	1111'B

h) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE corresponds to zero received RLC SDUs. The SS records the value.

i) The SS again transmits MAC PDUs as in g) above, but this time uses a valid MBMS-Id of 1110'B. The sequence numbers in the RLC headers shall be identical with those sent in g).

j) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE corresponds to > 0 received RLC SDUs

Expected sequence

Step	Direction UE SS	Carrier	Message	Comment
1	←	U	ACTIVATE RB TEST MODE	
2	→	U	ACTIVATE RB TEST MODE COMPLETE	
3	←	U	CLOSE UE TEST LOOP	Loop back mode 3 is activated on Cell 31 for the selected national service on MTCH.
4	←	M	MBMS MCCH Message Configuration C4	Includes the national service activated at UE in the modified services list for one modification period.
5	←	M	MBMS MCCH Message Configuration C2	No modified services. One ongoing service corresponding to that activated at the UE.
6	→	U	CLOSE UE TEST LOOP COMPLETE	The UE establishes the MTCH according to the activation time and closes the test loop.
7			MAC PDU(TCTF, MBMS-Id, RLC UM PDU(SN=x))	Sent with reserved MBMS-Id = 1111'B
8				SS waits for T = 2 s
9	←	U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
10	→	U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to zero. The SS records the value.
11			MAC PDU(TCTF, MBMS-Id, RLC UM PDU(SN=x))	Sent with valid MBMS-Id = 1110'B
12				SS waits for T = 2 s
13	←	U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
14	→	U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is greater than zero.
15	←	U	OPEN UE TEST LOOP	
16	→	U	OPEN UE TEST LOOP COMPLETE	
17	←	U	DEACTIVATE RB TEST MODE	
18	→	U	DEACTIVATE RB TEST MODE COMPLETE	

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 [9], clause 9.1.3 for the MBSFN carriers and in TS 34.108 [9] clause 9.1.1 or 9.1.2 for the unicast carrier:

MBMS COMMON P-T-M RB INFORMATION (Step 4 and Step 5) (3.84 Mcps)

Information Element	Value/remark	Vers
Message type		Rel-6
RB information list	1 entry in the list	Rel-6
- RB identity		Rel-6
- MBMS Common RB identity	14	
- PDCP info		
- Support for lossless SRNS relocation	Not Present	
- Max PDCP SN window size	Not Present	
- PDCP PDU header	absent	
- Header compression information	Not Present	
- RLC info		
- DL UM RLC LI size	7	
- DL Duplication Avoidance and Reordering info	Not Present	
- DL Out of sequence delivery info	Not Present	
TrCh information for each TrCh	1 entry in the list	Rel-6

- Transport channel identity		Rel-6
- MBMS Common TrCh identity	1	
- TFS		
- CHOICE *Transport channel type*	Common transport channels	
- Dynamic Transport format information		
- RLC Size	Refer to TrCh parameters defined above	
- Number of TBs and TTI List	(This IE is repeated for TFI number.)	
- Number of Transport blocks	Refer to TrCh paramters defined above	
- CHOICE mode	FDD	
- CHOICE *Logical channel list*	All	
- no data		
- Semi-static Transport Format information		
- Transmission time interval	Refer to TrCh paramters defined above	
- Type of channel coding	Turbo	
- Coding Rate	Not present	
- Rate matching attribute	Refer to TrCh paramters defined above	
- CRC size	Refer to TrCh paramters defined above	
TrCh information for each CCTrCh	Not Present (Default TFCS applies for each CCTrCh)	Rel-6
PhyCh information	1 entry in list	Rel-6
- PhyCh identity		Rel-6
- MBMS Common PhyCh identity	23	
CHOICE mode	3.84 Mcps TDD IMB	
- Secondary CCPCH frame type 2 info		Rel-8
- Sub-frame number	2(check in 5.5.2)	Rel-8
- Downlink channelisation codes		Rel-8
- First channelisation code	(1..15) or reference to 6.10 "parameter set"	
- Last channelisation code	(1..15) or reference to 6.10 "parameter set"	
- CHOICE modulation	16QAM(check in6.10 "parameter set")	Rel-8
- CPICH secondary CCPCH power offset	0dB	Rel-8
LCR TDD MBSFN information	Not present	Rel-7

MBMS CURRENT CELL P-T-M RB INFORMATION (Step 4 and Step 5)

Information Element	Value/remark	Version
Message type		Rel-6
S-CCPCH list	Contains 1 S-CCPCH	Rel-6
- S-CCPCH identity	Not Present	
- Secondary CCPCH info	23	
- MBMS Soft Combining Timing Offset	Not Present	
- TrCh information common for all TrCh	Not Present (MD)	
- TrCH information list		
- TrCh information	1	
- RB information list		
- RB information		
- RB information	14	
- MBMS short transmission ID	Reference to the service which is being provided on this RB.	
- MBMS logical channel identity	1	
- L1 combining status	Not Present	
- MSCH configuration information	Not Present	
S-CCPCH in SIB type 5	Not Present	Rel-6
MBSFN TDM Info List	Not Present	Rel-7

7.1.1.10a.5 Test Requirement

1) At step 10 on each iteration, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to zero received RLC SDUs for Cell 31 MTCH.

2) At step 14 on each iteration, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to > 0 received RLC SDUs for Cell 31 MTCH.

7.1.2 RACH/FACH procedures

7.1.2.1 Selection and control of Power Level

7.1.2.1.1 Void

NOTE Test case "Selection and control of Power Level (FDD)" has been removed as the test purpose is implicitly tested by radio resource management test cases in TS 34.121 clause 8.4.2.1 and 8.4.2.2.

7.1.2.1.2 Selection and control of Power Level (3,84 Mcps TDD option)

(FFS)

7.1.2.1.3 Void

NOTE: Test case "Selection and control of Power Level (1.28Mcps TDD option)" has been removed as the test purpose is implicitly tested by radio resource management test cases in TS 34.12 27.1.2.2. Correct application of Dynamic Persistence

7.1.2.2 Correct application of Dynamic Persistence

7.1.2.2.1 Void

NOTE Test case "Correct application of Dynamic Persistence (FDD)" has been removed as the test purpose is implicitly tested by radio resource management test cases in TS 34.121.

7.1.2.2.2 Correct application of Dynamic Persistence (3.84 Mcps TDD option)

(FFS)

7.1.2.2.3 Void

7.1.2.3 Correct Selection of RACH parameters

7.1.2.3.1 Correct Selection of RACH parameters (FDD)

7.1.2.3.1.1 Definition

The physical random access procedure described in this subclause is initiated upon request of a PHY-Data-REQ primitive from the MAC sublayer.

The UE selection of "PRACH system information" is described in TS 25.331 clause 8.5.17.

7.1.2.3.1.2 Conformance requirement

A. The physical random-access procedure shall be performed as follows:

1 Derive the available uplink access slots, in the next full access slot set, for the set of available RACH sub-channels within the given ASC with the help of TS 25.214, subclauses 6.1.1 and 6.1.2. Randomly select one access slot among the ones previously determined. If there is no access slot available in the selected set, randomly select one uplink access slot corresponding to the set of available RACH sub-channels within the given ASC from the next access slot set. The random function shall be such that each of the allowed selections is chosen with equal probability.

2 Randomly select a signature from the set of available signatures within the given ASC. The random function shall be such that each of the allowed selections is chosen with equal probability.

3 Set the Preamble Retransmission Counter to Preamble Retrans Max.

…

5 … Transmit a preamble using the selected uplink access slot, signature, and preamble transmission power.

6 If no positive or negative acquisition indicator (AI ≠ +1 nor –1) corresponding to the selected signature is detected in the downlink access slot corresponding to the selected uplink access slot:

6.1 Select the next available access slot in the set of available RACH sub-channels within the given ASC.

6.2 Randomly select a new signature from the set of available signatures within the given ASC. The random function shall be such that each of the allowed selections is chosen with equal probability.

…

6.4 Decrease the Preamble Retransmission Counter by one.

6.5 If the Preamble Retransmission Counter > 0 then repeat from step 5. Otherwise pass L1 status ("No ack on AICH") to the higher layers (MAC) and exit the physical random access procedure.

7 If a negative acquisition indicator corresponding to the selected signature is detected in the downlink access slot corresponding to the selected uplink access slot, pass L1 status ("Nack on AICH received") to the higher layers (MAC) and exit the physical random access procedure.

8 Transmit the random access message three or four uplink access slots after the uplink access slot of the last transmitted preamble depending on the AICH transmission timing parameter. Transmission power of the control part of the random access message should be P_{p-m} [dB] higher than the power of the last transmitted preamble. Transmission power of the data part of the random access message is set according to subclause 5.1.1.2.

9 Pass L1 status "RACH message transmitted" to the higher layers and exit the physical random access procedure.

Reference(s)

TS 25.214 clause 6.1.

7.1.2.3.1.3 Test purpose

To verify that:

A1 the UE, initially:

- determines the ASC for the given Access Class (AC).
- derives the available uplink access slots, in the next full access slot set, for the set of available RACH sub-channels within the given ASC with the help of TS 25.214, subclauses 6.1.1. and 6.1.2. and randomly select one access slot among the ones previously determined.
- randomly select a new signature from the set of available signatures within the given ASC.

A2 the UE, when not receiving any reply from UTRAN:

- selects the next available access slot in the set of available RACH sub-channels within the given ASC.
- randomly select a new signature from the set of available signatures within the given ASC.
- does not transmit on the PRACH resources specified in the BCH message SIB 5/SIB 5bis after that the physical random access procedure is terminated.

A3 the UE, when detecting a negative acquisition indicator:

- does not transmit on the PRACH resources specified in the BCH message SIB 5/SIB 5bisafter that the physical random access procedure is terminated.

A4 the UE, when detecting a positive acquisition indicator:

- transmits the random access message three or four uplink access slots after the uplink access slot of the last transmitted preamble depending on the AICH transmission timing parameter.
- terminates the random access procedure.

7.1.2.3.1.4 Method of test

Initial conditions

The UE shall be attached to the network and in idle mode.

The UE shall use Access Class AC#0-9, which provides permission to use ASC#0 for the initial access.

Preamble Retrans Max parameter in SIB5/SIB5bis set to 5.

Maximum number of preamble retransmission cycles in SIB 5/SIB 5bis is set to Mmax = 1.

2 ASC settings (ASC#0 and ASC#1) are defined (with default parameters) in SIB5/SIB 5bis, except that the parameter assigned sub channel number is set as follows:

ASC#0 Assigned sub channel number = '0001'B

ASC#1 Assigned sub channel number = '0010'B

The available sub-channel number defined in SIB5/SIB 5bis is set to '1111 1111 1111'B.

NOTE: this value allows RACH transmission on all sub-channels defined by "Assigned sub channel number" above.

Related ICS/IXIT Statement(s)

TBD

Foreseen Final State of the UE

The same as the initial conditions.

Test procedure

a) The SS pages the UE until it performs a RACH access.

b) The SS measures the access slot and preamble signature used.

c) The SS does not acknowledge the RACH access, causing the UE to retry.

d) The SS again measures the access slot and preamble signature used.

e) The SS repeats the procedure from step c) until the maximum number of retries "Preamble Retrans Max" has been attempted, and monitors the RACH channel for 10 seconds to ensure that no further RACH accesses occur.

f) The SS pages the UE until it performs a RACH access.

g) The SS measures the access slot and preamble signature used.

h) The SS responds with a negative acquisition indicator on the AICH.

i) The SS monitors the RACH channel for 10 seconds to ensure that no further RACH accesses occur.

j) The SS pages the UE until it performs a RACH access.

k) The SS measures the access slot used.

l) The SS acknowledges the RACH access normally.

m) The SS measures the first access slot used in the PRACH message part.

n) The SS monitors the RACH channel for 10 seconds to ensure that no further RACH accesses occur.

Expected sequence

Step	Direction UE / SS	Message	Comments
1	←	PAGE	Preamble Retransmission Counter = 5
2	→	Access Preamble	Access slot used = n, where n is defined by the table in clause 7.1.2.3.1.5 Signature used = any from {P_0 .. P_7} Preamble Retransmission Counter = 4
3	→	Access Preamble	Access slot used = mod(n+3,15) Signature used = any from {P_0 .. P_7} Preamble Retransmission Counter = 3
4	→	Access Preamble	Access slot used = mod(n+6,15) Signature used = any from {P_0 .. P_7} Preamble Retransmission Counter = 2
5	→	Access Preamble	Access slot used = mod(n+9,15) Signature used = any from {P_0 .. P_7} Preamble Retransmission Counter = 1
6	→	Access Preamble	Access slot used = mod(n+12,15) Signature used = any from {P_0 .. P_7} Preamble Retransmission Counter = 0
7		Wait for T = 10s	SS monitors for RACH access attempts
8	←	PAGE	
9	→	Access Preamble	Access slot used = n, where n is defined by the table in clause 7.1.2.3.1.5 Signature used = any from {P_0 .. P_7}
10	←	AICH = NEG ACQUISITION IND	
11		Wait for T = 10s	SS monitors for RACH access attempts
12	←	PAGE	
13	→	Access Preamble	Access slot used = n, where n is defined by the table in clause 7.1.2.3.1.5 Signature used = any from {P_0 .. P_7}
14	←	AICH = POS ACQUISITION IND	
15	→	RRC_CONNECTION_REQUEST	Message part. Access slot used = mod(n+3, 15)
16		Wait for T = 10s	SS monitors for RACH access attempts

Specific Message Contents

Use the default parameter values for the system information block with the same type specified in clause 6.1.0b of TS 34.108, with the following exceptions

Contents of System Information Block type 1

Information Element	Value/Remark
- UE Timers and constants in connected mode	
-N300	0

PRACH power offset info, PRACH info, and PRACH partitioning in System Information Block type 5/System Information Block type 5bis

Information Element	Value/Remark
PRACH info	
- CHOICE	FDD
- Available Sub Channel number	'1111 1111 1111'B
PRACH partitioning	
- Access Service Class	
- ASC Setting	
- CHOICE mode	FDD
- Available signature Start Index	0 (ASC#0)
- Available signature End Index	7 (ASC#0)
- Assigned Sub-channel Number	'0001'B
- ASC Setting	
- CHOICE mode	FDD
- Available signature Start Index	0 (ASC#1)
- Available signature End Index	7 (ASC#1)
- Assigned Sub-channel Number	'0010'B
PRACH power offset	
- Preamble Retrans Max	5

7.1.2.3.1.5 Test requirements

A1

At step 2

- the SS shall receive a PRACH preamble using an access slot as defined below and using a preamble signature from the set of preamble signatures {P_0 .. P_7}. See TS 25.213, clause 4.3.3.3 for a list of preamble codes.

- the access slot selected for the first access preamble can be any of the shaded table entries given below for ASC#0, depending on SFN.

NOTE: the table entries which are not shaded are not allowed for ASC#0.

SFN modulo 8 of corresponding P-CCPCH frame	Sub-channel number											
	0	1	2	3	4	5	6	7	8	9	10	11
0	0	1	2	3	4	5	6	7				
1	12	13	14						8	9	10	11
2				0	1	2	3	4	5	6	7	
3	9	10	11	12	13	14						8
4	6	7					0	1	2	3	4	5
5			8	9	10	11	12	13	14			
6	3	4	5	6	7					0	1	2
7						8	9	10	11	12	13	14

A2

At steps 3, 4, 5, and 6

- the SS shall receive a PRACH preamble using access slot mod(n + 3, 15), where n is the access slot used in the previous step, and using a preamble signature from the set of preamble signatures {P_0 .. P_7}. See TS 25.213, clause 4.3.3.3 for a list of preamble codes.

At step 7

- the SS shall not receive on the PRACH resources specified in the BCH message SIB 5/SIB 5bis after that the physical random access procedure is terminated.

A3

At step 11

- the SS shall not receive on the PRACH resources specified in the BCH message SIB 5/SIB 5bis after that the physical random access procedure is terminated.

A4

At step 15

- the SS shall receive the random access message three access slots after the uplink access slot of the preamble received in step 13.

At step 11

- the SS shall not receive on the PRACH resources specified in the BCH message SIB 5/SIB 5bis after that the physical random access procedure is terminated.

7.1.2.3.2 Correct Selection of RACH parameters (3.84 Mcps TDD option)

(FFS)

7.1.2.3.3 Correct Selection of RACH parameters (1.28 Mcps TDD option)

7.1.2.3.3.1 Definition and applicability

All TDD 1.28 Mcps UE

7.1.2.3.3.2 Conformance requirement

That the UE selects UpPCH codes and UpPCH sub-channels that are defined for the ASC that the UE should adopt based on its AC (when the RACH message to be transmitted is an 'RRC Connection Request'). Parameters are defined in the SIB 5 messages received by the UE.

Reference(s)

TS25.224 clauses 4.7.1 and 5.6.

TS25.321 clause 11.2.3.

7.1.2.3.3.3 Test Purpose

To verify that the UE selects UpPCH codes and sub-channels that are allocated to the ASC that the UE should adopt based on its AC.

7.1.2.3.3.4 Method of test

Initial conditions

The UE is attached to the network and in idle mode. The Sim card should be configured so that the UE can adopt a known ASC based on its AC. The SS will broadcast SIB 5 messages that allocate to each ASC subsets of the total UpPCH codes and sub-channels.

Related ICS/IXT Statement(s)

TBD

Foreseen Final State of the UE

The same as the initial condition.

Test procedure

The test procedure is similar to that specified for test 7.1.2.1.3. In place of power level the test monitors the UpPCH codes that are used for the UE's UpPCH transmissions and the sub-channels in which they are made.

a) The SS pages the UE to initiate the RACH access procedure;

b) The SS does not respond to UpPCH transmissions received from the UE;

c) The SS identifies the UpPCH codes on which the UE transmits;

d) The SS identifies the system frame numbers of the frames in which the UE's UpPCH transmissions are received;

e) The procedure is continued until the maximum permitted power ramping cycles, and within each power ramping cycle, the maximum number of UpPCH transmissions have been made.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	<–		PAGE	
2	->		UpPCH	Code and sub-channel should be valid.
3	->		UpPCH	Code and sub-channel should be valid.
4			………	
5	->		UpPCH	Code and sub-channel should be valid.
6	->		UpPCH	Code and sub-channel should be valid.
7	->		UpPCH	Code and sub-channel should be valid.
8			………	
9	->		UpPCH	Code and sub-channel should be valid.

7.1.2.3.3.5 Test Requirements

The UpPCH transmissions should be made in sub-channels and using codes that are allocated to the ASC that the UE should adopt based on its AC.

7.1.2.4 Correct Detection and Response to FPACH (1.28 Mcps TDD option)

7.1.2.4.1 Definition and applicability

All TDD 1,28 Mcps UE.

7.1.2.4.2 Conformance requirement

That the UE:

1. Receives and acts upon an FPACH message transmitted within WT sub-frames of the UE transmitting a UpPCH code, provided that:

   - The FPACH was transmitted in the FPACH resource associated with the UpPCH code used by the UE; and

   - The FPACH message correctly identifies the UpPCH codes identity and the number of sub-frames between the UpPCH and the FPACH transmissions.

2. Responds to the valid FPACH by transmitting an 'RRC Connection Request' message in the PRACH resources associated with the FPACH. The transmission should:

   - Occupy the PRACH resource associated with the FPACH and the sub-channel in which the FPACH was received for the duration of the TTI;

   - Be made with a timing correction and a transmission power that are based on information received in the FPACH.

3. Does not respond to FPACH messages that are transmitted, within WT sub-frames of the UE UpPCH transmission, in FPACH resources that are not associated with the UpPCH code that the UE used. Nor should it respond to FPACH messages that are received on the correct FPACH resources within WT sub-frames but which contain the incorrect UpPCH code identifier or an incorrect indication of the number of sub-frames elapsed between the UpPCH and FPACH transmissions.

Reference(s)

TS 25.224 clauses 4.7.1, 5.2.3, 5.6.

TS 25.331 clause 8.5.7.

TS 25.321 clause 11.2.3.

7.1.2.4.3 Test Purpose

To verify that:

- The UE does not respond to FPACH transmissions that are either, received on incorrect FPACH resources, or are received on correct resources and within WT sub-frames of the UpPCH transmission, but which do not contain the correct UpPCH identity or elapsed sub-frames.
- The UE does respond to an FPACH transmission that is received, within WT sub-frames of the UpPCH transmission, on the correct FPACH resources for the UpPCH code that was used, provided that the FPACH contains the identity of the UpPCH code and the number of sub-frames elapsed between the UpPCH and the FPACH transmissions.
- The UE response is to transmit an 'RRC Connection Request' message on the PRACH resources that are associated with the FPACH taking account of the timing correction and power adjustment parameters received in the FPACH.

7.1.2.4.4 Method of test

Initial conditions

The UE is attached to the network and in idle mode. The SS BCH SIB 5 message will specify that there are two or more FPACH associated with the UpPCH code set in a single PRACH system information. The UpPCH code set must include one or more odd and one or more even numbered codes.

Related ICS/IXT Statement(s)

TBD

Foreseen Final State of the UE

The same as the initial condition.

Test procedure

The test procedure consists of a number of stages:

a) The SS pages the UE to initiate RACH access.

b) When UpPCH transmissions are received from the UE the SS should transmit FPACH responses within WT sub-frames of each UpPCH transmission but on an incorrect FPACH resource for the UpPCH code used. It is noted that the UE may change the code used for each UpPCH transmission randomly amongst those available to its ASC.

c) The PRACH resources associated with all of the FPACH should be monitored for a transmission from the UE.

d) The SS pages the UE to initiate RACH access.

e) When UpPCH transmissions are received from the UE the SS should transmit FPACH responses within WT sub-frames of each UpPCH transmission on the correct FPACH resource for the UpPCH code used. The FPACH transmission should contain a signature reference number that is different from that of the UpPCH code that was used by the UE.

f) The PRACH resources associated with all of the FPACH should be monitored for a transmission from the UE.

g) The SS pages the UE to initiate RACH access.

h) When UpPCH transmissions are received from the UE the SS should transmit FPACH responses within WT sub-frames of each UpPCH transmission on the correct FPACH resource for the UpPCH code used. The FPACH transmission should contain a relative sub-frame number that is different from that defined by the elapsed number of frames between the UpPCH and the FPACH transmissions.

i) The PRACH resources associated with all of the FPACH should be monitored for a transmission from the UE.

j) The SS pages the UE to initiate RACH access.

k) When UpPCH transmissions are received from the UE the SS should transmit an FPACH response on the correct FPACH resources for the UpPCH code that was used by the UE. The FPACH response should include correct values for the signature reference and relative sub-frame number fields. The FPACH should also include known entries for the Received starting position of the UpPCH ($UpPCH_{POS}$) and the Transmit Power Level Command for RACH ($PRX_{PRACHdes}$) fields.

l) The SS should monitor the PRACH resources associated with the FPACH commencing two or three sub-frames (depending upon the sub-frame in which the FPACH was transmitted and the length of the TTI) following the sub-frame in which the FPACH was transmitted and continuing for the number of sub-frames in the RACH TTI. The power level of the PRACH transmissions and the time of arrival of their mid-ambles should be measured. The SS should continue to monitor the UpPCH slot to ensure that the UE has ceased UpPCH transmissions.

Expected sequence

Step	Direction UE	Direction SS	Message	Comments
1	<-		PAGE	
2	->		UpPCH	
3	<-		FPACH	Incorrect FPACH resources
4	->		UpPCH	
5			……….	
6	<-		PAGE	
7	->		UpPCH	
8	<-		FPACH	Incorrect signature reference
9	->		UpPCH	
10			………	
11	<-		PAGE	
12	->		UpPCH	
13	<-		FPACH	Incorrect relative sub-frame number
14	->		UpPCH	
15			……….	
16	<-		PAGE	
17	->		UpPCH	
18	<-		FPACH	Correct resources and information fields
19	->		RRC Connection Request	$P_{PRACH} = L_{PCCPCH} + PRX_{PRACHdes}$ +(i-1)*Pwr_{ramp}, $UpPCH_{ADV} + UpPCH_{POS}$- 8×16Tc

7.1.2.4.5 Test Requirements

The UE should not respond to FPACH transmissions, which are made on the incorrect FPACH resources for the UpPCH code that the UE uses. The UE should continue to transmit UpPCH until the permitted maximum number of power ramping cycles is complete.

The UE should not respond to FPACH transmissions which are made within WT sub-frames of a UpPCH transmission and on the correct FPACH resources for the UpPCH code that it used if the FPACH contains either an incorrect signature reference number or an incorrect relative sub-frame number. The UE should continue to transmit UpPCH until the permitted maximum number of power ramping cycles is complete.

The UE should respond to an FPACH received within WT sub-frames of a UpPCH transmission if the FPACH is received on the correct FPACH resources for the UpPCH code used and if it contains valid information fields. The UE should cease transmitting UpPCH bursts and transmit an RRC Connection Request message using the PRACH resources that are associated with the FPACH and the sub-frame in which the FPACH was received. The transmission should commence two or three sub-frames after that containing the FPACH (dependent upon the sub-frame in which the FPACH was transmitted and the length of the TTI) and is made in all sub-frames within the TTI. Each PRACH burst should be made using the transmission power:

$$P_{PRACH} = L_{PCCPCH} + PRX_{PRACHdes} + (i-1)*Pwr_{ramp}$$

Where i is the number of transmission attempts on UpPCH, i=1…Max SYNC_UL Transmissions. When the power used by the UE for the UpPCH transmission acknowledged by the FPACH was:

$$P_{UpPCH} = L_{PCCPCH} + PRX_{UpPCHdes} +(i-1)*Pwr_{ramp}$$

And $PRACH_{ADV}$,i.e., the offset from the start of the PRACH slot of the UE's transmission measured by SS shall be

$UpPCH_{ADV}$+$UpPCH_{POS}$ - 8×16Tc chips, to an accuracy of 1/8 chip.

Where $UpPCH_{ADV}$ denotes the offset from the start of the UpPCH slot of the UE's transmission measured by SS and $UpPCH_{POS}$ is the timing correction signalled to the UE in the FPACH.

7.1.2.4a Access Service class selection for RACH transmission

7.1.2.4a.1 Definition and applicability

All UE.

7.1.2.4a.2 Conformance requirement

The following ASC selection scheme shall be applied, where NumASC is the highest available ASC number and MinMLP the highest logical channel priority assigned to one logical channel:

- In case all TBs in the TB set have the same MLP, select ASC=min(NumASC, MLP).
- In case TBs in a TB set have different priority, determine the highest priority level MinMLP and select ASC=min(NumASC, MinMLP).

Reference(s)

TS 25.321 clause 11.2.1.

7.1.2.4a.3 Test purpose

To verify that MAC selects ASC correctly.

7.1.2.4a.4 Method of test

Initial conditions

System Simulator:

- SYSTEM INFORMATION BLOCK TYPE 7 (see specific message contents).
- 1 cell, default parameters, Ciphering Off.

User Equipment:

- The UE shall operate under normal test conditions, Ciphering Off.
- The Test-USIM shall be inserted

  The SS starts broadcasting the System Information as specified in TS 34.108 clause 6.1, using the configuration for the PRACH and SCCPCH (signalled in SYSTEM INFORMATION BLOCK types 5 and 6) as follows:

  1. The SCCPCH is configured as specified in TS 34.108 clause 6.10.2.4.3.3 (Interactive/Background 32 kbps RAB + SRB for PCCH + SRB for CCCH + SRB for DCCH + SRB for BCCH).
  2. The PRACH is configured as specified in TS 34.108 clause 6.10.2.4.4.1.

  The SS follows the procedure in TS 34.108 clause 7.4.2.6 (initiated by Mobile Terminated connection) so that the UE shall be in state BGP 6-11 (PS-DCCH+DTCH_FACH) with the following exceptions:

  1. The MAC Logical channel Priority (MLP) of the user RB is set to 8.
  2. The Timer Poll for RB20 will be Omitted in Radio Bearer Setup message to UE.

The user RB is placed into loop-back mode 1 each with the UL SDU size set to 39 bytes.

Related ICS/IXIT Statement(s)

TBD

Foreseen Final State of the UE

Test procedure

a) The SS sends 1 RLC SDU of size 10 bytes on the downlink user RB.

The SS waits to receive uplink data on RACH TrCH via the user RB.

NOTE 1: As all access slots are allowed, correct reception of loop backed PDU by SS, implicitly checks correct selection of ASC.

b) The SS reconfigures the transmitted system information as follows:

Only one ASC setting (ASC#0) is defined, with default parameters, except that the parameter "Assigned sub channel number" is set as follows:

ASC#0 Assigned sub channel number = '0010'B (FDD)

The available sub-channel number defined in system information is set to '1111 1111 1111'B (default parameter setting).

NOTE 2: this value allows RACH transmission on any sub-channel defined by "Assigned sub channel number" above.

ASC#0 sub channel size = Size1 : NULL (1.28Mcps TDD)

NOTE 3: "all available channelisation codes" and "all available subchannels" with "subchannel size=Size 1" .The SS then updates System Information Block 6, sends a SYSTEM INFORMATION CHANGE INDICATION message to the UE and waits 10 s for the UE to take the system information change into account.

c) The SS sends 1 RLC SDU of size 10 bytes on the downlink user RB.

d) The SS waits to receive uplink data on RACH TrCH via the user RB, for FDD, then checks that the access slots and preamble signatures used correspond to ASC#0, i.e. the access slot selected for the first access preamble can be any of the shaded table entries given below for ASC#0, depending on SFN. The access slot used for the Message part shall be the access slot used for preamble (for which SS ACK's) + 3.

NOTE 4: the table entries which are not shaded are not allowed for ASC#0 (FDD).

SFN modulo 8 of corresponding P-CCPCH frame	**Sub-channel number**											
	0	1	2	3	4	5	6	7	8	9	10	11
0	0	1	2	3	4	5	6	7				
1	12	13	14						8	9	10	11
2				0	1	2	3	4	5	6	7	
3	9	10	11	12	13	14						8
4	6	7					0	1	2	3	4	5
5			8	9	10	11	12	13	14			
6	3	4	5	6	7					0	1	2
7						8	9	10	11	12	13	14

e) The SS reconfigures the transmitted system information as follows:

Four ASC settings (ASC#0 to ASC#3) are defined (with default parameters), except that the parameter assigned sub channel number is set as follows (FDD):

ASC#0 Assigned sub channel number = '0100'B

ASC#1 Assigned sub channel number = '0001'B

ASC#2 Assigned sub channel number = '0010'B

ASC#3 Assigned sub channel number = '0000'B (i.e. no sub channel is assigned)

The available sub-channel number defined in system information is set to '1111 1111 1111'B (default parameter setting).

NOTE 5: this value allows RACH transmission on all sub-channels defined by "Assigned sub channel number" above.

Four ASC settings (ASC#0 to ASC#3) are defined (with default parameters), except that the parameter assigned sub channel number is set as follows (1.28Mcps TDD):

ASC#0 sub channel size = Size4 : '0100'B

ASC#1 sub channel size = Size4 : '0001'B

ASC#2 sub channel size = Size4 : '0010'B

ASC#3 sub channel size = Size4 : '0000'B (i.e. no sub channel is assigned)

NOTE 6: Each bit indicates availability of a subchannel, where the subchannels are numbered subchannel 0, subchannel 1 etc. The value 1 of a bit indicates that the subchannel is available for the ASC this IE is associated with. The value 0 of a bit indicates that the subchannel is not available for the ASC this IE is associated with. Default value of the IE is that all subchannels within the size are available for the ASC this IE is associated with.

The SS then updates System Information Block 6, sends a SYSTEM INFORMATION CHANGE INDICATION message to the UE and waits 10 s for the UE to take the system information change into account.

f) The SS sends 1 RLC SDU of size 10 bytes on the downlink user RB.

g) The SS waits 10 s to ensure no uplink data is received on RACH TrCH via the user RB.

h) The SS then reconfigures the uplink user RB to have a MAC Logical channel Priority of 1 by sending Radio Bearer Reconfiguration message on the DCCH using UM RLC.

i) The SS sends 1 RLC SDU of size 10 bytes on the downlink user RB.

j) The SS waits to receive uplink data on RACH TrCH via the user RB, for FDD, then checks that the access slots and preamble signatures used correspond to ASC#1, i.e. the access slot selected for the first access preamble can be any of the shaded table entries given below for ASC#1, depending on SFN. The access slot used for the Message part shall be the access slot used for preamble (for which SS ACK's) + 3.SS will receive 2 loop backed PDU's. One the loop backed PDU of step I, and the second one due to RLC layer transmission/retransmission of loop backed PDU of step f. As 'In sequence Delivery' will be enabled, the loop backed PDU of step f shall arrive before loop backed PDU of step i.

NOTE 7: the table entries which are not shaded are not allowed for ASC#1(FDD).

SFN modulo 8 of corresponding P-CCPCH frame	**Sub-channel number**											
	0	1	2	3	4	5	6	7	8	9	10	11
0	0	1	2	3	4	5	6	7				
1	12	13	14						8	9	10	11
2				0	1	2	3	4	5	6	7	
3	9	10	11	12	13	14						8
4	6	7					0	1	2	3	4	5
5			8	9	10	11	12	13	14			
6	3	4	5	6	7					0	1	2
7						8	9	10	11	12	13	14

k) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	RLC PDU	
1a	→	RLC PDU	
2	←	SYSTEM INFORMATION CHANGE INDICATION	Modified system information
3	←	RLC PDU	
4	→	RLC PDU	SS checks ASC parameters (ASC#0)
5	←	SYSTEM INFORMATION CHANGE INDICATION	Modified system information
6	←	RLC PDU	
6a			SS waits to check no RLC PDUs are received
7	←	RB RECONFIGURATION	User RB MLP = 1
7a	→	RLC PDU	Optional step, see note 1 SS checks ASC parameters (ASC#1)(transmission/retransmission of loop backed PDU of step 6)
7b	→	RB RCONFIGURATION COMPLETE	
7c	→	RLC PDU	Optional step, see note 1 SS checks ASC parameters (ASC#1)(transmission/retransmission of loop backed PDU of step 6)
8	←	RLC PDU	
8a	→	RLC PDU	Optional step, see note 1 SS checks ASC parameters (ASC#1) (transmission/retransmission of loop backed PDU of step 6)
9	→	RLC PDU	SS checks ASC parameters (ASC#1)
10	↔	RB RELEASE	optional
Note 1: Loop backed RLC PDU of step 6 can be received either at step 7a or at step 7c or at step 8a			

Specific Message Contents

System Information Block type 7

Use the same System Information Block Type 7 message as found in clause 6.1.0b of TS 34.108, with the following exceptions:

- PRACHs listed in system information block type6 - Dynamic persistence level	 2

System Information Block type 6 (Step 2) (FDD)

Use the same System Information Block Type 6 message as found in clause 6.1.0b of TS 34.108, with the following exceptions:

- PRACH system information list	
- PRACH system information	
- PRACH info	
- CHOICE mode	FDD
- Available Signature	'0000 0000 1111 1111'B
- Available SF	64
- Preamble scrambling code number	0
- Puncturing Limit	1.00
- Available Sub Channel number	'1111 1111 1111'B
- Transport Channel Identity	15
- RACH TFS	
- CHOICE Transport channel type	Common transport channels
- Dynamic Transport format information	
- RLC size	168
- Number of TB and TTI List	
- Number of Transport blocks	1
- CHOICE Mode	FDD
- CHOICE Logical Channel List	Configured
- RLC size	360
- Number of TB and TTI List	
- Number of Transport blocks	1
- CHOICE Mode	FDD
- CHOICE Logical Channel List	Configured
- Semi-static Transport Format information	
- Transmission time interval	20 ms
- Type of channel coding	Convolutional
- Coding Rate	1/2
- Rate matching attribute	150
- CRC size	16
- RACH TFCS	
- CHOICE TFCI signalling	Normal
- TFCI Field 1 information	
- CHOICE TFCS representation	Complete reconfiguration
- TFCS complete reconfiguration information	
- CHOICE CTFC Size	2 bit
- CTFC information	0
- Power offset information	
- CHOICE Gain Factors	Computed Gain Factor
- Reference TFC ID	0
- CHOICE Mode	FDD
- Power offset Pp-m	0 dB
- CTFC information	1
- Power offset information	
- CHOICE Gain Factors	Signalled Gain Factor
- CHOICE mode	FDD
- Gain factor ßc	11
- Gain factor ßd	15
- Reference TFC ID	0
- CHOICE Mode	FDD
- Power offset Pp-m	0 dB
- PRACH partitioning	
- Access Service Class	
- ASC Setting	
- CHOICE mode	FDD
- Available signature Start Index	0
- Available signature End Index	7
- Assigned Sub-Channel Number	'0010'B The first/ leftmost bit of the bit string contains the most significant bit of the Assigned Sub-Channel Number.
- Persistence scaling factor	Not Present
- AC-to-ASC mapping table	
- AC-to-ASC mapping	0 (AC0-9)
- AC-to-ASC mapping	0 (AC10)

- AC-to-ASC mapping	0 (AC11)
- AC-to-ASC mapping	0 (AC12)
- AC-to-ASC mapping	0 (AC13)
- AC-to-ASC mapping	0 (AC14)
- AC-to-ASC mapping	0 (AC15)
- CHOICE mode	FDD
- Primary CPICH TX power	31
- Constant value	-10
- PRACH power offset	
- Power Ramp Step	3dB
- Preamble Retrans Max	4
- RACH transmission parameters	
- Mmax	2
- NB01min	3 slot
- NB01max	10 slot
- AICH info	
- Channelisation code	3
- STTD indicator	FALSE
- AICH transmission timing	0

System Information Block type 6 (Step 2)(1.28Mcps TDD)

Use the same System Information Block Type 6 message as found in clause 6.1.0b of TS 34.108, with the following exceptions:

- PRACH system information list	
- PRACH system information	
- PRACH info	
- CHOICE mode	TDD
- CHOICE TDD option	1.28 Mcps TDD
- SYNC_UL info	
- SYNC_UL codes bitmap	'11111111'
- UL Target SIR	10 dB
- Power Ramping Step	3 dB
- Max SYNC_UL Transmissions	8
- Mmax	32
- Transport Channel Identity	15
- RACH TFS	
- CHOICE Transport channel type	Common transport channels
- Dynamic Transport format information	
- RLC size	Reference clause 6.11 "Parameter Set"
- Number of TB and TTI List	
- Number of Transport blocks	Reference clause 6.11 "Parameter Set"
- CHOICE Mode	TDD
- CHOICE Logical Channel List	Configured
- Semi-static Transport Format information	
- Transmission time interval	20 ms
- Type of channel coding	Convolutional
- Coding Rate	1/2
- Rate matching attribute	150
- CRC size	16
- RACH TFCS	Not present
- PRACH partitioning	
- Access Service Class	
- ASC Setting	
- CHOICE mode	TDD
- CHOICE TDD option	1.28 Mcps TDD
- Available SYNC_UL codes indices	'11111111'
- CHOICE subchannel size	Size1
- Available Subchannels	Null
- Persistence scaling factor	Not Present
- AC-to-ASC mapping table	
- AC-to-ASC mapping	0 (AC0-9)
- AC-to-ASC mapping	0 (AC10)
- AC-to-ASC mapping	0 (AC11)
- AC-to-ASC mapping	0 (AC12)
- AC-to-ASC mapping	0 (AC13)
- AC-to-ASC mapping	0 (AC14)
- AC-to-ASC mapping	0 (AC15)
- CHOICE mode	TDD (no data)

RADIO BEARER RECONFIGURATION (FDD) (Step 7)

The contents of RADIO BEARER RECONFIGURATION message in this test case is identical to the message sub-type titled as "Packet to CELL_FACH from CELL_FACH in PS" as found in clause 9 of TS 34.108, with the following exceptions:

- RB mapping info	
- Information for each multiplexing option	2 RBMuxOptions
- RLC logical channel mapping indicator	Not Present
- Number of uplink RLC logical channels	1
- Uplink transport channel type	DCH
- UL Transport channel identity	1
- Logical channel identity	Not Present
- CHOICE RLC size list	Configured
- MAC logical channel priority	1
- Downlink RLC logical channel info	
- Number of downlink RLC logical channels	1
- Downlink transport channel type	DCH
- DL DCH Transport channel identity	6
- DL DSCH Transport channel identity	Not Present
- Logical channel identity	Not Present
- RLC logical channel mapping indicator	Not Present
- Number of uplink RLC logical channels	1
- Uplink transport channel type	RACH
- UL Transport channel identity	Not Present
- Logical channel identity	7
- CHOICE RLC size list	Explicit list
- RLC size index	Reference to TS34.108 clause 6 Parameter Set
- MAC logical channel priority	1
- Downlink RLC logical channel info	
- Number of downlink RLC logical channels	1
- Downlink transport channel type	FACH
- DL DCH Transport channel identity	Not Present
- DL DSCH Transport channel identity	Not Present
- Logical channel identity	7

RADIO BEARER RECONFIGURATION (1.28Mcps TDD) (Step 7)

The contents of RADIO BEARER RECONFIGURATION message in this test case is identical to the message sub-type titled as "Packet to CELL_FACH from CELL_FACH in PS" as found in clause 9 of TS 34.108, with the following exceptions:

- RB mapping info	
- Information for each multiplexing option	2 RBMuxOptions
- RLC logical channel mapping indicator	Not Present
- Number of uplink RLC logical channels	1
- Uplink transport channel type	DCH
- UL Transport channel identity	1
- Logical channel identity	Not Present
- CHOICE RLC size list	Configured
- MAC logical channel priority	1
- Downlink RLC logical channel info	
- Number of downlink RLC logical channels	1
- Downlink transport channel type	DCH
- DL DCH Transport channel identity	6
- DL DSCH Transport channel identity	Not Present
- Logical channel identity	Not Present
- RLC logical channel mapping indicator	Not Present
- Number of uplink RLC logical channels	1
- Uplink transport channel type	RACH
- UL Transport channel identity	Not Present
- Logical channel identity	7
- CHOICE RLC size list	Explicit list
- RLC size index	Reference to TS34.108 clause 6 Parameter Set
- MAC logical channel priority	1
- Downlink RLC logical channel info	
- Number of downlink RLC logical channels	1
- Downlink transport channel type	FACH
- DL DCH Transport channel identity	Not Present
- DL DSCH Transport channel identity	Not Present
- Logical channel identity	7

7.1.2.4a.5 Test requirements

In step 1a, SS implicitly checks ASC parameters by receiving correctly the loop backed PDU.

In step 4, the access slots and preamble signatures used on the PRACH TrCH on which the RLC PDU was received shall correspond to configured legal values for the allowed ASC#0.

In step 6a, no PDUs shall be received on PRACH.

In step 9, the access slots and preamble signatures used on the PRACH TrCH on which the RLC PDU was received shall correspond to configured legal values for the allowed ASC#1.

7.1.2.5 Void

NOTE: Test case "Control of RACH transmissions for FDD mode" has been removed as the test purpose is implicitly tested by radio resource management test case in TS 34.121 clause 8.4.2.3.

7.1.3 Priority handling between data flows of one UE

7.1.3.1 Priority handling between data flows of one UE

7.1.3.1.1 Definition and applicability

7.1.3.1.2 Conformance requirement

When selecting between the Transport Format Combinations in the given Transport Format Combination Set, priorities of the data flows to be mapped onto the corresponding Transport Channels can be taken into account.

The chosen TFC shall be selected from within the set of valid TFCs and shall satisfy the following criteria in the order in which they are listed below:

1. No other TFC shall allow the transmission of more highest priority data than the chosen TFC.

2. No other TFC shall allow the transmission of more data from the next lower priority logical channels. Apply this criterion recursively for the remaining priority levels.

3. No other TFC shall have a lower bit rate than the chosen TFC.

The above rules for TFC selection in the UE shall apply to DCH, and the same rules shall apply for TF selection on RACH.

Reference(s)

TS 25.301 clause 5.3.1.2.

TS 25.321, clause 11.4.

7.1.3.1.3 Test purpose

To verify that the UE prioritise signalling compared to data on a lower priority logical channel.

7.1.3.1.4 Method of test

Initial conditions

System Simulator:

- 1 cell, default parameters, Ciphering Off.

User Equipment:

- The UE shall operate under normal test conditions, Ciphering Off.
- The Test-USIM shall be inserted.

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 7-bit "Length Indicator" tests described in 3G TS 34.108 clause 6.11.1 is used.

For radio bearer setup the following settings shall be used in both CS and PS mode:

- Re-establishment Timer: useT314
- MAC logical channel priority: 7
- UL Logical Channel Identity:7
- DL Logical Channel Identity:7

Let UM_7_PayloadSize denote the RAB payload size in octets.

Related ICS/IXIT Statement(s)

None

Test procedure

a The SS transmits a TRANSPORT FORMAT COMBINATION CONTROL message using AM_RLC on the DCCH, which indicates that only transport format minimum set is allowed on the uplink for DCH transport channel on the DTCH. I.e. the restricted uplink transport format set shall be (DCCH, UM RLC 7 bit LI RB)=(TF0, TF0), (TF1, TF0) and (TF0, TF1).

b The SS closes the test loop using UE test loop mode 1 with the UL SDU size set to (UM_7_PayloadSize * 25) - 2 bytes. See note 1.

c. The SS transmits a MEASUREMENT CONTROL message requesting periodic reporting with a period of 250ms.

d. The SS sends one RLC SDUs of size floor (UM_7_PayloadSize) - 1 bytes to the UE. The UE is expected to loop this data back in one RLC SDU, segmented into a total of 25 RLC PDUs.

e. The SS waits until data is returned in uplink.

f. The SS checks that the UE transmits alternating measurement reports and data.

NOTE 1: Having UE to return 25 PDUs corresponds to 25*TTI (40 ms) = 1 second of continuous data transmission. SDU size shall be (UM_7_PayloadSize * 25) - 2 to account for presence of Special "Length Indicator" indicating "beginning of an SDU" in the first PDU for a Rel5 and later UE and presence of Special "Length Indicator" indicating end of SDU in the last PDU. As the periodic measurement interval is 250ms this will guarantee that data transmission will be interrupted by transmission of measurement reports in uplink.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	<--		ACTIVATE RB TEST MODE (DCCH)	TC
2	-->		ACTIVATE RB TEST MODE COMPLETE (DCCH)	TC
3	<--		RADIO BEARER SETUP (DCCH)	RRC
4	-->		RADIO BEARER SETUP COMPLETE (DCCH)	RRC
4a	<--		TRANSPORT FORMAT COMBINATION CONTROL (DCCH)	RRC Transport format combinations is limited to transport format minimum set (DCCH, AM RLC 7 bit LI RB)=(TF0, TF0), (TF1, TF0) and (TF0, TF1).
5	<--		CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 with UL RLC SDU size parameter set to achieve UE to transmit 25 PDUs in uplink.
6	-->		CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
7	-		Void	
8	<--		MEASUREMENT CONTROL (DCCH)	SS sends a MEASUREMENT CONTROL message requesting periodic reporting at 250 ms interval.
9	<--		Downlink RLC PDU	SS sends a SDU fit into one PDU.
10	-->		Uplink RLC PDUs	SS starts receiving RLC PDUs from the UE on the UM RLC RB
11	-->		MEASUREMENT REPORT (DCCH)	SS checks that at least one MEASUREMENT REPORT message is received within 500 ms (=2 x reporting interval)
12	-->		Uplink RLC PDUs	SS checks that UE resumes returning RLC PDUs from the UE on the UM RLC RB

7.1.3.1.5 Test requirements

1. After step 10 the UE shall transmit a MEASUREMENT REPORT message within 500 ms.

2. After step 11 the UE shall resume data transmission.

7.1.3.2 TFC Selection

7.1.3.2.1 Definition and applicability

All UEs

7.1.3.2.2 Conformance requirement

Before selecting a TFC, i.e. at every boundary of the shortest TTI, or prior to each transmission on PRACH the set of valid TFCs shall be established. All TFCs in the set of valid TFCs shall:

1. belong to the TFCS.

1a. not be restricted by higher layer signalling (e.g. TFC Control, see [7]).

2. not be in the Blocked state.

3. be compatible with the RLC configuration.

4. not require RLC to produce padding PDUs (see [6] for definition).

5. not carry more bits than can be transmitted in a TTI (e.g. when compressed mode by higher layer scheduling is used and the presence of compressed frames reduces the number of bits that can be transmitted in a TTI using the Minimum SF configured).

[...]

The chosen TFC shall be selected from within the set of valid TFCs and shall satisfy the following criteria in the order in which they are listed below:

1. No other TFC shall allow the transmission of more highest priority data than the chosen TFC.

2. No other TFC shall allow the transmission of more data from the next lower priority logical channels. Apply this criterion recursively for the remaining priority levels.

3. No other TFC shall have a lower bit rate than the chosen TFC.

In FDD mode the above rules for TFC selection in the UE shall apply to DCH, and the same rules shall apply for TF selection on RACH.

[...]

Reference(s)

TS 25.301 clause 5.3.1.2.

TS 25.321, clause 11.4.

7.1.3.2.3 Test purpose

1. To verify that the UE supports a TFCS that does not allow simultaneous transmission of max data rate on all transport channels.

2. To verify that the UE selects a TFC according to the rule that no other TFC shall allow the transmission of more highest priority data than the chosen TFC.

3. To verify that the UE selects a TFC according to the rule that no other TFC shall allow the transmission of more data from the next lower priority logical channels.

7.1.3.2.4 Method of test

Initial conditions

System Simulator:

- 1 cell, default parameters, Ciphering Off.

User Equipment:

- The UE shall operate under normal test conditions, Ciphering Off.

- The Test-USIM shall be inserted.

RRC Connection Setup procedure is executed with the following exception for SRB 2

Parameter	Value
Polling Info	
- Timer poll prohibit	500

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the following exceptions:

A radio bearer configuration for "Streaming / unknown / UL:16 DL:64 kbps / PS RAB + Interactive or background / UL:16 DL:64 kbps / PS RAB + UL:13.6 DL:13.6 kbps SRBs for DCCH" is configured. This is a modified version of the radio bearer configuration as specified in TS 34.108, clause 6.10.2.4.1.58 (FDD) clause 6.10.3.4.1.58 (3.85 Mcps

TDD) for "Streaming / unknown / UL:16 DL:64 kbps / PS RAB + Interactive or background / UL: 8 DL: 8 kbps / PS RAB + UL:3.4 DL:3.4 kbps SRBs for DCCH" RAB with the following modifications:

NOTE This radio bearer configuration has been selected to provide for a representative test scenario for how UTRAN configures the TFCS such that the data rate can be increased on one transport channel when there is no (or low) activity on the other transport channels, e.g. to provide for improved signalling performance (13.6 kbps) when there is no data transmitted.

Uplink Transport channel parameters for Streaming / unknown / UL:16 kbps / PS RAB

Higher layer	RAB/Signalling RB		**RAB**
RLC	Logical channel type		DTCH
	RLC mode		AM
	Payload sizes, bit		320
	Max data rate, bps		16000
	AMD PDU header, bit		16
MAC	MAC header, bit		0
	MAC multiplexing		N/A
Layer 1	TrCH type		DCH
	TB sizes, bit		336
	TFS	TF0, bits	0x336
		TF1, bits	1x336
	TTI, ms		20
	Coding type		TC
	CRC, bit		16
	Max number of bits/TTI after channel coding		1068
	Uplink: Max number of bits/radio frame before rate matching		534
	RM attribute		135-175

Uplink Transport channel parameters for Interactive or background / UL:16 kbps / PS RAB

Higher layer	RAB/Signalling RB		**RAB**
RLC	Logical channel type		DTCH
	RLC mode		AM
	Payload sizes, bit		320
	Max data rate, bps		16000
	AMD PDU header, bit		16
MAC	MAC header, bit		0
	MAC multiplexing		N/A
Layer 1	TrCH type		DCH
	TB sizes, bit		336
	TFS	TF0, bits	0x336
		TF1, bits	1x336
		TF2, bits	2x336
	TTI, ms		40
	Coding type		TC
	CRC, bit		16
	Max number of bits/TTI after channel coding		2124
	Uplink: Max number of bits/radio frame before rate matching		531
	RM attribute		135-175

Uplink Transport channel parameters for UL:13.6 kbps SRBs for DCCH

Higher layer	RAB/signalling RB		**SRB#1**	**SRB#2**	**SRB#3**	**SRB#4**
	User of Radio Bearer		RRC	RRC	NAS_DT High prio	NAS_DT Low prio
RLC	Logical channel type		DCCH	DCCH	DCCH	DCCH
	RLC mode		UM	AM	AM	AM
	Payload sizes, bit		136	128	128	128
	Max data rate, bps		13600	12800	12800	12800
	AMD/UMD PDU header, bit		8	16	16	16
MAC	MAC header, bit		4	4	4	4
	MAC multiplexing		4 logical channel multiplexing			
Layer 1	TrCH type		DCH			
	TB sizes, bit		148 (alt 0, 148)			
	TFS	TF0, bits	0x148 (alt 1x0)			
		TF1, bits	1x148			
		TF2, bits	2x148			
		TF3, bits	4x148			
	TTI, ms		40			
	Coding type		CC 1/3			
	CRC, bit		16			
	Max number of bits/TTI before rate matching		~2064			
	Uplink: Max number of bits/radio frame before rate matching		~516			
	RM attribute		155-185			

Uplink TFCS

TFCS size	15
TFCS	(Streaming RAB, Interactive RAB, DCCH)= (TF0,TF0,TF0), (TF1,TF0,TF0), (TF0,TF1,TF0), (TF0,TF2,TF0), (TF1,TF1,TF0), (TF0,TF0,TF1), (TF1,TF0,TF1), (TF1,TF0,TF2), (TF1,TF0,TF3), (TF0,TF1,TF1), (TF0,TF1,TF2), (TF0,TF1,TF3), (TF1,TF1,TF1), (TF0,TF0,TF2), (TF0,TF0,TF3)

Uplink Physical channel parameters (FDD)

DPCH Uplink	Min spreading factor	32
	Max number of DPDCH data bits/radio frame	1200
	Puncturing Limit	1.0

Uplink Physical channel parameters (3.84Mcps TDD)

DPCH Uplink	Midamble	512 chips
	Codes and time slots	SF8 x 1 code x 1 time slot + SF16 x 1code x 1 time slot
	Max. Number of data bits/radio frame	696 bits
	TFCI code word	16 bits
	TPC	2 bits
	Puncturing Limit	0.72 (alt. 0.68)

Downlink Transport channel parameters for Streaming / unknown / DL:64 kbps / PS RAB

Higher layer	RAB/Signalling RB		**RAB**
RLC	Logical channel type		DTCH
	RLC mode		AM
	Payload sizes, bit		640
	Max data rate, bps		64000
	AM PDU header, bit		16
MAC	MAC header, bit		0
	MAC multiplexing		N/A
Layer 1	TrCH type		DCH
	TB sizes, bit		656
	TFS	TF0, bits	0x656
		TF1, bits	1x656
		TF2, bits	2x656
		TF3, bits	4x656
	TTI, ms		40
	Coding type		TC
	CRC, bit		16
	Max number of bits/TTI after channel coding		8076
	RM attribute		125-165

Downlink Transport channel parameters for Interactive or background / DL:64 kbps / PS RAB

Higher Layer	RAB/Signalling RB		**RAB**
RLC	Logical channel type		DTCH
	RLC mode		AM
	Payload sizes, bit		320
	Max data rate, bps		64000
	AMD PDU header, bit		16
MAC	MAC header, bit		0
	MAC multiplexing		N/A
Layer 1	TrCH type		DCH
	TB sizes, bit		336
	TFS	TF0, bits	0x336
		TF1, bits	1x336
		TF2, bits	2x336
		TF3, bits	4x336
		TF4, bits	8x336
	TTI, ms		40
	Coding type		TC
	CRC, bit		16
	Max number of bits/TTI after channel coding		8460
	RM attribute		135-175

Downlink Transport channel parameters for DL:13.6 kbps SRBs for DCCH

Higher layer	RAB/signalling RB		**SRB#1**	**SRB#2**	**SRB#3**	**SRB#4**
	User of Radio Bearer		RRC	RRC	NAS_DT High prio	NAS_DT Low prio
RLC	Logical channel type		DCCH	DCCH	DCCH	DCCH
	RLC mode		UM	AM	AM	AM
	Payload sizes, bit		136	128	128	128
	Max data rate, bps		13600	12800	12800	12800
	AMD/UMD PDU header, bit		8	16	16	16
MAC	MAC header, bit		4	4	4	4
	MAC multiplexing		4 logical channel multiplexing			
Layer 1	TrCH type		DCH			
	TB sizes, bit		148 (alt 0, 148) (note)			
	TFS	TF0, bits	0x148 (alt 1x0) (note)			

		TF1, bits	1x148
		TF2, bits	2x148
		TF3, bits	4x148
	TTI, ms		40
	Coding type		CC 1/3
	CRC, bit		16
	Max number of bits/TTI before rate matching		2064
	RM attribute		155-230
NOTE: alternative parameters enable the measurement "transport channel BLER" in the UE.			

Downlink TFCS

TFCS size	22
TFCS	((Streaming RAB, Interactive RAB, DCCH)= (TF0,TF0,TF0), (TF1,TF0,TF0), (TF2,TF0,TF0), (TF3,TF0,TF0), (TF0,TF1,TF0), (TF1,TF1,TF0), (TF2,TF1,TF0), (TF3,TF1,TF0), (TF0,TF2,TF0), (TF0,TF3,TF0), (TF0,TF4,TF0), (TF0,TF0,TF1), (TF1,TF0,TF1), (TF2,TF0,TF1), (TF3,TF0,TF1), (TF0,TF1,TF1), (TF1,TF1,TF1), (TF2,TF1,TF1), (TF3,TF1,TF1), (TF0,TF0,TF2), (TF3, TF0, TF2), (TF0,TF0,TF3)

Downlink Physical channel parameters (FDD)

DPCH Downlink	DTX position		Flexible
	Spreading factor		32
	DPCCH	Number of TFCI bits/slot	8
		Number of TPC bits/slot	4
		Number of Pilot bits/slot	8
	DPDCH	Number of data bits/slot	140
		Number of data bits/frame	2100

Downlink Physical channel parameters (3.84 Mcps TDD)

DPCH Downlink	Midamble	256 chips
	Codes and time slots	SF16 x 6 codes x 1 time slot
	Max. Number of data bits/radio frame	1640 bits
	TFCI code word	16 bits
	Puncturing limit	0.64

The logical channel priorities are set according to the following:

Radio Bearer	**Logical Channel Priority**
RB1 (DCCH)	3
RB2 (DCCH)	3
RB3 (DCCH)	4
RB4 (DCCH)	5
RB 5 (streaming/unknown)	2
RB 6 (Interactive/ background)	7

Let PayloadSize denote the RAB payload size in octets.

Related ICS/IXIT Statement(s)

None

Test procedure

In the following, the Streaming/ unknown radio bearer is denoted RB 5, the Interactive/ background radio bearer is denoted RB 6, the payload size for RB5 is denoted RB5_PayloadSize and the payload size for RB6 is denoted RB6_PayloadSize.

a) The SS closes the test loop using UE test loop mode 1 with the UL SDU size set to (RB5_PayloadSize * 25) - 1 bytes for RB5 and to (RB6_PayloadSize * 25) - 1 bytes for RB6. See note 1.

b) The SS transmits a MEASUREMENT CONTROL message requesting periodic reporting with a period of 250ms.

c) The SS sends two RLC SDUs of size floor (RB6_PayloadSize) - 1 bytes to the UE on RB 6. The UE is expected to loop this data back in two RLC SDUs, segmented into a total of 50 RLC PDUs.

d) The SS checks that data is returned in uplink

e) The SS waits until a measurement report is received and checks that the UE transmits the measurement report and data on RB6 simultaneously using a TFC that maximises the data rate for the SRB.

f) The SS waits until the UE has looped back all data

g) The SS sends two RLC SDUs of size floor (RB5_PayloadSize) - 1 bytes to the UE on RB 5. The UE is expected to loop this data back in two RLC SDUs, segmented into a total of 50 RLC PDUs.

h) The SS sends two RLC SDUs of size floor (RB6_PayloadSize) - 1 bytes to the UE on RB 6. The UE is expected to loop this data back in two RLC SDUs, segmented into a total of 50 RLC PDUs.

i) The SS checks that data is returned in uplink on RB5 and RB6 simultaneously.

j) The SS waits until a measurement report is received and checks that during the reception of the measurement report, at least once data is also received on RB5 simultaneously, but not on RB6.

NOTE 1. Having UE to return 50 PDUs corresponds to 50*TTI (20 ms) = 1 second of continuous data transmission. As the periodic measurement interval is 250ms this will guarantee that data transmission will be interrupted by transmission of measurement reports in uplink. To keep the uplink SDU size below the limit (1500 octets) of the Max SDU size parameter associated with PDP context establishment then two downlink PDUs is used to generate the 50 uplink PDUs (uplink SDU size= 1000 octets).

Expected sequence

Step	Direction UE SS	Message	Comments
1	<--	ACTIVATE RB TEST MODE (DCCH)	TC
2	-->	ACTIVATE RB TEST MODE COMPLETE (DCCH)	TC
3	<--	RADIO BEARER SETUP (DCCH)	RRC
4	-->	RADIO BEARER SETUP COMPLETE (DCCH)	RRC
5	<--	CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 with UL RLC SDU size parameter for RB5 and RB6 set to achieve UE to transmit 50 PDUs in uplink.
6	-->	CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
7	<--	MEASUREMENT CONTROL (DCCH)	SS sends a MEASUREMENT CONTROL message requesting periodic reporting at 250 ms interval.
8	<--	2 x Downlink RLC PDU on RB6	SS sends two SDUs fit into two PDUs on RB6.
9	-->	Uplink RLC PDUs	SS starts receiving RLC PDUs from the UE on RB6
10	-->	MEASUREMENT REPORT (DCCH)	SS checks that at least one MEASUREMENT REPORT message is received within 500 ms (=2 x reporting interval) simultaneous with RB 6 data.
11	-->	Uplink RLC PDUs	SS checks that UE continues returning RLC PDUs on RB6
12	<--	2 x Downlink RLC PDU on RB5	SS sends two SDUs fit into two PDUs on RB5.
13	<--	2 x Downlink RLC PDU on RB6	SS sends two SDUs fit into two PDUs on RB6.
14	-->	Uplink RLC PDUs	SS starts receiving RLC PDUs from the UE on RB5 and RB6
15	-->	MEASUREMENT REPORT (DCCH) and simultaneous data on RB5 and RB6	SS checks that at least one MEASUREMENT REPORT message is received within 500 ms (=2 x reporting interval) simultaneous with RB 5 data but not on RB6 [Note 1].
16	-->	Uplink RLC PDUs	SS continues receiving RLC PDUs from the UE on RB5 and RB6

7.1.3.2.5 Test requirements

1. After step 8 the UE shall loopback data on RB6 using the transport format that carries the maximum amount of data (2 PDUs per TTI)

2. After step 10 the UE shall transmit a MEASUREMENT REPORT message within 500 ms.

3. After step 10 and during the reception of the MEASUREMENT REPORT message, data shall also be received on RB6

4. After step 13, the UE shall loopback data simultaneously on RB5 and RB6 using a TFC that carries data for both transport channels.

5. After step 15 the UE shall transmit a MEASUREMENT REPORT message within 500 ms

6. After step 15 and during the reception of the MEASUREMENT REPORT, the UE shall at least once simultaneously transmit data on RB5 but not on RB6 [Note 1].

NOTE 1: Due to the complexity of test case implementation, the SS verifies at least once that the UE transmits one Measurement report simultaneously with data on RB5 but not on RB6.

7.1.4 Control of CPCH transmissions.

7.1.4.1 Control of CPCH transmissions for FDD

7.1.4.1.1 Definition and applicability

All UEs which support CPCH.

7.1.4.1.2 Conformance requirement

1. If counter M is not less than N_access_fails, the UE shall execute an access failure error procedure and the CPCH access procedure ends.
2. If the sum of the Frame Count Transmitted counter plus the number of frames in the next TTI is larger than NF_max, the UE shall exit the CPCH transmission procedure.
3. If the CSICH information indicates no PCPCH is available, the UE shall not attempt CPCH access.
4. If the CPCH Persistency levels are all set to 8, the UE shall not attempt CPCH access.
5. If the SS issues an immediate Emergency Stop command in the DL-DPCCH for CPCH, the UE shall abort CPCH access.

Reference(s)

TS 25.321 clause 11.3

TS 25.214 clause 6.

TS 25.211 clause 5.3.3.11.

7.1.4.1.3 Test purpose

To verify that the MAC entity control CPCH transmission correctly.

7.1.4.1.4 Method of test

Initial conditions

System Simulator:

- 1 cell, default parameters, Ciphering Off.

User Equipment:

- The UE shall operate under normal test conditions, Ciphering Off.
- The Test-USIM shall be inserted.

The UE is in Connected mode and a connection is established as described in the TS 34.123-1, clause 7.3 PDCP testing, clause "Setup a UE originated PS session using IP Header compression in AM RLC (using Loop back test mode 1).

Related ICS/IXIT Statement(s)

TBD

Foreseen Final State of the UE

The same as the initial conditions.

Test procedure

a) The SS ends SIBs 7, 8 and 9, sends CSICH information and waits 30 s.

b) The SS configures its RLC entity for "Transparent Mode".

c) The SS sends certain DATA BLOCKS to UE with UE-Id type and UE-Id field.

d) After having received the data block via configured mapped channels, the UE forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its MAC configuration to the SS.

e) The SS receives returned DATA BLOCKS.

f) The SS configures its RLC entity for "AM mode.

g) The SS starts the RB reconfiguration procedure by sending the RADIO BEARER RECONFIGURATION message.

h) After having received the UE confirmation for the reconfiguration procedure, the SS configures its RLC entity for" Transparent Mode".

i) The SS sends SIB 8 on BCH with parameter : N_access_fails = 0 and waits 30 s.

j) The SS sends certain DATA BLOCKS.

k) The SS shall not receive any LOOP BACK DATA BLOCKS within 30 s.

l) The SS configures its RLC entity for" AM mode".

m) The SS starts the RB reconfiguration procedure by sending the RADIO BEARER RECONFIGURATION message.

n) The SS receives RADIO BEARER RECONFIGURE COMPLETE.

o) After having received the UE confirmation for the reconfiguration procedure, the SS configures its RLC entity for "Transparent Mode".

p) The SS sends SIB 8 on BCH with parameter : NF_max = 0 and waits 30 s.

q) The SS sends certain DATA BLOCKS.

r) The SS shall not receive any returned DATA BLOCKS within 30 s.

s) The SS configures its RLC entity for "AM mode".

t) The SS starts the RB reconfiguration procedure by sending the RADIO BEARER RECONFIGURATION message.

u) The SS receives RADIO BEARER RECONFIGURE COMPLETE.

v) After having received the UE confirmation for the reconfiguration procedure, the SS configures its RLC entity for "Transparent Mode".

w) The SS sends SIB 8 on BCH and waits 30 s.

x) The SS continuously sends CSICH information with PCA1=PCA2= NOT AVAILABLE.

y) The SS sends certain DATA BLOCKS.

z) The SS shall not receive any returned DATA BLOCKS within 30 s.

aa) The SS configures its RLC entity for "AM mode".

bb) The SS starts the RB reconfiguration procedure by sending the RADIO BEARER RECONFIGURATION message.

cc) The SS receives RADIO BEARER RECONFIGURE COMPLETE.

dd) After having received the UE confirmation for the reconfiguration procedure, the SS configures its RLC entity for "Transparent Mode".

ee) The SS sends CSICH information with PCA1=PCA2= AVAILABLE and the SS PHY is configured to send CPCH Emergency Stop message in all DL DPCCHs for CPCH after N_start_message frames.

ff) The SS sends certain DATA BLOCKS.

gg) The SS shall not receive any returned DATA BLOCKS within 30 s.

hh) The SS configures its RLC entity for "AM mode".

ii) The SS starts the RB reconfiguration procedure by sending the RADIO BEARER RECONFIGURATION message.

jj) The SS receives RADIO BEARER RECONFIGURE COMPLETE.

kk) After having received the UE confirmation for the reconfiguration procedure, the SS configures its RLC entity for "Transparent Mode".

ll) The SS sends SIB 9 on BCH with the CPCH persistence levels set to 8, no access allowed.

mm) The SS sends certain DATA BLOCKS.

nn) The SS shall not receive any returned DATA BLOCKS within 30 s.

oo) The SS configures its RLC entity for "AM mode".

pp) The SS starts the RB reconfiguration procedure by sending the RADIO BEARER RECONFIGURATION message.

qq) The SS receives RADIO BEARER RECONFIGURE COMPLETE.

rr) After having received the UE confirmation for the reconfiguration procedure, the SS configures its RLC entity for "Transparent Mode".

ss) The SS sends SIB 9 on BCH with the CPCH persistence levels set to 1, immediate access allowed.

tt) The SS sends certain DATA BLOCKS.

uu) The SS receives returned DATA BLOCKS.

vv) The SS configures its RLC entity for "AM mode".

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	SIBs 7, 8 and 9 and CSICH information	Containing default settings for CPCH
2			SS sends CMAC_MAC_HEADER_REQ with disable_mac_header and CRLC_CONFIG_REQ with RLC mode as "Transparent mode".
3	←	DATA BLOCKS	
4	→	LOOP BACK DATA BLOCKS	
5			SS sends CMAC_MAC_HEADER_REQ with enable_mac_header and CRLC_CONFIG_REQ with RLC mode as "AM mode".
6	←	RADIO BEARER RECONFIGURATION	
7	→	RADIO BEARER RECONFIGURATION COMPLETE	
8			SS sends CMAC_MAC_HEADER_REQ with disable_mac_header and CRLC_CONFIG_REQ with RLC mode as "Transparent mode".
9	←	SIB 8	N_access_fails = 0
10	←	DATA BLOCK	
11			The SS can't receive loop back data blocks from UE in 30s.
12			SS sends CMAC_MAC_HEADER_REQ with enable_mac_header and CRLC_CONFIG_REQ with RLC mode as "AM mode".
13	←	RADIO BEARER RECONFIGURATION	
14	→	RADIO BEARER RECONFIGURATION COMPLETE	
15			SS sends CMAC_MAC_HEADER_REQ with disable_mac_header and CRLC_CONFIG_REQ with RLC mode as "Transparent mode".
16	←	SIB 8	NF_max = 0
17	←	DATA BLOCK	UE was trigged to send data block.
18			The SS can't receive data from UE in 30s
19			SS sends CMAC_MAC_HEADER_REQ with enable_mac_header and CRLC_CONFIG_REQ with RLC mode as "AM mode".
20	←	RADIO BEARER RECONFIGURATION	
21	→	RADIO BEARER RECONFIGURATION COMPLETE	
22			SS sends CMAC_MAC_HEADER_REQ with disable_mac_header and CRLC_CONFIG_REQ with RLC mode as "Transparent mode".
23	←	SIB 8 and CSICH information	PCA1=PCA2= NOT AVAILABLE
24	←	DATA BLOCK	
25			The SS can't receive data from UE in 30s
26			SS sends CMAC_MAC_HEADER_REQ with enable_mac_header and CRLC_CONFIG_REQ with RLC mode as "AM mode".
27	←	RADIO BEARER RECONFIGURATION	
28	→	RADIO BEARER RECONFIGURATION COMPLETE	
29			SS sends CMAC_MAC_HEADER_REQ with disable_mac_header and CRLC_CONFIG_REQ with RLC mode as "Transparent mode".

Step	Direction UE SS	Message	Comments
30	←	SIB 8 and CSICH information	PCA1=PCA2=AVAILABLE
31			SS sends a CPCH-Estop command in all DLDPCCHs for CPCH after N_start_message frames
32	←	DATA BLOCK	
33			The SS can't receive data from UE in 30s
34			SS sends CMAC_MAC_HEADER_REQ with enable_mac_header and CRLC_CONFIG_REQ with RLC mode as "AM mode".
35	←	RADIO BEARER RECONFIGURATION	
36	→	RADIO BEARER RECONFIGURATION COMPLETE	
37			SS sends CMAC_MAC_HEADER_REQ with disable_mac_header and CRLC_CONFIG_REQ with RLC mode as "Transparent mode".
38	←	SIB 9	CPCH Persistence levels set to 8; no access allowed
39	←	DATA BLOCK	
40			The SS can't receive data from UE in 30s
41			SS sends CMAC_MAC_HEADER_REQ with enable_mac_header and CRLC_CONFIG_REQ with RLC mode as "AM mode".
42	←	RADIO BEARER RECONFIGURATION	
43	→	RADIO BEARER RECONFIGURATION COMPLETE	
44			SS sends CMAC_MAC_HEADER_REQ with disable_mac_header and CRLC_CONFIG_REQ with RLC mode as "Transparent mode".
45	←	SIB 9	CPCH Persistence levels set to 1; immediate access allowed
46	←	DATA BLOCK	
47	→	LOOP BACK DATA BLOCKS	
48			SS sends CMAC_MAC_HEADER_REQ with enable_mac_header and CRLC_CONFIG_REQ with RLC mode as "AM mode".

Specific Message Contents

RADIO BEARER SET UP:

Information Element	Value/remark
RLC info - RLC mode	 AM RLC
RB mapping info -Downlink - Number of logical channels - Downlink transport channel type	 1 FACH
-Uplink - Number of logical channels - Uplink transport channel type	 1 CPCH

PRACH persistence level info in System Information Block type 7

Information Element	Value/Remark
PRACHs listed in SIB 5/SIB 5bis - Dynamic persistence level PRACHs listed in SIB 6 - Dynamic persistence level	 All set to 8, which maps to minimum persistence value, no access allowed All set to 8,which maps to minimum persistence value, no access allowed

CPCH parameters in System Information Block type 8

Information Element	Value/Remark
Back off control parameters	
- $N_{\_ap\_retrans\_max}$	15
- $N_{\_access\_fails}$	15
- $NF_{\_bo\_no\ aich}$	15
- $NS_{\_bo\_busy}$	15
- $NF_{\_bo\_all\_busy}$	15
- $NF_{\_bo\_mismatch}$	15
- $T_{\_CPCH}$	0
Power Control Algorithm	algorithm 1
TPC step size	1
DL DPCCH BER	15

CPCH set info in System Information Block type 8

Information Element	Value/Remark
AP preamble scrambling code	16
AP-AICH channelisation code	15
CD preamble scrambling code	17
CD/CA-ICH channelisation code	16
DeltaPp-m	0
UL DPCCH Slot Format	1
N_start_message	8
CPCH status indication mode	PA mode
PCPCH Channel #1 info	
- UL scrambling code	18
- DL channelisation code	15
- PCP length	8
- UCSM info	
- Minimum spreading factor	64
- NF_max	64
- AP signature	15
PCPCH Channel #2 info	
- UL scrambling code	19
- DL channelisation code	14
- PCP length	8
- UCSM info	
- Minimum spreading factor	64
- NF_max	64
- AP signature	14

PCPCH persistence level info in System Information Block type 9

Information Element	Value/Remark
CPCH set persistence levels - PCPCH persistence level	 Both set to 1, immediate access allowed

CSICH Information broadcast by SS PHY

Information Element	Value/Remark
PCPCH Channel Availability (PCA) : -PCA1 -PCA2	 Available Available

7.1.4.1.5 Test requirements

The SS can't receives data blocks from UE when N_access_fails or NF_max set as 0.

The SS can't receives data blocks from UE when NF_max set as 0.

The SS can't receives data blocks from UE when CSICH info indicates channels not available.

The SS can't receives data blocks from UE when CPCH Persistency level set to 8.

The SS can't receives data blocks from UE when Emergency Stop message terminates access.

7.1.5 HS-DSCH MAC-hs

7.1.5.1 MAC-hs reordering and stall avoidance

7.1.5.1.1 Definition and applicability

All UEs which support HS-PDSCH.

7.1.5.1.2 Conformance requirement

When a MAC-hs PDU with TSN = SN is received:

- If SN is within the receiver window:
  - if SN < next_expected_TSN, or this MAC-hs PDU has previously been received:
    - the MAC-hs PDU shall be discarded.
    - else:
  - the MAC-hs PDU is placed in the reordering buffer at the place indicated by the TSN.
- If SN is outside the receiver window:
  - the received MAC-hs PDU shall be placed above the highest received TSN in the reordering buffer, at the position indicated by SN;
  - RcvWindow_UpperEdge shall be set to SN thus advancing the receiver window;
  - any MAC-hs PDUs with TSN ≤ RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE, i.e. outside the receiver window after its position is updated, shall be removed from the reordering buffer and be delivered to the disassembly entity;
  - next_expected_TSN shall be set to RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE + 1;
- All received MAC-hs PDUs with consecutive TSNs from next_expected_TSN (included) up to the first not received MAC-hs PDU are delivered to the disassembly entity.
- next_expected_TSN shall be advanced to the TSN of this first not received MAC-hs PDU.

[...]

If no timer T1 is active:

- the timer T1 shall be started when a MAC-hs PDU with TSN > next_expected_TSN is correctly received.
- T1_TSN shall be set to the TSN of this MAC-hs PDU.

If a timer T1 is already active:

- no additional timer shall be started, i.e. only one timer T1 may be active at a given time.

The timer T1 shall be stopped if:

- the MAC-hs PDU with TSN = T1_TSN can be delivered to the disassembly entity before the timer expires.

When the timer T1expires and T1_TSN > next_expected_TSN:

- all correctly received MAC-hs PDUs with TSN > next_expected_TSN up to and including T1_TSN-1 shall be delivered to the disassembly entity;
- all correctly received MAC-hs PDUs up to the next not received MAC-hs PDU shall be delivered to the disassembly entity.
- next_expected_TSN shall be set to the TSN of the next not received MAC-hs PDU.

When the timer T1 is stopped or expires, and there still exist some received MAC-hs PDUs that can not be delivered to higher layer:

- timer T1 is started
- set T1_TSN to the highest TSN among those of the MAC-hs PDUs that can not be delivered.

[...]

Reference(s)

TS 25.321 clauses 11.6.2.3.1, 11.6.2.3.2

7.1.5.1.3 Test purpose

1. To confirm that the UE performs MAC-hs reordering and delivers RLC PDUs in order to RLC.
2. To confirm that the UE performs stall avoidance in case of missing MAC-hs PDUs based on a) window based stall avoidance and b) timer based stall avoidance.

7.1.5.1.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration “Interactive or background / UL:64 DL: [max bit rate depending on UE category] / PS RAB + UL:3.4 DL:3.4 kbps SRBs for DCCH” as specified in TS 34.108, clause 6.10.2.4.5.1. The following parameters are specific for this test case:

Parameter	Value
MAC-hs receiver window size	32
MAC-hs reordering timer T1	400 ms
Polling Info	
- Timer poll prohibit	Not Present
- Timer_poll	Not Present

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Let T be the value of MAC-hs reordering timer T1 parameter.

Test procedure

In this test procedure each MAC-hs PDU contains one RLC PDU carrying one SDU of size 39 octets and one length indicator indicating the end of the SDU.

a) The SS transmits a MAC-hs PDU with Transmission Sequence Number (TSN) = 0 containing an RLC PDU with SN=0.

b) The SS checks that the RLC PDU with SN=0 is looped back

c) The SS transmits a MAC-hs PDU with TSN = 1 containing an RLC PDU with SN=1.

d) The SS checks that the RLC PDU with SN=1 is looped back

e) The SS repeats the transmission of the MAC-hs PDUs in step a) and c) with identical content except that the RLC PDUs have SN 2,3

f) The SS checks that no data is looped back (the data is discarded in the UE)

g) The SS transmits a MAC-hs PDU with TSN = 3 containing an RLC PDU with SN=3

h) The SS waits 400 ms and checks that no data is looped back and no RLC status report is received during that time

i) The SS transmits a MAC-hs PDU with TSN = 2 containing an RLC PDU with SN=2

j) The SS checks that the RLC PDUs with SN = 2,3 are looped back

k) The SS transmits a MAC-hs PDU with TSN = 6 containing an RLC PDU with SN=4

l) The SS transmits a MAC-hs PDU with TSN = 7 containing an RLC PDU with SN=5

m) The SS transmits a MAC-hs PDU with TSN = 38 containing an RLC PDU with SN=6

n) The SS checks that the RLC PDU with SN = 4 and 5 is looped back but the RLC PDU with SN = 6 is not looped back

o) The SS waits 400 ms and checks that the RLC PDU with SN = 6 is looped back after this time

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	MAC-hs PDU with TSN = 0, containing RLC PDU with SN = 0	
2	→	RLC PDU with SN 0	
3	←	MAC-hs PDU with TSN = 1, containing RLC PDU with SN = 1	
4	→	RLC PDU with SN 1	
5	←	MAC-hs PDU with TSN = 0, containing RLC PDU with SN = 2	The duplicated data is discarded in the UE
6	←	MAC-hs PDU with TSN = 1, containing RLC PDU with SN = 3	The duplicated data is discarded in the UE
7	←	MAC-hs PDU with TSN = 3, containing RLC PDU with SN = 3	
8		SS waits T ms and checks that no data is looped back and no RLC status report is received	The waiting time may need to be adjusted to assure that T1 has not expired in the UE
9	←	MAC-hs PDU with TSN = 2, containing RLC PDU with SN = 2	
10	→	RLC PDUs with SN 2,3	
11	←	MAC-hs PDU with TSN = 6, containing RLC PDU with SN = 4	
12	←	MAC-hs PDU with TSN = 7, containing RLC PDU with SN = 5	
13	←	MAC-hs PDU with TSN = 38, containing RLC PDU with SN = 6	SS need to transmit this PDU before timer T1 in UE expires (400 ms after reception of MAC-hs PDU with TSN=6). Note: T_A
14	→	RLC PDUs with SN 4,5	The RLC PDUs with SN = 4,5 is looped back after reception of the MAC_hs PDU in step 13, i.e. before timer T1 expires
15		SS waits T ms and checks that the RLC PDU with SN = 6 is not looped back during this time	
16	→	RLC PDU with SN 6	The RLC PDU with SN = 6 is looped back after expiry of T1. Note: T_B
NOTE 1: The RLC SN in step 5,6 is increased since otherwise the data would be discarded by RLC even if the MAC-hs reordering does not work correctly. Since the data is discarded the same RLC SN can be reused later in the test sequence. NOTE 2: In step 8 the absence of an RLC status report is used to check that the RLC PDU with SN = 3 is not delivered to RLC. If the RLC PDU was delivered to RLC the gap in the SN would trigger a status report (detection of missing PDUs). NOTE3: In step13, the timer T1 is restarted in the UE since the PDU with TSN = 38 can not be delivered to higher layers. NOTE 4: General timer tolerance as defined by 34.108 sub-clause 4.2.3 applies.			

Specific Message Contents

None

7.1.5.1.5 Test requirements

1. After step 1, the RLC PDU with SN = 0 shall be looped back
2. After step 3, the RLC PDU with SN = 1 shall be looped back
3. After step 5 and 6 , no data shall be looped back
4. After step 7, no data shall be looped back and no RLC status report shall be received
5. After step 9, the RLC PDUs with SN = 2,3 shall be looped back
6. After step 13, the RLC PDUs with SN = 4,5 shall be looped back

7. In step 16, the RLC PDU with SN = 6 shall be looped back and $T_B - T_A$ shall be equal to T ms .

7.1.5.2 MAC-hs priority queue handling

7.1.5.2.1 Definition and applicability

All UEs which support HS-PDSCH.

7.1.5.2.2 Conformance requirement

Reordering Queue distribution:

The reordering queue distribution function routes the MAC-hs PDUs to the correct reordering buffer based on the Queue ID.

[...]

The HARQ process processes the Queue ID in the received MAC-hs PDUs. The UE shall:

- arrange the received MAC-hs PDUs in queues based on the Queue ID.

[...]

Reference(s)

TS 25.321 clauses 4.2.3.3 and 11.6.2.2

7.1.5.2.3 Test purpose

1. To confirm that the UE handles several priority queues, where different radio bearers are mapped to different queues.

7.1.5.2.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration "5 x Interactive or background / UL: 8 kbps DL: [max bit rate depending on UE category] / UM PS RAB" as specified in TS 34.108, clause 6.11.4a.1 with the logical channel, transport channel and queue identities set to:

Logical Channel ID	MAC-d flow (DL)	Queue ID	Comment
7	1	0	RB5
8	1	0	RB6
9	2	1	RB7
10	2	2	RB8
13	3	3	RB9
NOTE 1: LCH 7-8 emulates logical channels with the same priority whereas LCH 9-10 emulates logical channels with different priorities. NOTE 2: The radio bearer numbers refer to the radio bearers as specified in TS 34.108 clause 6.11.4a.1.			

The following parameters are specific for this test case:

- Timer poll prohibit	Not Present
- Timer_poll	Not Present

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 40 octets for RB5, RB6 and 39 octets for RB7, RB8, RB9.

Test procedure

In this test procedure each MAC-hs PDU contains one RLC PDU carrying one SDU of size 39 or 40 octets (depending on the RB Identity, see Initial conditions) and one length indicator indicating the end of the SDU.

a) The SS transmits a MAC-hs PDU where:

1. The TSN = 0
2. The Queue ID = 0
3. The MAC-hs PDU contains an RLC PDU with SN=0.

b) The SS checks that the RLC PDU with SN=0 is looped back and checks that the logical channel IDs are correct.

c) The SS repeats steps a), b) with the Logical channel ID, Queue ID and TSN field set as follows:

Iteration	Logical Channel ID	Queue ID Value	TSN Value
1	7	0	0
2	8	0	1
3	9	1	0
4	10	2	0
5	13	3	0

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		MAC-hs PDU containing an RLC PDU with SN = 0. The Logical channel ID, Queue ID and TSN are set according to the table above.	
2	→		RLC PDU with SN = 0	

Steps 1 to 2 of the expected sequence are repeated for iteration 2-5.

7.1.5.2.5 Test requirements

1. In step 2, for each iteration, the RLC PDU with SN=0 shall be looped back with the logical channel ID as specified by the table below:

Iteration	Logical Channel ID
1	7
2	8
3	9
4	10
5	13
NOTE: Logical Channel ID 13 is the Uplink Logical Channel Identity of RB9.	

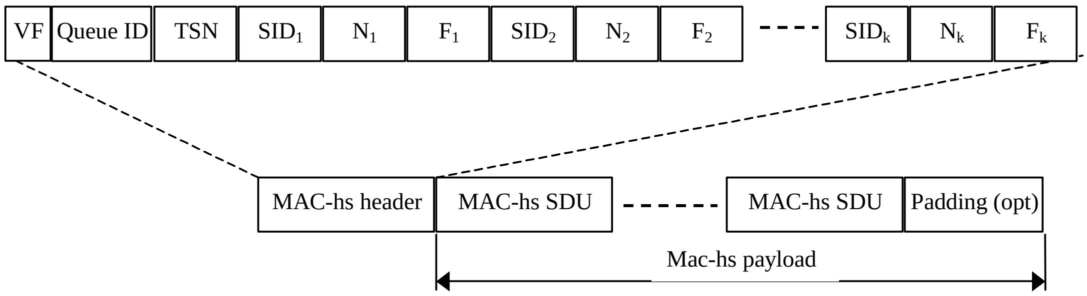
7.1.5.3 MAC-hs PDU header handling

7.1.5.3.1 Definition and applicability

All UEs which support HS-PDSCH.

7.1.5.3.2 Conformance requirement

MAC PDU (HS-DSCH):



[...]

The following fields are included in the MAC header for HS-DSCH:

- Version Flag (VF):
  The VF field is a one bit flag providing extension capabilities of the MAC-hs PDU format. The VF field shall be set to zero and the value one is reserved in this version of the protocol.

- Queue identifier (Queue ID):
  The Queue ID field provides identification of the reordering queue in the receiver, in order to support independent buffer handling of data belonging to different reordering queues. The length of the Queue ID field is 3 bit.

- Transmission Sequence Number (TSN):
  The TSN field provides an identifier for the transmission sequence number on the HS-DSCH. The TSN field is used for reordering purposes to support in-sequence delivery to higher layers. The length of the TSN field is 6 bit.

- Size index identifier (SID):
  The SID fields identifies the size of a set of consecutive MAC-d PDUs. The MAC-d PDU size for a given SID is configured by higher layers and is independent for each Queue ID. The length of the SID field is 3 bit.

- Number of MAC-D PDUs (N):
  The number of consecutive MAC-d PDUs with equal size is identified with the N field. The length of the N field is 7 bits. In FDD mode, the maximum number of PDUs transmitted in a single TTI shall be assumed to be 70. In 1.28 Mcps TDD mode, the maximum number of PDUs transmitted in a single TTI shall be assumed to be 45. In 3.84 Mcps TDD mode, the maximum number of PDUs transmitted in a single TTI shall be assumed to be 318. If more PDUs than the defined maximum number of PDUs for the corresponding mode are received, the UE behaviour is unspecified.

- Flag (F):
  The F field is a flag indicating if more fields are present in the MAC-hs header or not. If the F field is set to "0" the F field is followed by an additional set of SID, N and F fields. If the F field is set to "1" the F field is followed by a MAC-d PDU. The maximum number of MAC-hs header extensions, i.e. number of fields F set to “0”, in a single TTI shall be assumed to be 7. If more extensions than the maximum defined for the corresponding mode are included in a TTI, the UE behaviour is unspecified.

[...]

a) Use of reserved coding in the MAC header

   If the MAC entity receives a MAC PDU with a header field using a value marked as reserved for this version of the protocol, it shall discard the PDU, unless explicitly mentioned otherwise.

b) Inconsistent MAC header

   If the MAC entity receives a MAC PDU with a header inconsistent with the configuration received from RRC, it shall discard the PDU. E.g.: In case DTCH is mapped to RACH/FACH, the MAC entity shall discard a PDU with a C/T field indicating a logical channel number that is not configured.

[...]

Reference(s)

TS 25.321 clauses 9.1.4, 9.2.2, 10

7.1.5.3.3 Test purpose

1. To confirm that the UE discards PDUs with reserved values of the fields in the MAC header
2. To confirm that the UE discards PDUs with values in the MAC header that are inconsistent with the RRC configuration.
3. To confirm that the UE correctly reads the MAC header and disassembles the MAC-hs PDU into MAC-d PDUs and delivers the MAC-d PDUs to the RLC layer.

7.1.5.3.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration "Interactive or background / UL:64 DL: [max bit rate depending on UE category] / PS RAB + UL:3.4 DL:3.4 kbps SRBs for DCCH" as specified in TS 34.108, clause 6.10.2.4.5.1. The following parameters are specific for this test case:

Parameter	Value
UMD_PDU_size1	136 bit
UMD_PDU_size2	328 bit
Queue ID	0
Size Index Identifier (SID)	SID =0: 136 bit SID =1: 328 bit
MAC-hs reordering timer T1	400 ms
MAC-hs receiver window size	32

The RB is configured with 2 RLC PDU sizes UMD_PDU_size1 and UMD_PDU_size2.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Let T be the value of MAC-hs reordering timer T1 parameter.

Test procedure

a) The SS transmits a MAC-hs PDU containing:

   8 RLC UMD PDUs where:

   RLC PDUs with SN= 0, 2, 4, 6has the PDU size UMD_PDU_size1 and contains one SDU of length 14 octets .

   RLC PDUs with SN= 1, 3, 5, 7 has the PDU size UMD_PDU_size2 and contains one SDU of length 38 octets .

   The first RLC PDU with SN=0 will have two Length Indicators. The first Length Indicator will be set to 1111100 (starting of the SDU) and the second length Indicator will have the exact size of the first PDU.

   The remaining RLC PDUs will also have two length Indicators. The first LI will have the exact size of the PDU and the second LI will be set to 1111111(the rest of the RLC PDU has padding bits and the number padding bits will be zero).The MAC fields in the MAC-hs header shall be set according to 25.321 with the following exception:

Field	Value
Version flag VF	1

b) The SS checks that the UE does not loop back any data (since the MAC-hs PDU in the previous step is discarded)

c) The SS again transmits a MAC-hs PDU as in a) above, but this time sets the fields in the MAC-hs header according to 25.321 with the following exception:

Field	Value
Size index identifier (SID)	SID =2: 136 bit SID =3: 328 bit

The sequence numbers in the RLC headers shall be identical with those sent in a).

d) The SS checks that the UE does not loop back any data (since the MAC-hs PDU in the previous step is discarded)

e) The SS again transmits a MAC-hs PDU as in a) above, but this time sets the fields in the MAC-hs header according to 25.321. The sequence numbers in the RLC headers shall be identical with those sent in a).

f) The SS checks that the UE loops back 8 RLC PDUs and checks the sequence numbers of the RLC PDUs

Expected sequence

Step	Direction UE	Direction SS	Message	Comments
	UE	SS		
1	←		MAC-hs PDU with a reserved value of the version flag	discarded by the UE
2			wait for T ms	SS checks that no RLC PDUs are looped back (note)
3	←		MAC-hs PDU with a value of the size index identifier that is inconsistent with RRC configuration	discarded by the UE
4			wait for T ms	SS checks that no RLC PDUs are looped back (note)
5	←		MAC-hs PDU with correct values of the MAC-hs header	Accepted by the UE and the contained data is looped back.
6	→		RLC PDUs with SN 0,1, ...,7	
NOTE	General timer tolerance as defined by 34.108 sub-clause 4.2.3 applies.			

Specific Message Contents

See test procedure

7.1.5.3.5 Test requirements

1. After step 1, no data shall be looped back to the SS
2. After step 3, no data shall be looped back to the SS
3. After step 5, the RLC PDUs with SN =0,1, ...,7 shall be looped back to the SS

7.1.5.4 MAC-hs retransmissions

7.1.5.4.1 Definition and applicability

All UEs which support HS-PDSCH.

7.1.5.4.2 Conformance requirement

[...]

The UE shall:

- if the New Data Indicator has been incremented compared to the value in the previous received transmission in this HARQ process or this is the first received transmission in the HARQ process:

- replace the data currently in the soft buffer for this HARQ process with the received data.
- if the Transport Block Size index value is equal to 111111 (FDD only):
  - generate a positive acknowledgement (ACK) of the data in this HARQ process;
  - discard the received data;
  - assume that the data has been successfully decoded.
- if the New Data Indicator is identical to the value used in the previous received transmission in the HARQ process:
  - if the Transport Block Size index value is equal to 111111 (FDD only):
    - assume that the transport block size is identical to the last valid transport block size signalled for this HARQ process.
  - if the data has not yet been successfully decoded:
    - combine the received data with the data currently in the soft buffer for this HARQ process.
- if the data in the soft buffer has been successfully decoded and no error was detected:
  - deliver the decoded MAC-hs PDU to the reordering entity;
  - generate a positive acknowledgement (ACK) of the data in this HARQ process.
- else:
  - generate a negative acknowledgement (NAK) of the data in this HARQ process;
- schedule the generated positive or negative acknowledgement for transmission and the time of transmission relative to the reception of data in a HARQ process is configured by upper layer.

[...]

Reference(s)

TS 25.321 clauses 11.6.22

7.1.5.4.3 Test purpose

1. To confirm that the UE correctly transmit positive and negative acknowledgements when receiving MAC-hs PDUs

7.1.5.4.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration “Interactive or background / UL:64 DL: [max bit rate depending on UE category] / PS RAB + UL:3.4 DL:3.4 kbps SRBs for DCCH” as specified in TS 34.108, clause 6.10.2.4.5.1. The following parameters are specific for this test case:

Parameter	Value
Polling info	
- Timer Poll Prohibit	Not Present
- Timer_poll	Not Present

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Test procedure

In this test procedure each MAC-hs PDU contains one RLC PDU carrying one SDU of size 39 octets and one length indicator indicating the end of the SDU.

a) The SS transmits a MAC-hs PDU where:

1. The TSN = 0
2. The HARQ process id = 0
3. The Queue ID = 0
4. The MAC-hs PDU contains an RLC PDU with SN=0.
5. The physical layer CRC is modified such that the CRC check in the UE will fail

b) The SS checks that a negative acknowledgement is received for the correct HARQ process and no RLC PDU loop backed by UE

c) The SS transmits a MAC-hs PDU with the same content as in step a) but where the CRC is correct

d) The SS checks that a positive acknowledgement is received for the correct HARQ process and RLC PDU is loop backed by UE.

e) The SS repeats steps a), b), c) & d) with the HARQ process, TSN and RLC SN set as follows for iteration 2 to 8:

Iteration	HARQ process	TSN	RLC SN
1	0	0	0
2	1	1	1
3	2	2	2
4	3	3	3
5	4	4	4
6	5	5	5
7	6	6	6
8	7	7	7

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		MAC-hs PDU sent in process N	Erroneous CRC
2	→		MAC-hs negative acknowledgement with process id = N	
2a				SS checks for 5 sec that UE does not send loop backed PDU
3	←		MAC-hs PDU sent in process N	
4	→		MAC-hs positive acknowledgement with process id = N	
5	→		RLC Loop Backed PDU	
NOTE: The process id N in step 1-4 is taken from the table in the Test procedure description above.				

Steps 1 to 5 of the expected sequence are repeated for iteration 2-8.

7.1.5.4.5 Test requirements

1. After step 1, a MAC-hs negative acknowledgement shall be received for the correct HARQ process
2. After step 3, a MAC-hs positive acknowledgement shall be received for the correct HARQ process

7.1.5.5 MAC-hs reset

7.1.5.5.1 Definition and applicability

All UEs which support HS-PDSCH.

7.1.5.5.2 Conformance requirement

Rel-5 and Rel-6:

If a reset of the MAC-hs entity is requested by upper layers, the UE shall:

- flush soft buffer for all configured HARQ processes;
- stop all active re-ordering release timer (T1) and set all timer T1 to their initial value;
- start TSN with value 0 for the next transmission on every configured HARQ process;
- initialise the variables RcvWindow_UpperEdge and next_expected_TSN to their initial values;
- disassemble all MAC-hs PDUs in the re-ordering buffer and deliver all MAC-d PDUs to the MAC-d entity;
- flush the re-ordering buffer.

and then:

- indicate to all AM RLC entities mapped on HS-DSCH to generate a status report.

[...]

Rel-7:

If a reset of the MAC-hs entity is requested by upper layers, the UE shall at the activation time indicated by higher layers:

- flush soft buffer for all configured HARQ processes;
- stop all active re-ordering release timer (T1) and set all timer T1 to their initial value;
- start TSN with value 0 for the next transmission on every configured HARQ process;
- initialise the variables RcvWindow_UpperEdge and next_expected_TSN to their initial values;
- disassemble all MAC-hs PDUs in the re-ordering buffer and deliver all MAC-d PDUs to the MAC-d entity;
- flush the re-ordering buffer.

[...]

Reference(s)

TS 25.321 clause 11.6.2.5

7.1.5.5.3 Test purpose

1. To confirm that the UE flushes the reordering buffer and delivers all MAC-d PDUs in the buffer to higher layers upon reset.
2. To confirm that the UE initializes the TSN and next_expected_TSN to their initial values.

7.1.5.5.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off

User Equipment:

The SS establishes the reference radio bearer configuration "Interactive or background / UL:64 DL: [max bit rate depending on UE category] / PS RAB + UL:3.4 DL:3.4 kbps SRBs for DCCH" as specified in TS 34.108, clause 6.10.2.4.5.1. The following parameters are specific for this test case:

Parameter	Value
MAC-hs receiver window size	32
MAC-hs reordering timer T1	400 ms
Polling Info	
- Timer poll prohibit	Not Present
- Timer poll	Disabled

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Test procedure

In this test procedure each MAC-hs PDU contains one RLC PDU carrying one SDU of size 39 octets and one length indicator indicating the end of the SDU.

a) The SS transmits a MAC-hs PDU with Transmission Sequence Number (TSN) = 0 containing an RLC PDU with SN=0

b) The SS checks that the RLC PDU with SN=0 is looped back

b) The SS transmits 2 MAC-hs PDUs with TSN = 2,3 containing the RLC PDUs with SN=1,2

c) The SS initiates a MAC-hs reset by transmitting a PHYSICAL CHANNEL RECONFIGURATION message

d) The SS checks that the RLC PDUs with SN=1,2 are looped back

e) The UE may send an RLC status report

d) The SS transmits a MAC-hs PDU with TSN = 0 containing an RLC PDU with SN=3

e) The SS checks that the RLC PDU with SN=3 is looped back

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		MAC-hs PDU with TSN = 0, containing RLC PDU with SN = 0	
2	→		RLC PDU with SN 0	
3	←		MAC-hs PDU with TSN = 2, containing RLC PDU with SN = 1	
4	←		MAC-hs PDU with TSN = 3, containing RLC PDU with SN = 2	
5	←		SS transmits a PHYSICAL CHANNEL RECONFIGURATION message to trigger a MAC-hs reset	
6	→		PHYSICAL CHANNEL RECONFIGURATION COMPLETE	
7	→		RLC PDUs with SN 1,2	The RLC PDUs are delivered directly after the MAC-hs reset i.e. before T1 expires.
8	→		RLC status report	Optional
9	←		MAC-hs PDU with TSN = 0, containing RLC PDU with SN = 3	
10	→		RLC PDU with SN 3	
NOTE: Steps 6-8 may occur in different order.				

Specific Message Contents

PHYSICAL CHANNEL RECONFIGURATION (Step 5)

Use the same message as specified for "Packet to CELL_DCH from CELL_DCH in PS" in 34.108 except for the following:

Information Element	Value/remark
Downlink information common for all radio links - MAC-hs reset indicator	 TRUE

7.1.5.5.5 Test requirements

1. After step 1, the RLC PDU with SN = 0 shall be looped back
2. After step 5, the RLC PDUs with SN = 1,2 shall be looped back
3. After step 9, the RLC PDU with SN=3 shall be looped back

7.1.5.6 MAC-hs transport block size selection

7.1.5.6.1 Definition and applicability

All UEs which support HS-PDSCH and FDD.

7.1.5.6.2 Conformance requirement

For HS-DSCH the transport block size is derived from the value signalled on the HS-SCCH. The mapping between the TFRI value and the transport block size for each mode is specified below:

For all transmissions of a transport block, the transport block size is derived from the TFRI value as specified below, except only in those cases of retransmissions where the Node-B selects a combination for which no mapping exists between the original transport block size and the selected combination of channelisation Code set and modulation type. In such cases, the transport block size index value signalled to the UE shall be set to 111111, i.e., k_i=63.

Let k_i be the TFRI signalled on the HS-SCCH value and let $k_{0,i}$ be the value in the table 7.1.5.6.1 corresponding to the modulation and the number of codes signalled on the HS-SCCH. Let k_t be the sum of the two values: $k_t = k_i + k_{0,i}$. The transport block size $L(k_t)$ can be obtained by accessing the position k_t in the table in Annex A (normative) or by using the formula below (informative):

If k_t < 40

$$L(k_t) = 125 + 12 \cdot k_t$$

else

$$L(k_t) = \left\lfloor L_{\min} p^{k_t} \right\rfloor$$

$$p = 2085/2048$$

$$L_{\min} = 296$$

End

Table 7.1.5.6.1: Values of $k_{0,i}$ for different numbers of channelization codes and modulation schemes

Combination *i*	Modulation scheme	Number of channelization codes	$k_{0,i}$
0	QPSK	1	1
1		2	40
2		3	63
3		4	79
4		5	92
5		6	102
6		7	111
7		8	118
8		9	125
9		10	131
10		11	136
11		12	141
12		13	145
13		14	150
14		15	153
15	16QAM	1	40
16		2	79
17		3	102
18		4	118
19		5	131
20		6	141
21		7	150
22		8	157
23		9	164
24		10	169
25		11	175
26		12	180
27		13	184
28		14	188
29		15	192

……

The following table provides the mapping between k_t (as per the definition above) and the HS-DSCH Transport Block Size (L(k_t)):

Index	TB Size	Index	TB Size	Index	TB Size
1	137	86	1380	171	6324
2	149	87	1405	172	6438
3	161	88	1430	173	6554
4	173	89	1456	174	6673
5	185	90	1483	175	6793
6	197	91	1509	176	6916
7	209	92	1537	177	7041
8	221	93	1564	178	7168
9	233	94	1593	179	7298
10	245	95	1621	180	7430
11	257	96	1651	181	7564
12	269	97	1681	182	7700
13	281	98	1711	183	7840
14	293	99	1742	184	7981
15	305	100	1773	185	8125
16	317	101	1805	186	8272
17	329	102	1838	187	8422
18	341	103	1871	188	8574
19	353	104	1905	189	8729
20	365	105	1939	190	8886
21	377	106	1974	191	9047
22	389	107	2010	192	9210
23	401	108	2046	193	9377
24	413	109	2083	194	9546
25	425	110	2121	195	9719
26	437	111	2159	196	9894
27	449	112	2198	197	10073
28	461	113	2238	198	10255
29	473	114	2279	199	10440
30	485	115	2320	200	10629
31	497	116	2362	201	10821
32	509	117	2404	202	11017
33	521	118	2448	203	11216
34	533	119	2492	204	11418
35	545	120	2537	205	11625
36	557	121	2583	206	11835
37	569	122	2630	207	12048
38	581	123	2677	208	12266
39	593	124	2726	209	12488
40	605	125	2775	210	12713
41	616	126	2825	211	12943
42	627	127	2876	212	13177
43	639	128	2928	213	13415
44	650	129	2981	214	13657
45	662	130	3035	215	13904
46	674	131	3090	216	14155
47	686	132	3145	217	14411
48	699	133	3202	218	14671
49	711	134	3260	219	14936
50	724	135	3319	220	15206

51	737	136	3379	221	15481
52	751	137	3440	222	15761
53	764	138	3502	223	16045
54	778	139	3565	224	16335
55	792	140	3630	225	16630
56	806	141	3695	226	16931
57	821	142	3762	227	17237
58	836	143	3830	228	17548
59	851	144	3899	229	17865
60	866	145	3970	230	18188
61	882	146	4042	231	18517
62	898	147	4115	232	18851
63	914	148	4189	233	19192
64	931	149	4265	234	19538
65	947	150	4342	235	19891
66	964	151	4420	236	20251
67	982	152	4500	237	20617
68	1000	153	4581	238	20989
69	1018	154	4664	239	21368
70	1036	155	4748	240	21754
71	1055	156	4834	241	22147
72	1074	157	4921	242	22548
73	1093	158	5010	243	22955
74	1113	159	5101	244	23370
75	1133	160	5193	245	23792
76	1154	161	5287	246	24222
77	1175	162	5382	247	24659
78	1196	163	5480	248	25105
79	1217	164	5579	249	25558
80	1239	165	5680	250	26020
81	1262	166	5782	251	26490
82	1285	167	5887	252	26969
83	1308	168	5993	253	27456
84	1331	169	6101	254	27952
85	1356	170	6211		

Reference(s)

3GPP TS 25.321, 9.2.3, 9.2.3.1 and Annex A

7.1.5.6.3 Test purpose

To verify that the UE selects the correct transport block size based on the TFRI value signalled on the HS-SCCH.

7.1.5.6.4 Method of test

NOTE: The reference to UE Categories refers to the UE capability as signalled in the Rel-5 IE "HS-DSCH physical layer category" (1 to 12). All UEs supporting HS-DSCH should signal a category between 1 and 12 for this IE even if the UE physical capability category is above 12. This IE corresponds to the HS-DSCH category supported by the UE when MAC-ehs is not configured.

Definition of test variables:

N_{codes}	Number of HS-DSCH codes (1..15, maximum number dependent on UE category)
M	Type of modulation scheme (QPSK, 16QAM)
k_i	TFRI signalled on the HS-SCCH value
$K_{0,I}$	See table 7.1.5.6.2
k_t	Transport Block Size index (=k_i + $k_{0,I}$), see table 7.1.5.6.3
TB_{size}	Transport Block size
N_{PDUs}	Number of MAC-d PDUs
MAC-hs_header_size	MAC-hs header size for the reference HS-DSCH radio bearer configuration under test.
MAC-d_PDU_size	MAC-d PDU size for the reference HS-DSCH radio bearer configuration under test.

Table 7.1.5.6.2: Values of $k_{0,i}$ for different numbers of channelization codes and modulation schemes

Combination *I*	**Modulation scheme**	**Number of channelization codes**	$k_{0,i}$
0	QPSK	1	1
1		2	40
2		3	63
3		4	79
4		5	92
5		6	102
6		7	111
7		8	118
8		9	125
9		10	131
10		11	136
11		12	141
12		13	145
13		14	150
14		15	153
15	16QAM	1	40
16		2	79
17		3	102
18		4	118
19		5	131
20		6	141
21		7	150
22		8	157
23		9	164
24		10	169
25		11	175
26		12	180
27		13	184
28		14	188
29		15	192

Table 7.1.5.6.3: Mapping of HS-DSCH Transport Block Size for FDD to value of index k_t (=k_i + $k_{0,I}$)

Index	TB Size	Index	TB Size	Index	TB Size
1	137	86	1380	171	6324
2	149	87	1405	172	6438
3	161	88	1430	173	6554
4	173	89	1456	174	6673
5	185	90	1483	175	6793
6	197	91	1509	176	6916
7	209	92	1537	177	7041
8	221	93	1564	178	7168
9	233	94	1593	179	7298
10	245	95	1621	180	7430
11	257	96	1651	181	7564
12	269	97	1681	182	7700
13	281	98	1711	183	7840
14	293	99	1742	184	7981
15	305	100	1773	185	8125
16	317	101	1805	186	8272
17	329	102	1838	187	8422
18	341	103	1871	188	8574
19	353	104	1905	189	8729
20	365	105	1939	190	8886
21	377	106	1974	191	9047
22	389	107	2010	192	9210
23	401	108	2046	193	9377
24	413	109	2083	194	9546
25	425	110	2121	195	9719
26	437	111	2159	196	9894
27	449	112	2198	197	10073
28	461	113	2238	198	10255
29	473	114	2279	199	10440
30	485	115	2320	200	10629
31	497	116	2362	201	10821
32	509	117	2404	202	11017
33	521	118	2448	203	11216
34	533	119	2492	204	11418
35	545	120	2537	205	11625
36	557	121	2583	206	11835
37	569	122	2630	207	12048
38	581	123	2677	208	12266
39	593	124	2726	209	12488
40	605	125	2775	210	12713
41	616	126	2825	211	12943
42	627	127	2876	212	13177
43	639	128	2928	213	13415
44	650	129	2981	214	13657
45	662	130	3035	215	13904
46	674	131	3090	216	14155
47	686	132	3145	217	14411
48	699	133	3202	218	14671
49	711	134	3260	219	14936
50	724	135	3319	220	15206
51	737	136	3379	221	15481

52	751	137	3440	222	15761
53	764	138	3502	223	16045
54	778	139	3565	224	16335
55	792	140	3630	225	16630
56	806	141	3695	226	16931
57	821	142	3762	227	17237
58	836	143	3830	228	17548
59	851	144	3899	229	17865
60	866	145	3970	230	18188
61	882	146	4042	231	18517
62	898	147	4115	232	18851
63	914	148	4189	233	19192
64	931	149	4265	234	19538
65	947	150	4342	235	19891
66	964	151	4420	236	20251
67	982	152	4500	237	20617
68	1000	153	4581	238	20989
69	1018	154	4664	239	21368
70	1036	155	4748	240	21754
71	1055	156	4834	241	22147
72	1074	157	4921	242	22548
73	1093	158	5010	243	22955
74	1113	159	5101	244	23370
75	1133	160	5193	245	23792
76	1154	161	5287	246	24222
77	1175	162	5382	247	24659
78	1196	163	5480	248	25105
79	1217	164	5579	249	25558
80	1239	165	5680	250	26020
81	1262	166	5782	251	26490
82	1285	167	5887	252	26969
83	1308	168	5993	253	27456
84	1331	169	6101	254	27952
85	1356	170	6211		

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off

User Equipment:

UE in idle mode

The following parameters are specific for this test case:

Common for all UE categories:

Parameter	Value
MAC-d PDU size	336 bits
MAC-hs receiver window size	16
Number of HARQ processes	1
Number of reordering queues	1

UE Category 1 to 4:

Parameter	Value
RLC Transmission window size	128
RLC Receiving window size	512

UE Category 5 and 6:

Parameter	Value
RLC Transmission window size	256
RLC Receiving window size	512

UE Category 7 and 8:

Parameter	Value
RLC Transmission window size	512
RLC Receiving window size	1536

UE Category 9 and 10:

Parameter	Value
RLC Transmission window size	512
RLC Receiving window size	2047

UE Category 11 and 12:

Parameter	Value
RLC Transmission window size	128
RLC Receiving window size	1024

Test procedure

a) The SS establishes the reference radio bearer configuration "Interactive or background / UL:64 DL: [max bit rate depending on UE category] / PS RAB + UL:3.4 DL:3.4 kbps SRBs for DCCH" as specified in TS 34.108, clause 6.10.2.4.5.1. See note 1.

b) The SS closes the test loop using UE test loop mode 1 setting the UL RLC SDU size parameter to 39 octets (312 bits).

c) The SS sets M= QPSK.

d) The SS sets N_{codes} = 1.

e) The SS sets $k_{0,i}$ to the value according to table 7.1.5.6.2 based on the actual value of M and N_{codes}.

f) The SS sets the test parameter k_i to 0.

g) The SS calculates the index value k_t (=k_i + $k_{0,I}$) and look up the transport block size, TB_{size}, for the actual k_t in table 7.1.5.6.3

If TB_{size} is bigger than the UE capability for "Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI" then SS continues with step n) else step h). See note 2.

h) The SS calculates the coding rate using $Coding\_rate = (TB_{size} + N_{CRC}) / (N_{codes} \cdot N_{phy\_bits})$.

If *Coding_rate* falls within any of the ranges defined in table 14.1.3.2.1 then SS continues with step m), else proceed with step i). See note 4.

i) The SS calculates the maximum number of MAC-d PDUs that fits into the MAC-hs transport block:

$$N_{PDUs} = \mathrm{floor}((TB_{size} - MAC\text{-}hs\_header\_size) / MAC\text{-}d\_PDU\_size)$$

If N_{PDUs} is bigger than 70 then SS continues with step n) else j).

j) The SS creates a MAC-hs PDU of size TB_{size} containing N_{PDUs} MAC-d PDUs + padding. The payload data of the MAC-d PDUs contains 4 RLC SDUs of size N_{PDUs} * MAC-d PDU payload size / 4 minus 8 bits (size of 7 bit length indicator and expansion bit). See note 3.

k) The SS configures the HARQ transmission parameters according to TS 34.108 [9], table 6.1.5.1 based on the actual value of *M*. Then the SS transmits the MAC-hs PDU.

l) The SS checks that the UE returned RLC SDUs has the same content as the first 312 bits of the test data sent by the SS in downlink.

m) The SS increments the test parameter k_i by 1. If k_i is less than 63 then SS repeats steps g) to m).

n) The SS increments the test parameter N_{codes} *by 1*. If N_{codes} is less or equal to the UE capability for *"Maximum number of HS-DSCH codes received"* then the SS repeats test steps e) to n) else continue with step o). See note 2.

o) If *Modulation* = QPSK and UE capability for *"Supported modulation"* is 16QAM then the SS sets the test parameter *Modulation* to 16QAM and repeats steps d) to o) else continue with step p). See note 2.

p) The SS opens the UE test loop.

q) The SS release the radio bearer.

r) The SS may optionally deactivate the radio bearer test mode.

NOTE 1: The SS configures the physical channel parameters according to the actual UE category under test.

NOTE 2: See table 14.1.3.1.1 in section 14.1.3.1 for FDD HS-DSCH physical layer and RLC and MAC-hs capability parameters and there values for different UE FDD HS-DSCH physical layer categories (UE categories). The capability parameters having impact on the test procedure are: "Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI", *"Maximum number of HS-DSCH codes received" and "Supported modulation"*

NOTE 3: The test data for transport channels on HS-DSCH is divided into 4 RLC SDUs to keep the SDU size not to exceed 1500 octets (limit of SDU size in SM).

NOTE 4: See table 14.1.3.2.1 in section 14.1.3.2 for those values of coding rate that must be avoided because of turbo coder irregularities.

Expected sequence

Step	Direction UE	SS	Message	Comments
1	<--		SYSTEM INFORMATION (BCCH)	Broadcast
2	<--		PAGING TYPE 1 (PCCH)	Paging (PS domain, P-TMSI)
3	-->		RRC CONNECTION REQUEST (CCCH)	RRC
4	<--		RRC CONNECTION SETUP (CCCH)	RRC
5	-->		RRC CONNECTION SETUP COMPLETE (DCCH)	RRC
6	-->		SERVICE REQUEST (DCCH)	GMM
7	<--		SECURITY MODE COMMAND	RRC see note 1
8	-->		SECURITY MODE COMPLETE	RRC see note 1
9	<--		ACTIVATE RB TEST MODE (DCCH)	TC
10	-->		ACTIVATE RB TEST MODE COMPLETE (DCCH)	TC
11	<--		RADIO BEARER SETUP (DCCH)	RRC. For the PS radio bearer the 'pdcp info' IE shall be omitted.
12	-->		RADIO BEARER SETUP COMPLETE (DCCH)	RRC
13	<--		CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 RLC SDU size is set to 39 octets
14	-->		CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
15	SS			The SS calculates test data for the first TFRC (TFRI,N_{codes} and *M*).
16	<--		DOWNLINK MAC-hs PDU (4 x RLC SDU)	Send test data. The MAC-hs PDU contains 4 RLC SDUs
17	-->		UPLINK RLC SDUs	The SS checks that the content of the received UL RLC SDUs are correct
18	SS			The SS calculates test data for next TFRC and repeat steps 16 to 18 until all TFRCs have been tested.
19	<--		OPEN UE TEST LOOP (DCCH)	TC
20	-->		OPEN UE TEST LOOP COMPLETE (DCCH)	TC
21			RB RELEASE	RRC
22	<--		DEACTIVATE RB TEST MODE	TC Optional step
23	-->		DEACTIVATE RB TEST MODE COMPLETE	TC Optional step
Note 1: In addition to activate integrity protection Step 6 and Step 7 are inserted in order to stop T3317 timer in the UE, which starts after transmitting SERVICE REQUEST message.				

7.1.5.6.5 Test requirements

For each TFRC the UE shall return a UL RLC SDUs with the same content as the first 312 bits of the test data sent by the SS in downlink.

7.1.5.6a MAC-hs transport block size selection (1.28 Mcps TDD)

7.1.5.6a.1 Definition and applicability

All 1.28 Mcps TDD UEs which support HS-PDSCH.

7.1.5.6a.2 Conformance requirement

The mapping of transport block size, in bits, to TFRI value is dependent upon the UE's HS-DSCH capability class.

When MAC-hs is used, the bit aligned table of transport block size defined as following shall be used.

If k is the signalled TFRI value then the corresponding HS-DSCH transport block size L_k is given by:

If k = 1..62

$$L_k = \lfloor L_{\min} p^{k-1} \rfloor$$

where

$p = \frac{6214}{5973}$ if the HS-DSCH physical layer category is between 1 and 3 inclusively,

$p = \frac{1292}{1228}$ if the HS-DSCH physical layer category is between 4 and 6 inclusively,

$p = \frac{1901}{1795}$ if the HS-DSCH physical layer category is between 7 and 9 inclusively,

$p = \frac{9445}{8877}$ if the HS-DSCH physical layer category is between 10 and 12 inclusively,

$p = \frac{2345}{2196}$ if the HS-DSCH physical layer category is between 13 and 15 inclusively,

and

$L_{\min} = 240$

If k = 63 then,

L_k = 2788 if the HS-DSCH physical layer category is between 1 and 3 inclusively,

5600 if the HS-DSCH physical layer category is between 4 and 6 inclusively,

8416 if the HS-DSCH physical layer category is between 7 and 9 inclusively,

11226 if the HS-DSCH physical layer category is between 10 and 12 inclusively,

14043 if the HS-DSCH physical layer category is between 13 and 15 inclusively.

If k=0, L_k indicates NULL and shall not be used to signal a transport block size in the TFRI.

Transport block sizes calculated by this formula shall equal the values indicated in the following tables: –

Table 7.1.5.6a.1: HSDPA Transport Block Sizes for 1.28 Mcps TDD, for HS-DSCH physical layer category [1, 3], bit aligned

TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]
0	NULL	16	434	32	817	48	1540
1	240	17	451	33	851	49	1602
2	249	18	470	34	885	50	1667
3	259	19	489	35	921	51	1734
4	270	20	508	36	958	52	1804
5	281	21	529	37	996	53	1877
6	292	22	550	38	1037	54	1952
7	304	23	572	39	1078	55	2031
8	316	24	596	40	1122	56	2113
9	329	25	620	41	1167	57	2198
10	342	26	645	42	1214	58	2287
11	356	27	671	43	1263	59	2380
12	370	28	698	44	1314	60	2476
13	385	29	726	45	1367	61	2575
14	401	30	755	46	1423	62	2679
15	417	31	786	47	1480	63	2788

Table 7.1.5.6a.2: HSDPA Transport Block Sizes for 1.28 Mcps TDD, for HS-DSCH physical layer category [4, 6], bit aligned

TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]
0	NULL	16	514	32	1159	48	2613
1	240	17	541	33	1219	49	2749
2	252	18	569	34	1283	50	2893
3	265	19	598	35	1350	51	3043
4	279	20	630	36	1420	52	3202
5	294	21	662	37	1494	53	3369
6	309	22	697	38	1572	54	3544
7	325	23	733	39	1654	55	3729
8	342	24	772	40	1740	56	3924
9	360	25	812	41	1831	57	4128
10	379	26	854	42	1926	58	4343
11	398	27	899	43	2027	59	4570
12	419	28	946	44	2132	60	4808
13	441	29	995	45	2244	61	5058
14	464	30	1047	46	2361	62	5322
15	488	31	1101	47	2484	63	5600

Table 7.1.5.6a.3: HSDPA Transport Block Sizes for 1.28 Mcps TDD, for HS-DSCH physical layer category [7, 9], bit aligned

TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]
0	NULL	16	567	32	1421	48	3559
1	240	17	601	33	1505	49	3769
2	254	18	636	34	1594	50	3991
3	269	19	674	35	1688	51	4227
4	285	20	713	36	1787	52	4477
5	301	21	756	37	1893	53	4741
6	319	22	800	38	2005	54	5021
7	338	23	848	39	2123	55	5318
8	358	24	898	40	2249	56	5632
9	379	25	951	41	2381	57	5964
10	402	26	1007	42	2522	58	6317
11	425	27	1066	43	2671	59	6690
12	451	28	1129	44	2829	60	7085
13	477	29	1196	45	2996	61	7503
14	505	30	1267	46	3173	62	7946
15	535	31	1341	47	3360	63	8416

Table 7.1.5.6a.4: HSDPA Transport Block Sizes for 1.28 Mcps TDD, for HS-DSCH physical layer category [10, 12], bit aligned

TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]
0	NULL	16	608	32	1641	48	4427
1	240	17	647	33	1746	49	4711
2	255	18	688	34	1858	50	5012
3	271	19	732	35	1977	51	5333
4	289	20	779	36	2103	52	5674
5	307	21	829	37	2238	53	6037
6	327	22	882	38	2381	54	6424
7	348	23	939	39	2533	55	6835
8	370	24	999	40	2695	56	7272
9	394	25	1063	41	2868	57	7737
10	419	26	1131	42	3051	58	8232
11	446	27	1203	43	3247	59	8759
12	474	28	1280	44	3455	60	9320
13	505	29	1362	45	3676	61	9916
14	537	30	1449	46	3911	62	10550
15	571	31	1542	47	4161	63	11226

Table 7.1.5.6a.5: HSDPA Transport Block Sizes for 1.28 Mcps TDD, for HS-DSCH physical layer category [13,15], bit aligned

TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]
0	NULL	16	642	32	1836	48	5250
1	240	17	686	33	1961	49	5606
2	256	18	732	34	2094	50	5987
3	273	19	782	35	2236	51	6393
4	292	20	835	36	2388	52	6827
5	312	21	892	37	2550	53	7290
6	333	22	952	38	2723	54	7785
7	355	23	1017	39	2908	55	8313
8	380	24	1086	40	3105	56	8877
9	405	25	1160	41	3316	57	9479
10	433	26	1238	42	3541	58	10123
11	462	27	1322	43	3781	59	10809
12	494	28	1412	44	4037	60	11543
13	527	29	1508	45	4311	61	12326
14	563	30	1610	46	4604	62	13162
15	601	31	1719	47	4916	63	14043

Reference(s)

3GPP TS 25.321 Section 9.2.3.3.

7.1.5.6a.3 Test purpose

To verify that the UE selects the correct transport block size based on the TFRI value signalled on the HS-SCCH.

7.1.5.6a.4 Method of test

Definition of test variables:

N_{slots}	Number of HS-DSCH slots (1- 6 dependent on UE category)
N_{codes}	Number of HS-DSCH codes per timeslot, 1 to 16
k	TFRI signalled on the HS-SCCH value (see Table 7.1.5.6a.2)
TB_{size}	Transport Block size (see Table 7.1.5.6a.2)
N_{PDUs}	Number of MAC-d PDUs
MAC-hs_header_size	MAC-hs header size for the reference HS-DSCH radio bearer configuration under test.
MAC-d_PDU_size	MAC-d PDU size for the reference HS-DSCH radio bearer configuration under test.

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off

User Equipment:

UE in idle mode

The following parameters are specific for this test case:

Common for all UE categories:

Parameter	Value
MAC-d PDU size	336 bits
MAC-hs receiver window size	16
Number of HARQ processes	1
Number of reordering queues	1

UE Category 1 to 3:

Parameter	Value
RLC Transmission window size	128
RLC Receiving window size	512

UE Category 4and 6

Parameter	Value
RLC Transmission window size	256
RLC Receiving window size	512

UE Category 7 and 9:

Parameter	Value
RLC Transmission window size	512
RLC Receiving window size	1536

UE Category 10and 12:

Parameter	Value
RLC Transmission window size	512
RLC Receiving window size	1536

UE Category 13and 15:

Parameter	Value
RLC Transmission window size	512
RLC Receiving window size	1536

Test procedure

a) The SS establishes the reference radio bearer configuration "Interactive or background / UL:64 DL: [max bit rate depending on UE category] / PS RAB + UL:3.4 DL:3.4 kbps SRBs for DCCH" as specified in TS 34.108, clause 6.10.3.4.6.1. See note 1.

b) The SS closes the test loop using UE test loop mode 1 setting the UL RLC SDU size parameter to 39 octets (312 bits).

c) The SS sets $N_{slots} = 3$.

d) The SS sets $N_{codes} = 1$.

e) The SS calculates TB_{size} and k for N_{slots} and N_{codes} according to table 7.1.5.6a.2

f) If TB_{size} is bigger than the UE capability for "Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI" then SS continues with step l) else step g). See note 2.

g) The SS calculates the maximum number of MAC-d PDUs that fits into the MAC-hs transport block:

$$N_{PDUs} = \text{floor}((TB_{size} - MAC\text{-}hs\_header\_size) / MAC\text{-}d\_PDU\_size)$$

If N_{PDUs} is bigger than 45 then SS continues with step m) else i).

h) The SS creates a MAC-hs PDU of size TB_{size} containing N_{PDUs} MAC-d PDUs + padding. The payload data of the MAC-d PDUs contains 4 RLC SDUs of size N_{PDUs} * MAC-d PDU payload size / 4 minus 8 bits (size of 7 bit length indicator and expansion bit). See note 3.

i) The SS transmits the MAC-hs PDU.

j) The SS checks that the UE returned RLC SDUs has the same content as the first 312 bits of the test data sent by the SS in downlink.

k) The SS increments N_{codes} by 1.If N_{codes} is ≤16 then SS repeats steps e) to k).

l) The SS sets N_{slots} *to the next category supported by the UE and repeats steps d) to l)*. If there are no more categories supported by the UE (i.e. all categories have been tested) then the test is completed via steps m) through q). See note 2.

m) The SS opens the UE test loop.

n) The SS release the radio bearer.

o) The SS may optionally deactivate the radio bearer test mode.

NOTE 1: The SS configures the physical channel parameters according to the actual UE category under test.

NOTE 2: See 34.108 6.11for 1.28 Mcps TDD HS-DSCH physical layer, RLC and MAC-hs capability parameters and the values for different UE 3.84 Mcps TDD HS-DSCH physical layer categories (UE categories). The capability parameters having impact on the test procedure are: "Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI" and "Maximum number of HS-DSCH timeslots per TTI"

NOTE 3: The test data for transport channels on HS-DSCH is divided into 4 RLC SDUs to keep the SDU size not to exceed 1500 octets (limit of SDU size in SM).

Expected sequence:

Step	Direction UE / SS	Message	Comments
1	<--	SYSTEM INFORMATION (BCCH)	Broadcast
2	<--	PAGING TYPE 1 (PCCH)	Paging (PS domain, P-TMSI)
3	-->	RRC CONNECTION REQUEST (CCCH)	RRC
4	<--	RRC CONNECTION SETUP (CCCH)	RRC
5	-->	RRC CONNECTION SETUP COMPLETE (DCCH)	RRC
6	-->	SERVICE REQUEST (DCCH)	GMM
7	<--	SECURITY MODE COMMAND	RRC see note 1
8	-->	SECURITY MODE COMPLETE	RRC see note 1
9	<--	ACTIVATE RB TEST MODE (DCCH)	TC
10	-->	ACTIVATE RB TEST MODE COMPLETE (DCCH)	TC
11	<--	RADIO BEARER SETUP (DCCH)	RRC. For the PS radio bearer the 'pdcp info' IE shall be omitted.
12	-->	RADIO BEARER SETUP COMPLETE (DCCH)	RRC
13	<--	CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 RLC SDU size is set to 39 octets
14	-->	CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
15	SS		The SS calculates test data for the first TFRC
16	<--	DOWNLINK MAC-hs PDU (4 x RLC SDU)	Send test data. The MAC-hs PDU contains 4 RLC SDUs
17	-->	UPLINK RLC SDUs	The SS checks that the content of the received UL RLC SDUs are correct
18	SS		The SS calculates test data for next TFRC and repeat steps 16 to 18 until all TFRCs have been tested.
19	<--	OPEN UE TEST LOOP (DCCH)	TC
20	-->	OPEN UE TEST LOOP COMPLETE (DCCH)	TC
21		RB RELEASE	RRC
22	<--	DEACTIVATE RB TEST MODE	TC Optional step
23	-->	DEACTIVATE RB TEST MODE COMPLETE	TC Optional step
Note 1: In addition to activate integrity protection Step 6 and Step 7 are inserted in order to stop T3317 timer in the UE, which starts after transmitting SERVICE REQUEST message.			

7.1.5.6a.5 Test requirements

For each TFRC the UE shall return a UL RLC SDUs with the same content as the first 312 bits of the test data sent by the SS in downlink.

7.1.5.7 MAC-hs transport block size selection (3.84 Mcps TDD)

7.1.5.7.1 Definition and applicability

All 3.84 Mcps TDD UEs which support HS-PDSCH.

7.1.5.7.2 Conformance requirement

For HS-DSCH the transport block size is derived from the value signalled on the HS-SCCH. The mapping between the TFRI value and the transport block size for each mode is specified below:

Let k be the signalled TFRI value, then the corresponding HS-DSCH transport block size L_k is given by:

If k=1..510

$$L_k = \lfloor L_{\min} p^k \rfloor$$

$$p = \frac{8313}{8192}$$

$$L_{\min} = 57$$

If k = 511

L_k = 102000

If k=0, L_k indicates NULL and shall not be used to signal a transport block size in the TFRI.

Transport block sizes calculated by this formula shall equal the values indicated in Table 7.1.5.7.2

Table 7.1.5.7.2: HSDPA Transport Block Sizes for 3.84 Mcps TDD

TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]
0	NULL	128	372	256	2432	384	15890
1	57	129	377	257	2468	385	16124
2	58	130	383	258	2504	386	16362
3	59	131	389	259	2541	387	16604
4	60	132	394	260	2579	388	16849
5	61	133	400	261	2617	389	17098
6	62	134	406	262	2656	390	17351
7	63	135	412	263	2695	391	17607
8	64	136	418	264	2735	392	17867
9	65	137	424	265	2775	393	18131
10	66	138	431	266	2816	394	18399
11	66	139	437	267	2858	395	18671
12	67	140	443	268	2900	396	18946
13	68	141	450	269	2943	397	19226
14	69	142	457	270	2986	398	19510
15	71	143	463	271	3030	399	19798
16	72	144	470	272	3075	400	20091
17	73	145	477	273	3121	401	20388
18	74	146	484	274	3167	402	20689
19	75	147	491	275	3213	403	20994
20	76	148	499	276	3261	404	21304
21	77	149	506	277	3309	405	21619
22	78	150	514	278	3358	406	21938
23	79	151	521	279	3408	407	22263
24	81	152	529	280	3458	408	22591
25	82	153	537	281	3509	409	22925
26	83	154	545	282	3561	410	23264
27	84	155	553	283	3613	411	23607
28	85	156	561	284	3667	412	23956
29	87	157	569	285	3721	413	24310
30	88	158	578	286	3776	414	24669
31	89	159	586	287	3832	415	25033
32	91	160	595	288	3888	416	25403
33	92	161	604	289	3946	417	25778
34	93	162	613	290	4004	418	26159
35	95	163	622	291	4063	419	26545
36	96	164	631	292	4123	420	26938
37	98	165	640	293	4184	421	27335
38	99	166	650	294	4246	422	27739
39	100	167	659	295	4309	423	28149
40	102	168	669	296	4372	424	28565
41	103	169	679	297	4437	425	28987
42	105	170	689	298	4502	426	29415
43	107	171	699	299	4569	427	29849

44	108	172	709	300	4636	428	30290
45	110	173	720	301	4705	429	30738
46	111	174	730	302	4774	430	31192
47	113	175	741	303	4845	431	31652
48	115	176	752	304	4916	432	32120
49	116	177	763	305	4989	433	32594
50	118	178	775	306	5063	434	33076
51	120	179	786	307	5138	435	33564
52	122	180	798	308	5213	436	34060
53	123	181	809	309	5290	437	34563
54	125	182	821	310	5369	438	35074
55	127	183	834	311	5448	439	35592
56	129	184	846	312	5528	440	36117
57	131	185	858	313	5610	441	36651
58	133	186	871	314	5693	442	37192
59	135	187	884	315	5777	443	37742
60	137	188	897	316	5862	444	38299
61	139	189	910	317	5949	445	38865
62	141	190	924	318	6037	446	39439
63	143	191	937	319	6126	447	40021
64	145	192	951	320	6217	448	40613
65	147	193	965	321	6308	449	41212
66	150	194	980	322	6402	450	41821
67	152	195	994	323	6496	451	42439
68	154	196	1009	324	6592	452	43066
69	156	197	1024	325	6689	453	43702
70	159	198	1039	326	6788	454	44347
71	161	199	1054	327	6889	455	45002
72	163	200	1070	328	6990	456	45667
73	166	201	1085	329	7094	457	46342
74	168	202	1101	330	7198	458	47026
75	171	203	1118	331	7305	459	47721
76	173	204	1134	332	7413	460	48426
77	176	205	1151	333	7522	461	49141
78	178	206	1168	334	7633	462	49867
79	181	207	1185	335	7746	463	50603
80	184	208	1203	336	7860	464	51351
81	186	209	1221	337	7976	465	52109
82	189	210	1239	338	8094	466	52879
83	192	211	1257	339	8214	467	53660
84	195	212	1276	340	8335	468	54453
85	198	213	1294	341	8458	469	55257
86	201	214	1313	342	8583	470	56073
87	204	215	1333	343	8710	471	56901
88	207	216	1353	344	8839	472	57742
89	210	217	1373	345	8969	473	58595
90	213	218	1393	346	9102	474	59460
91	216	219	1413	347	9236	475	60338
92	219	220	1434	348	9373	476	61230
93	222	221	1456	349	9511	477	62134

94	226	222	1477	350	9652	478	63052
95	229	223	1499	351	9794	479	63983
96	232	224	1521	352	9939	480	64928
97	236	225	1543	353	10086	481	65887
98	239	226	1566	354	10235	482	66860
99	243	227	1589	355	10386	483	67848
100	246	228	1613	356	10539	484	68850
101	250	229	1637	357	10695	485	69867
102	254	230	1661	358	10853	486	70899
103	258	231	1685	359	11013	487	71946
104	261	232	1710	360	11176	488	73009
105	265	233	1736	361	11341	489	74087
106	269	234	1761	362	11508	490	75182
107	273	235	1787	363	11678	491	76292
108	277	236	1814	364	11851	492	77419
109	281	237	1840	365	12026	493	78563
110	285	238	1868	366	12204	494	79723
111	290	239	1895	367	12384	495	80901
112	294	240	1923	368	12567	496	82095
113	298	241	1952	369	12752	497	83308
114	303	242	1981	370	12941	498	84539
115	307	243	2010	371	13132	499	85787
116	312	244	2039	372	13326	500	87054
117	316	245	2070	373	13523	501	88340
118	321	246	2100	374	13722	502	89645
119	326	247	2131	375	13925	503	90969
120	331	248	2163	376	14131	504	92313
121	336	249	2195	377	14340	505	93676
122	340	250	2227	378	14551	506	95060
123	346	251	2260	379	14766	507	96464
124	351	252	2293	380	14984	508	97889
125	356	253	2327	381	15206	509	99335
126	361	254	2362	382	15430	510	100802
127	366	255	2397	383	15658	511	102000

Reference(s)

3GPP TS 25.321 Section 9.2.3.2

7.1.5.7.3 Test purpose

To verify that the UE selects the correct transport block size based on the TFRI value signalled on the HS-SCCH.

7.1.5.7.4 Method of test

Definition of test variables:

N_{slots} Number of HS-DSCH slots (2, 4, 6 or 12 dependent on UE category)

N_{codes} Number of HS-DSCH codes per timeslot, 1 to 16

k TFRI signalled on the HS-SCCH value (see Table 7.1.5.7.2)

TB_{size} Transport Block size (see Table 7.1.5.7.2)

N_{PDUs} Number of MAC-d PDUs

MAC-hs_header_size MAC-hs header size for the reference HS-DSCH radio bearer configuration under test.

MAC-d_PDU_size MAC-d PDU size for the reference HS-DSCH radio bearer configuration under test.

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off

User Equipment:

UE in idle mode

The following parameters are specific for this test case:

Common for all UE categories:

Parameter	Value
MAC-d PDU size	336 bits
MAC-hs receiver window size	16
Number of HARQ processes	1
Number of reordering queues	1

UE Category 1 to 4:

Parameter	Value
RLC Transmission window size	128
RLC Receiving window size	512

UE Category 5 and 6:

Parameter	Value
RLC Transmission window size	256
RLC Receiving window size	512

UE Category 7 and 8:

Parameter	Value
RLC Transmission window size	512
RLC Receiving window size	1536

UE Category 9:

Parameter	Value
RLC Transmission window size	512
RLC Receiving window size	2047

Test procedure

a) The SS establishes the reference radio bearer configuration “Interactive or background / UL:64 DL: [max bit rate depending on UE category] / PS RAB + UL:3.4 DL:3.4 kbps SRBs for DCCH” as specified in TS 34.108, clause 6.10.3.4.6.1. See note 1.

b) The SS closes the test loop using UE test loop mode 1 setting the UL RLC SDU size parameter to 39 octets (312 bits).

c) The SS sets $N_{slots} = 2$.

d) The SS sets N_{codes} = 1.

e) The SS calculates TB_{size} and k for N_{slots} and N_{codes} according to table 7.1.5.7.2

f) If TB_{size} is bigger than the UE capability for "Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI" then SS continues with step l) else step g). See note 2.

g) The SS calculates the maximum number of MAC-d PDUs that fits into the MAC-hs transport block:

N_{PDUs} = floor((TB_{size} – *MAC-hs_header_size) / MAC-d_PDU_size)*

If N_{PDUs} is bigger than 318 then SS continues with step m) else i).

h) The SS creates a MAC-hs PDU of size TB_{size} containing N_{PDUs} MAC-d PDUs + padding. The payload data of the MAC-d PDUs contains 4 RLC SDUs of size N_{PDUs} * MAC-d PDU payload size / 4 minus 8 bits (size of 7 bit length indicator and expansion bit). See note 3.

i) The SS transmits the MAC-hs PDU.

j) The SS checks that the UE returned RLC SDUs has the same content as the first 312 bits of the test data sent by the SS in downlink.

k) The SS increments N_{codes} by 1.If N_{codes} is ≤16 then SS repeats steps e) to k).

l) The SS sets N_{slots} *to the next category supported by the UE and repeats steps d) to l)*. If there are no more categories supported by the UE (i.e. all categories have been tested) then the test is completed via steps m) through q). See note 2.

m) The SS opens the UE test loop.

n) The SS release the radio bearer.

o) The SS may optionally deactivate the radio bearer test mode.

NOTE 1: The SS configures the physical channel parameters according to the actual UE category under test.

NOTE 2: See table 18.2.1.4.1.1 in section 18.2.1.4.1 for 3.84 Mcps TDD HS-DSCH physical layer, RLC and MAC-hs capability parameters and the values for different UE 3.84 Mcps TDD HS-DSCH physical layer categories (UE categories). The capability parameters having impact on the test procedure are: "Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI" and "Maximum number of HS-DSCH timeslots per TTI"

NOTE 3: The test data for transport channels on HS-DSCH is divided into 4 RLC SDUs to keep the SDU size not to exceed 1500 octets (limit of SDU size in SM).

Expected sequence

Step	Direction UE	SS	Message	Comments
1	<--		SYSTEM INFORMATION (BCCH)	Broadcast
2	<--		PAGING TYPE 1 (PCCH)	Paging (PS domain, P-TMSI)
3	-->		RRC CONNECTION REQUEST (CCCH)	RRC
4	<--		RRC CONNECTION SETUP (CCCH)	RRC
5	-->		RRC CONNECTION SETUP COMPLETE (DCCH)	RRC
6	-->		SERVICE REQUEST (DCCH)	GMM
7	<--		SECURITY MODE COMMAND	RRC see note 1
8	-->		SECURITY MODE COMPLETE	RRC see note 1
9	<--		ACTIVATE RB TEST MODE (DCCH)	TC
10	-->		ACTIVATE RB TEST MODE COMPLETE (DCCH)	TC
11	<--		RADIO BEARER SETUP (DCCH)	RRC. For the PS radio bearer the 'pdcp info' IE shall be omitted.
12	-->		RADIO BEARER SETUP COMPLETE (DCCH)	RRC
13	<--		CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 RLC SDU size is set to 39 octets
14	-->		CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
15	SS			The SS calculates test data for the first TFRC
16	<--		DOWNLINK MAC-hs PDU (4 x RLC SDU)	Send test data. The MAC-hs PDU contains 4 RLC SDUs
17	-->		UPLINK RLC SDUs	The SS checks that the content of the received UL RLC SDUs are correct
18	SS			The SS calculates test data for next TFRC and repeat steps 16 to 18 until all TFRCs have been tested.
19	<--		OPEN UE TEST LOOP (DCCH)	TC
20	-->		OPEN UE TEST LOOP COMPLETE (DCCH)	TC
21			RB RELEASE	RRC
22	<--		DEACTIVATE RB TEST MODE	TC Optional step
23	-->		DEACTIVATE RB TEST MODE COMPLETE	TC Optional step
Note 1: In addition to activate integrity protection Step 6 and Step 7 are inserted in order to stop T3317 timer in the UE, which starts after transmitting SERVICE REQUEST message.				

7.1.5.7.5 Test requirements

For each TFRC the UE shall return a UL RLC SDUs with the same content as the first 312 bits of the test data sent by the SS in downlink.

7.1.5.8 MAC-hs transport block size selection (7.68 Mcps TDD)

7.1.5.8.1 Definition and applicability

All 7.68 Mcps TDD UEs which support HS-PDSCH.

7.1.5.8.2 Conformance requirement

For HS-DSCH the transport block size is derived from the value signalled on the HS-SCCH. The mapping between the TFRI value and the transport block size for each mode is specified below:

Let k be the signalled TFRI value, then the corresponding HS-DSCH transport block size L_k is given by:

If k=1..510

$$L_k = \lfloor L_{\min} p^k \rfloor$$

$$p = \frac{33297}{32768}$$

$$L_{\min} = 57$$

If k = 511

L_k = 204000

If k=0, L_k indicates NULL and shall not be used to signal a transport block size in the TFRI.

Transport block sizes calculated by this formula shall equal the values indicated in Table 7.1.5.8.2

Table 7.1.5.8.2: HSDPA Transport Block Sizes for 7.68 Mcps TDD

TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]
0	NULL	128	442	256	3438	384	26709
1	57	129	449	257	3494	385	27140
2	58	130	457	258	3550	386	27578
3	59	131	464	259	3607	387	28023
4	60	132	472	260	3666	388	28476
5	61	133	479	261	3725	389	28935
6	62	134	487	262	3785	390	29402
7	63	135	495	263	3846	391	29877
8	64	136	503	264	3908	392	30360
9	65	137	511	265	3971	393	30850
10	66	138	519	266	4035	394	31348
11	67	139	528	267	4101	395	31854
12	69	140	536	268	4167	396	32368
13	70	141	545	269	4234	397	32891
14	71	142	553	270	4302	398	33422
15	72	143	562	271	4372	399	33961
16	73	144	572	272	4443	400	34509
17	74	145	581	273	4514	401	35066
18	76	146	590	274	4587	402	35633
19	77	147	600	275	4661	403	36208
20	78	148	609	276	4736	404	36792
21	79	149	619	277	4813	405	37386
22	81	150	629	278	4891	406	37990
23	82	151	639	279	4970	407	38603
24	83	152	650	280	5050	408	39226
25	85	153	660	281	5131	409	39860
26	86	154	671	282	5214	410	40503
27	87	155	682	283	5298	411	41157
28	89	156	693	284	5384	412	41822
29	90	157	704	285	5471	413	42497
30	92	158	715	286	5559	414	43183
31	93	159	727	287	5649	415	43880
32	95	160	739	288	5740	416	44588
33	96	161	751	289	5833	417	45308
34	98	162	763	290	5927	418	46040
35	99	163	775	291	6023	419	46783
36	101	164	787	292	6120	420	47538

37	103	165	800	293	6219	421	48306
38	104	166	813	294	6319	422	49085
39	106	167	826	295	6421	423	49878
40	108	168	840	296	6525	424	50683
41	109	169	853	297	6630	425	51501
42	111	170	867	298	6737	426	52333
43	113	171	881	299	6846	427	53178
44	115	172	895	300	6957	428	54036
45	117	173	910	301	7069	429	54908
46	119	174	924	302	7183	430	55795
47	120	175	939	303	7299	431	56696
48	122	176	954	304	7417	432	57611
49	124	177	970	305	7537	433	58541
50	126	178	986	306	7658	434	59486
51	128	179	1001	307	7782	435	60446
52	131	180	1018	308	7908	436	61422
53	133	181	1034	309	8035	437	62414
54	135	182	1051	310	8165	438	63421
55	137	183	1068	311	8297	439	64445
56	139	184	1085	312	8431	440	65486
57	142	185	1103	313	8567	441	66543
58	144	186	1120	314	8705	442	67617
59	146	187	1138	315	8846	443	68709
60	148	188	1157	316	8988	444	69818
61	151	189	1175	317	9134	445	70945
62	153	190	1194	318	9281	446	72091
63	156	191	1214	319	9431	447	73254
64	158	192	1233	320	9583	448	74437
65	161	193	1253	321	9738	449	75639
66	164	194	1274	322	9895	450	76860
67	166	195	1294	323	10055	451	78101
68	169	196	1315	324	10217	452	79361
69	172	197	1336	325	10382	453	80643
70	174	198	1358	326	10550	454	81945
71	177	199	1380	327	10720	455	83267
72	180	200	1402	328	10893	456	84612
73	183	201	1425	329	11069	457	85978
74	186	202	1448	330	11248	458	87366
75	189	203	1471	331	11429	459	88776
76	192	204	1495	332	11614	460	90209
77	195	205	1519	333	11801	461	91666
78	198	206	1543	334	11992	462	93145
79	201	207	1568	335	12185	463	94649
80	205	208	1594	336	12382	464	96177
81	208	209	1619	337	12582	465	97730
82	211	210	1646	338	12785	466	99308
83	215	211	1672	339	12992	467	100911
84	218	212	1699	340	13201	468	102540
85	222	213	1727	341	13414	469	104195
86	225	214	1755	342	13631	470	105877

87	229	215	1783	343	13851	471	107587
88	233	216	1812	344	14075	472	109324
89	237	217	1841	345	14302	473	111088
90	240	218	1871	346	14533	474	112882
91	244	219	1901	347	14767	475	114704
92	248	220	1932	348	15006	476	116556
93	252	221	1963	349	15248	477	118438
94	256	222	1994	350	15494	478	120350
95	260	223	2027	351	15744	479	122293
96	265	224	2059	352	15999	480	124267
97	269	225	2093	353	16257	481	126273
98	273	226	2126	354	16519	482	128312
99	278	227	2161	355	16786	483	130383
100	282	228	2196	356	17057	484	132488
101	287	229	2231	357	17332	485	134627
102	291	230	2267	358	17612	486	136800
103	296	231	2304	359	17897	487	139009
104	301	232	2341	360	18185	488	141253
105	306	233	2379	361	18479	489	143533
106	311	234	2417	362	18777	490	145850
107	316	235	2456	363	19081	491	148205
108	321	236	2496	364	19389	492	150597
109	326	237	2536	365	19702	493	153029
110	331	238	2577	366	20020	494	155499
111	337	239	2619	367	20343	495	158010
112	342	240	2661	368	20671	496	160560
113	348	241	2704	369	21005	497	163152
114	353	242	2748	370	21344	498	165786
115	359	243	2792	371	21689	499	168463
116	365	244	2837	372	22039	500	171182
117	371	245	2883	373	22395	501	173946
118	377	246	2929	374	22756	502	176754
119	383	247	2977	375	23124	503	179608
120	389	248	3025	376	23497	504	182507
121	395	249	3074	377	23876	505	185454
122	402	250	3123	378	24262	506	188447
123	408	251	3174	379	24653	507	191490
124	415	252	3225	380	25051	508	194581
125	421	253	3277	381	25456	509	197722
126	428	254	3330	382	25867	510	200914
127	435	255	3384	383	26284	511	204000

Reference(s)

3GPP TS 25.321 Section 9.2.3.2a

7.1.5.8.3 Test purpose

To verify that the UE selects the correct transport block size based on the TFRI value signalled on the HS-SCCH.

7.1.5.8.4 Method of test

Definition of test variables:

N_{slots} Number of HS-DSCH slots (1, 2, 3, 4, 5, 8 or 12 dependent on UE category)

N_{codes} Number of HS-DSCH codes per timeslot, 1 to 16

k TFRI signalled on the HS-SCCH value (see Table 7.1.5.8.2)

TB_{size} Transport Block size (see Table 7.1.5.8.2)

N_{PDUs} Number of MAC-d PDUs

MAC-hs_header_size MAC-hs header size for the reference HS-DSCH radio bearer configuration under test.

MAC-d_PDU_size MAC-d PDU size for the reference HS-DSCH radio bearer configuration under test.

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off

User Equipment:

UE in idle mode

The following parameters are specific for this test case:

Common for all UE categories:

Parameter	Value
MAC-d PDU size	336 bits
MAC-hs receiver window size	16
Number of HARQ processes	1
Number of reordering queues	1

UE Category 1 to 4:

Parameter	Value
RLC Transmission window size	128
RLC Receiving window size	512

UE Category 5 and 6:

Parameter	Value
RLC Transmission window size	256
RLC Receiving window size	512

UE Category 7 to 10:

Parameter	Value
RLC Transmission window size	512
RLC Receiving window size	1536

UE Category 11 to 12:

Parameter	Value
RLC Transmission window size	768
RLC Receiving window size	3072

UE Category 13:

Parameter	Value
RLC Transmission window size	1024
RLC Receiving window size	4095

Test procedure

a) The SS establishes the reference radio bearer configuration "Interactive or background / UL:64 DL: [max bit rate depending on UE category] / PS RAB + UL:3.4 DL:3.4 kbps SRBs for DCCH" as specified in TS 34.108, clause 6.10.3.4.6.1. See note 1.

b) The SS closes the test loop using UE test loop mode 1 setting the UL RLC SDU size parameter to 39 octets (312 bits).

c) The SS sets $N_{slots} = 2$.

d) The SS sets $N_{codes} = 1$.

e) The SS calculates TB_{size} and k for N_{slots} and N_{codes} according to table 7.1.5.8.2

f) If TB_{size} is bigger than the UE capability for "Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI" then SS continues with step l) else step g). See note 2.

g) The SS calculates the maximum number of MAC-d PDUs that fits into the MAC-hs transport block:

$$N_{PDUs} = \text{floor}((TB_{size} - MAC\text{-}hs\_header\_size) / MAC\text{-}d\_PDU\_size)$$

If N_{PDUs} is bigger than 318 then SS continues with step m) else i).

h) The SS creates a MAC-hs PDU of size TB_{size} containing N_{PDUs} MAC-d PDUs + padding. The payload data of the MAC-d PDUs contains 4 RLC SDUs of size N_{PDUs} * MAC-d PDU payload size / 4 minus 8 bits (size of 7 bit length indicator and expansion bit). See note 3.

i) The SS transmits the MAC-hs PDU.

j) The SS checks that the UE returned RLC SDUs has the same content as the first 312 bits of the test data sent by the SS in downlink.

k) The SS increments N_{codes} by 1. If N_{codes} is ≤16 then SS repeats steps e) to k).

l) The SS sets N_{slots} *to the next category supported by the UE and repeats steps d) to l)*. If there are no more categories supported by the UE (i.e. all categories have been tested) then the test is completed via steps m) through q). See note 2.

m) The SS opens the UE test loop.

n) The SS release the radio bearer.

o) The SS may optionally deactivate the radio bearer test mode.

NOTE 1: The SS configures the physical channel parameters according to the actual UE category under test.

NOTE 2: See table 18.2.1.4.1.1 in section 18.2.1.4.1 for 3.84 Mcps TDD HS-DSCH physical layer, RLC and MAC-hs capability parameters and the values for different UE 3.84 Mcps TDD HS-DSCH physical layer categories (UE categories). The capability parameters having impact on the test procedure are: "Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI" and "Maximum number of HS-DSCH timeslots per TTI"

NOTE 3: The test data for transport channels on HS-DSCH is divided into 4 RLC SDUs to keep the SDU size not to exceed 1500 octets (limit of SDU size in SM).

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	<--		SYSTEM INFORMATION (BCCH)	Broadcast
2	<--		PAGING TYPE 1 (PCCH)	Paging (PS domain, P-TMSI)
3	-->		RRC CONNECTION REQUEST (CCCH)	RRC
4	<--		RRC CONNECTION SETUP (CCCH)	RRC
5	-->		RRC CONNECTION SETUP COMPLETE (DCCH)	RRC
6	-->		SERVICE REQUEST (DCCH)	GMM
7	<--		SECURITY MODE COMMAND	RRC see note 1
8	-->		SECURITY MODE COMPLETE	RRC see note 1
9	<--		ACTIVATE RB TEST MODE (DCCH)	TC
10	-->		ACTIVATE RB TEST MODE COMPLETE (DCCH)	TC
11	<--		RADIO BEARER SETUP (DCCH)	RRC. For the PS radio bearer the 'pdcp info' IE shall be omitted.
12	-->		RADIO BEARER SETUP COMPLETE (DCCH)	RRC
13	<--		CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 RLC SDU size is set to 39 octets
14	-->		CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
15	SS			The SS calculates test data for the first TFRC
16	<--		DOWNLINK MAC-hs PDU (4 x RLC SDU)	Send test data. The MAC-hs PDU contains 4 RLC SDUs
17	-->		UPLINK RLC SDUs	The SS checks that the content of the received UL RLC SDUs are correct
18	SS			The SS calculates test data for next TFRC and repeat steps 16 to 18 until all TFRCs have been tested.
19	<--		OPEN UE TEST LOOP (DCCH)	TC
20	-->		OPEN UE TEST LOOP COMPLETE (DCCH)	TC
21			RB RELEASE	RRC
22	<--		DEACTIVATE RB TEST MODE	TC Optional step
23	-->		DEACTIVATE RB TEST MODE COMPLETE	TC Optional step
Note 1: In addition to activate integrity protection Step 6 and Step 7 are inserted in order to stop T3317 timer in the UE, which starts after transmitting SERVICE REQUEST message.				

7.1.5.8.5 Test requirements

For each TFRC the UE shall return a UL RLC SDUs with the same content as the first 312 bits of the test data sent by the SS in downlink.

7.1.5.9 MAC-hs data transmission with enhanced TS0 (1.28 Mcps TDD)

7.1.5.9.1 Definition and applicability

All UEs which support HS-PDSCH and 1.28Mcps TDD and enhanced TS0.

7.1.5.9.2 Conformance requirement

For 1.28 Mcps, the timeslots to be used for HS-PDSCH resources are signalled by the bits $x_{ts,1}, x_{ts,2}, \ldots, x_{ts,5}$, where bit $x_{ts,n}$ carries the information for timeslot n+1. Timeslot 1 cannot be used for HS-DSCH resources. If the signalling bit is set (i.e. equal to 1), then the corresponding timeslot shall be used for HS-PDSCH resources. Otherwise, the timeslot shall not be used. All used timeslots shall use the same channelisation code set, as signalled by the channelisation code set information bits.

When indicated by the higher layer that Timeslot 0 can be used for HS-PDSCH, bit $x_{ts,1}$ carries the information for timeslot 0. If $x_{ts,1}$ is set (i.e. equal to 1), Timeslot 0 shall be used for HS-PDSCH resource. Otherwise, Timeslot 0 shall not be used.

Reference(s)

TS 25.222 clause 4.6.1.2.1

7.1.5.9.3 Test purpose

To verify that the UE can receive the data transmitted in TS0 with MAC-hs.

7.1.5.9.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off cell1 configures 3 carrier frequency, one is primary frequency, other are secondary frequencies. The frequency relation show as below:

Parameter	Cell 1
UTRA RF Channel Number1	Ch. 1
UTRA RF Channel Number2	Ch. 2
UTRA RF Channel Number3	Ch.3

User Equipment:

UE in idle mode

Test procedure

a) The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.5.4.7.6 using condition A11 as specified in clause 9.1 of TS 34.108.

b) The SS closes the test loop using UE test loop mode 1 setting the UL RLC SDU size parameter to 39 octets (312 bits).

c) The SS transmits a MAC-hs PDU in TS0.

d) The SS checks that the UE returned RLC SDUs has the same content as the first 312 bits of the test data sent by the SS in downlink.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	<--		RADIO BEARER SETUP (DCCH)	RRC. For the PS radio bearer the 'pdcp info' IE shall be omitted.
2	-->		RADIO BEARER SETUP COMPLETE (DCCH)	RRC
3	<--		CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 RLC SDU size is set to 39 octets
4	-->		CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
5	<--		DOWNLINK MAC-hs PDU	Send test data inTS0
6	-->		UPLINK RLC SDUs	The SS checks that the content of the received UL RLC SDUs are correct

Specific Message Contents

RADIO BEARER SETUP (Step 1)

Use the same message as specified for "Packet to CELL_DCH / E-DCH / HS-DSCH using three multiplexing options (3/3) and SRBs mapped on DCH/DCH" in 34.108 with the following exceptions:

Information Element	Value/remark
Downlink HS-PDSCH Information	Not Present
- CHOICE mode	TDD
- CHOICE *TDD option*	1.28 Mcps
- TS0 Indicator	TRUE
Multi-frequency Info	
- Second Frequency Info	UTRA RF Channel Number2

7.1.5.9.5 Test requirements

In step6 the UE shall return a UL RLC SDUs with the same content as the first 312 bits of the test data sent by the SS in downlink.

7.1.5a HS-DSCH MAC-ehs

7.1.5a.1 MAC-ehs multiplexing / multiple logical channels on same queue

7.1.5a.1.1 Definition and applicability

All UEs which support MAC-ehs.

7.1.5a.1.2 Conformance requirement

- LCH-ID demultiplexing:
  The demultiplexing entity routes the MAC-ehs SDUs to correct logical channel based on the received logical channel identifier.

- The following is allowed:
  The MAC-ehs SDUs included in a MAC-ehs PDU can have a different size and a different priority and can be mapped to different priority queues.

[...]

When MAC-ehs is configured, a MAC PDU for HS-DSCH consists of one MAC-ehs header and one or more reordering PDUs. Each reordering PDU consists of one or more reordering SDUs belonging to the same priority queue. Each reordering SDU equals a complete MAC-ehs SDU or a segment of a MAC-ehs SDU. Each MAC-ehs SDU equals a MAC-d PDU or a MAC-c PDU (FDD and 1.28 Mcps TDD only). The LCH-ID and L fields are repeated per reordering SDU. The TSN and SI fields are repeated per reordering PDU. In 1.28 Mcps TDD multi-frequency HS-DSCH cell, TSN can be extended to 9bit as indicated by RRC signalling. When TSN is extended to 9bit, the 3 least significant bits are placed after the last reordering PDU. If several TSNs are included in MAC-ehs header, the extended bits of TSN should be concatenated in the same order as that of the TSN occurrence in the MAC-ehs header. For FDD, the size of the TSN field is configurable by upper layers [7].

The presence of the TSN_i and SI_i fields is based on the value of the $LCH\text{-}ID_i$; if the $LCH\text{-}ID_i$ is mapped to the same reordering queue as $LCH\text{-}ID_{i-1}$, there is no TSN_i or SI_i field. The mapping of the LCH-ID to the reordering queue is provided by upper layers [7]. The TSN_1 and SI_1 fields are always present.

[...]

For each MAC-d or MAC-c PDU that is delivered to the demultiplexing entity, the UE shall:

- route MAC-d or MAC-c PDU to the correct logical channel based on the corresponding LCH ID field.

Reference(s)

TS 25.321 clauses 4.2.3.5, 9.1.4, 11.6.4.7

7.1.5a.1.3 Test purpose

To confirm that the UE handles multiple logical channels, mapped to same Mac-ehs queue.

7.1.5a.1.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration 3 x Interactive or background / UL: 8 kbps DL: [max bit rate depending on UE category] / UM PS RAB as specified in TS 34.108, clause 6.11.4f.1 (FDD) / 6.11.5.4.8.1 (1.28 Mcps TDD) with the logical channel, MAC-ehs queue identities set to:

Logical Channel ID	Mac-ehs Queue ID	Comment
7	0	RB5
8	0	RB6
9	0	RB7

DL MAC header type is set as MAC-ehs.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB5, RB6 and RB7 and RLC Mode as UM.

Test procedure

In this test procedure each DL RLC PDU consists of one RLC SDU of size 39 octets , special LI and length indicator indicating the end of the SDU.

a) The SS transmits a MAC-ehs PDU where:

1. The TSN1 = 0, TSN2, TSN3 are not present
2. contains 3 MAC-ehs SDU's one each from each RB.

b) The SS checks that the RLC PDU's are looped back and checks that the logical channel IDs are correct.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		MAC-ehs PDU containing 3 RLC PDU's with TSN = 0. Each RLC corresponds to different RB's configured	MAC-ehs header consists of LCH1[6], L1[42],TSN1[0], SI1[00],F1[0] LCH2[7],L2[42],F2[0], LCH3[8],L3[42],F3[1] all values are in decimal. See NOTE1
2	→		Loop Backed RLC PDU's on RB5, RB6 and RB7	
NOTE1: The SS will send the LCH Id one less than the LCH Id signalled to the UE as per TS 25.321 section 9.2.2				

Specific Message Contents

None

7.1.5a.1.5 Test requirements

In Step 2, SS receives one loop backed RLC PDU on RB5, RB6 and RB7.

7.1.5a.2 MAC-ehs multiplexing / multiple logical channels on multiple queues

7.1.5a.2.1 Definition and applicability

All UEs which support MAC-ehs.

7.1.5a.2.2 Conformance requirement

- LCH-ID demultiplexing:
  The demultiplexing entity routes the MAC-ehs SDUs to correct logical channel based on the received logical channel identifier.

- The following is allowed:
  The MAC-ehs SDUs included in a MAC-ehs PDU can have a different size and a different priority and can be mapped to different priority queues.

[...]

When MAC-ehs is configured, a MAC PDU for HS-DSCH consists of one MAC-ehs header and one or more reordering PDUs. Each reordering PDU consists of one or more reordering SDUs belonging to the same priority queue. Each reordering SDU equals a complete MAC-ehs SDU or a segment of a MAC-ehs SDU. Each MAC-ehs SDU equals a MAC-d PDU or a MAC-c PDU (FDD and 1.28 Mcps TDD only). The LCH-ID and L fields are repeated per reordering SDU. The TSN and SI fields are repeated per reordering PDU. In 1.28 Mcps TDD multi-frequency HS-DSCH cell, TSN can be extended to 9bit as indicated by RRC signalling. When TSN is extended to 9bit, the 3 least significant bits are placed after the last reordering PDU. If several TSNs are included in MAC-ehs header, the extended bits of TSN should be concatenated in the same order as that of the TSN occurrence in the MAC-ehs header. For FDD, the size of the TSN field is configurable by upper layers [7].

The presence of the TSN_i and SI_i fields is based on the value of the $LCH\text{-}ID_i$; if the $LCH\text{-}ID_i$ is mapped to the same reordering queue as $LCH\text{-}ID_{i-1}$, there is no TSN_i or SI_i field. The mapping of the LCH-ID to the reordering queue is provided by upper layers [7]. The TSN_1 and SI_1 fields are always present.

[...]

For each MAC-d or MAC-c PDU that is delivered to the demultiplexing entity, the UE shall:

- route MAC-d or MAC-c PDU to the correct logical channel based on the corresponding LCH ID field.

Reference(s)

TS 25.321 clauses 4.2.3.5, 9.1.4, 11.6.4.7

7.1.5a.2.3 Test purpose

To confirm that the UE handles multiple logical channels, mapped to different Mac-ehs queues.

7.1.5a.2.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration 3 x Interactive or background / UL: 8 kbps DL: [max bit rate depending on UE category] / UM PS RAB as specified in TS 34.108, clause 6.11.4f.1 (FDD) / 6.11.5.4.8.1 (1.28 Mcps TDD) with the logical channel, MAC-ehs queue identities set to:

Logical Channel ID	Mac-ehs Queue ID	Comment
7	0	RB5
8	1	RB6
9	2	RB7

DL MAC header type is set as MAC-ehs.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB5, RB6 and RB7 and RLC Mode as UM.

Test procedure

In this test procedure each DL RLC PDU consists of one RLC SDU of size 39 octets , special LI and length indicator indicating the end of the SDU.

a) The SS transmits a MAC-ehs PDU where:

   1. The TSN1 = 0, TSN2=0, TSN3=0

   2. contains 3 MAC-ehs SDU's one each from each RB.

b) The SS checks that the RLC PDU's are looped back and checks that the logical channel IDs are correct.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		MAC-ehs PDU containing 3 RLC PDU's with all TSN's = 0. Each RLC PDU corresponds to different RB's configured on different MAC-ehs queues	MAC-ehs header consists of LCH1[6], L1[42], TSN1[0], SI1[0], F1[0] LCH2[7], L2[42], TSN2[0], SI2[0], F2[0] LCH3[8], L3[42], TSN3[0], SI3[0], F3[1] where all values are in decimal. See NOTE1
2	→		Loop Backed RLC PDU on RB5, RB6 and RB7	
NOTE1: The SS will send the LCH Id one less than the LCH Id signalled to the UE as per TS 25.321 section 9.2.2				

Specific Message Contents

None.

7.1.5a.2.5 Test requirements

In Step 2, SS receives one loop backed RLC PDU on RB5, RB6 and RB7.

7.1.5a.3 MAC-ehs segmentation / UE handling of partial and full PDUs

7.1.5a.3.1 Definition and applicability

All UEs which support MAC-ehs.

7.1.5a.3.2 Conformance requirement

If MAC-ehs is configured by upper layers [7], the parameters for the MAC header are:

…

- Segmentation Indication (SI)

  The SI field indicates if the MAC-ehs SDU has been segmented. Table 9.2.2-1 shows the 2 bit SI field.

Table 9.2.2-1: Structure of the SI field

SI Field	Segmentation indication
00	The first reordering SDU of the reordering PDU is a completeMAC-ehs SDU. The last reordering SDU of the reordering PDU is a complete MAC-ehs SDU.
01	If there are more than one reordering SDUs in the reordering PDU, the last reordering SDU of the reordering PDU is a complete MAC-ehs SDU. The first reordering SDU of the reordering PDU is the last segment of a MAC-ehs SDU.
10	If there are more than one reordering SDUs in the reordering PDU, the first reordering SDU of the reordering PDU is a complete MAC-ehs SDU. The last reordering SDU of the reordering PDU is the first segment of a MAC-ehs SDU.
11	If there are more than one reordering SDUs in the reordering PDU, the first reordering SDU of the reordering PDU is the last segment of a MAC-ehs SDU and the last reordering SDU of reordering PDU is the first segment of a MAC-ehs SDU. If there is only one reordering SDU in the reordering PDU, the reordering SDU is a middle segment of a MAC-ehs SDU.

[…]

The reassembly unit processes the SI field associated with a reordering PDU. The UE shall:

- if SI field is set to “00”:
  - deliver all MAC-d or MAC-c PDUs corresponding to MAC-ehs SDUs in the reordering PDU to demultiplexing entity;
  - discard any previously stored segment of MAC-ehs SDU.
- if SI field is set to “01”:
  - if the received and stored segments of a MAC-ehs SDU are consecutive:
    - combine the first reordering SDU with the stored segment of MAC-ehs SDU;
    - deliver the MAC-d or MAC-c PDU corresponding to the combined MAC-ehs SDU to demultiplexing entity.
  - if the received and stored segments of MAC-ehs SDU are not consecutive
    - discard the first received reordering SDU and the stored segment of MAC-ehs SDU.
  - deliver all MAC-d or MAC-c PDUs corresponding to subsequent MAC-ehs SDUs in the reordering queue to demultiplexing entity;
- if SI field is set to “10”:
  - deliver all MAC-d or MAC-c PDUs corresponding to all but last reordering SDU in the reordering PDU to the demultiplexing entity;
  - discard any previously stored segment of MAC-ehs SDU and store the last reordering SDU of the received reordering PDU
- if SI field is set to “11”:
  - if the received and stored MAC-ehs SDUs are consecutive:
    - if there is only one reordering SDU in the reordering PDU:

        - combine the received reordering SDU with the stored segment of MAC-ehs SDU:

    - if is more than one reordering SDUs in the reordering PDU:

        - combine the first received reordering SDU with the stored segment MAC-ehs SDU;

        - deliver the MAC-d or MAC-c PDU corresponding to the combined MAC-ehs SDU to demultiplexing entity.

        - deliver all MAC-d or MAC-c PDUs corresponding to all but last reordering SDU in the reordering PDU to demultiplexing entity;

        - discard any previously stored segment of MAC-ehs SDU and store the last reordering SDU of the received reordering PDU.

- if the received and stored segments of the MAC-ehs SDU are not consecutive:

    - discard the first received reordering SDU and the stored segment of MAC-ehs SDU;

    - if is more than one reordering SDUs in the reordering PDU:

        - deliver all MAC-d or MAC-c PDUs corresponding to all but first and last reordering SDUs in the reordering PDU to demultiplexing entity and store the last reordering SDU of the received reordering PDU.

Reference(s)

TS 25.321 clauses 9.2.2, 11.6.4.6

7.1.5a.3.3 Test purpose

1. To test UE is able to handle all 4 SI values.
2 To test UE is able to combine MAC-ehs SDU segments from consecutive MAC-ehs PDU's
3. To test UE discards stored MAC-ehs SDU segment, if it cannot be combined.

7.1.5a.3.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration 1 x Interactive or background / UL: 8 kbps DL: [max bit rate depending on UE category] / UM PS RAB as specified in TS 34.108, clause 6.11.4f.2 (FDD) / 6.11.5.4.8.2 (1.28 Mcps TDD) with the logical channel, MAC-ehs queue identity set to:

Logical Channel ID	Mac-ehs Queue ID	Comment
7	0	RB5

DL MAC header type is set as MAC-ehs.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets and RLC Mode as UM.

Test procedure

In this test procedure each DL RLC PDU consists of one RLC SDU of size 39 octets , special LI and length indicator indicating the end of the SDU.

a) The SS transmits a MAC-ehs PDU:

The TSN = 0, SI =10, and containing one full MAC-ehs SDU 1 and one segment of MAC-ehs SDU 2.

b) UE loops back the RLC PDU corresponding to full MAC-ehs SDU 1 and stores the segment of MAC-ehs SDU 2.

c) The SS transmits a MAC-ehs PDU :

The TSN=1, SI=01, and containing remaining part of the MAC-ehs SDU 2 and a full MAC-ehs SDU3.

d) UE transmits 2 loop back PDU's corresponding to MAC-ehs SDU's 2 and 3.

e) The SS transmits a MAC-ehs PDU:

The TSN=2, SI=11, and containing a segment of the MAC-ehs SDU 4, a full MAC-ehs SDU5 and a segment of MAC-ehs SDU 6.

f) UE discards, segment of MAC-ehs SDU4, loop backs RLC PDU corresponding to MAC-ehs SDU5 and stores segment of MAC-ehs SDU 6.

g) The SS transmits a MAC-ehs PDU:

The TSN=3, SI=00, and containing one full MAC-ehs SDU 7.

h) UE discards stored segment of MAC-ehs SDU6, and loops back RLC PDU corresponding to MAC-ehs SDU 7.

i) The SS transmits a MAC-ehs PDU:

The TSN=4, SI=10, and containing first segment of MAC-ehs SDU 8.

j) The SS transmits a MAC-ehs PDU:

The TSN=5, SI=11, and containing second segment of MAC-ehs SDU 8.

k) The SS transmits a MAC-ehs PDU:

The TSN=6, SI=01, and containing last segment of MAC-ehs SDU 8.

l) UE transmits loop back PDU corresponding to MAC-ehs SDU 8.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	MAC-ehs SDU, TSN=0	TSN=0, SI=10 Contains full MAC-ehs SDU1 and segment of MAC-ehs SDU2
2	→	RLC PDU corresponding to MAC-ehs SDU1	
3	←	MAC-ehs SDU, TSN=1	TSN=1, SI=01 Contains segment of MAC-ehs SDU2 and full MAC-ehs SDU3 and
4	→	RLC PDU corresponding to MAC-ehs SDU2	
5	→	RLC PDU corresponding to MAC-ehs SDU3	
6	←	MAC-ehs SDU, TSN=2	TSN=2, SI=11 Contains segment of MAC-ehs SDU4, full MAC-ehs SDU5 and segment of MAC-ehs SDU6
7	→	RLC PDU corresponding to MAC-ehs SDU5	
8			SS Waits for 5 seconds to see no further loop back PDU's are received
9	←	MAC-ehs SDU, TSN=3	TSN=3, SI=00 Contains full MAC-ehs SDU7
10	→	RLC PDU corresponding to MAC-ehs SDU7	
11	←	MAC-ehs SDU, TSN=4	TSN=4, SI=10 Contains [first] segment of MAC-ehs SDU8
12	←	MAC-ehs SDU, TSN=5	TSN=5, SI=11 Contains second segment of MAC-ehs SDU8 [SDU not yet completed]
13	←	MAC-ehs SDU, TSN=6	TSN=6, SI=01 Contains last[third] segment of MAC-ehs SDU8
14	→	RLC PDU corresponding to MAC-ehs SDU8	
15			SS Waits for 5 seconds to see no further loop back PDU's are received

Specific Message Contents

None.

7.1.5a.3.5 Test requirements

a) In step 2, UE loop backs RLC PDU corresponding to MAC-ehs SDU1.

b) In step 4 and 5, UE loop backs RLC PDU's corresponding to MAC-ehs SDU's 2 and 3.

c) In Step 7, UE loops back RLC PDU corresponding to MAC-ehs SDU5

d) In step 8, no RLC PDU's are received by SS.

e) In Step 10, UE loops back RLC PDU corresponding to MAC-ehs SDU7

f) In Step 14, UE loops back RLC PDU corresponding to MAC-ehs SDU8

g) In step 15, no RLC PDU's are received by SS

7.1.5a.4 MAC-ehs reordering and stall avoidance

7.1.5a.4.1 Definition and applicability

All UEs which support MAC-ehs.

7.1.5a.4.2 Conformance requirement

The SI field indicates if the MAC-ehs SDU has been segmented. Table 9.2.2-1 shows the 2 bit SI field.

Table 9.2.2-1: Structure of the SI field

SI Field	Segmentation indication
00	The first reordering SDU of the reordering PDU is a completeMAC-ehs SDU. The last reordering SDU of the reordering PDU is a complete MAC-ehs SDU.
01	If there are more than one reordering SDUs in the reordering PDU, the last reordering SDU of the reordering PDU is a complete MAC-ehs SDU. The first reordering SDU of the reordering PDU is the last segment of a MAC-ehs SDU.
10	If there are more than one reordering SDUs in the reordering PDU, the first reordering SDU of the reordering PDU is a complete MAC-ehs SDU. The last reordering SDU of the reordering PDU is the first segment of a MAC-ehs SDU.
11	If there are more than one reordering SDUs in the reordering PDU, the first reordering SDU of the reordering PDU is the last segment of a MAC-ehs SDU and the last reordering SDU of reordering PDU is the first segment of a MAC-ehs SDU. If there is only one reordering SDU in the reordering PDU, the reordering SDU is a middle segment of a MAC-ehs SDU.

[…]

When a reordering PDU with TSN = SN is received:

- if SN is within the receiver window:
  - if SN < next_expected_TSN, or this reordering PDU has previously been received:
    - the reordering PDU shall be discarded;
  - else:
    - the reordering PDU shall be placed in the reordering buffer at the place indicated by the TSN.
- if SN is outside the receiver window:
  - the received reordering PDU shall be placed above the highest received TSN in the reordering buffer, at the position indicated by SN;
  - RcvWindow_UpperEdge shall be set to SN thus advancing the receiver window;
  - any reordering PDU with TSN ≤ RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE, i.e. outside the receiver window after its position is updated, shall be removed from the reordering buffer and be delivered to the reassembly entity;
  - if next_expected_TSN is below the updated receiver window:
    - next_expected_TSN shall be set to RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE + 1;
- if the reordering PDU with TSN = next_expected_TSN is stored in the reordering buffer:
  - all received reordering PDUs with consecutive TSNs from next_expected_TSN (included) up to the first not received reordering PDU shall be delivered to the reassembly entity;
  - next_expected_TSN shall be advanced to the TSN of this first not received reordering PDU.

[...]

If no timer T1 is active:

- the timer T1 shall be started when a reordering PDU with TSN > next_expected_TSN is correctly received.

- T1_TSN shall be set to the TSN of this reordering PDU.

If a timer T1 is already active:

- no additional timer shall be started, i.e. only one timer T1 may be active at a given time.

The timer T1 shall be stopped if:

- the reordering PDU with TSN = T1_TSN can be delivered to the reassembly entity before the timer expires.

When the timer T1expires and T1_TSN > next_expected_TSN:

- all correctly received reordering PDUs with TSN > next_expected_TSN up to and including T1_TSN -1 shall be delivered to the reassembly entity;
- all correctly received reordering PDUs up to the next not received reordering PDU shall be delivered to the reassembly entity.
- next_expected_TSN shall be set to the TSN of the next not received reordering PDU.

When the timer T1 is stopped or expires, and there still exist some received reordering PDUs that can not be delivered to higher layer:

- timer T1 is started
- set T1_TSN to the highest TSN among those of the reordering PDUs that can not be delivered.

[...]

The reassembly unit processes the SI field associated with a reordering PDU. The UE shall:

- if SI field is set to “00”:
  - deliver all MAC-d or MAC-c PDUs corresponding to MAC-ehs SDUs in the reordering PDU to demultiplexing entity;
  - discard any previously stored segment of MAC-ehs SDU.
- if SI field is set to “01”:
  - if the received and stored segments of a MAC-ehs SDU are consecutive:
    - combine the first reordering SDU with the stored segment of MAC-ehs SDU;
    - deliver the MAC-d or MAC-c PDU corresponding to the combined MAC-ehs SDU to demultiplexing entity.
  - if the received and stored segments of MAC-ehs SDU are not consecutive
    - discard the first received reordering SDU and the stored segment of MAC-ehs SDU.
  - deliver all MAC-d or MAC-c PDUs corresponding to subsequent MAC-ehs SDUs in the reordering queue to demultiplexing entity;
- if SI field is set to “10”:
  - deliver all MAC-d or MAC-c PDUs corresponding to all but last reordering SDU in the reordering PDU to the demultiplexing entity;
  - discard any previously stored segment of MAC-ehs SDU and store the last reordering SDU of the received reordering PDU
- if SI field is set to “11”:
  - if the received and stored MAC-ehs SDUs are consecutive:
    - if there is only one reordering SDU in the reordering PDU:

        - combine the received reordering SDU with the stored segment of MAC-ehs SDU:

    - if is more than one reordering SDUs in the reordering PDU:

        - combine the first received reordering SDU with the stored segment MAC-ehs SDU;

        - deliver the MAC-d or MAC-c PDU corresponding to the combined MAC-ehs SDU to demultiplexing entity.

        - deliver all MAC-d or MAC-c PDUs corresponding to all but last reordering SDU in the reordering PDU to demultiplexing entity;

        - discard any previously stored segment of MAC-ehs SDU and store the last reordering SDU of the received reordering PDU.

- if the received and stored segments of the MAC-ehs SDU are not consecutive:

    - discard the first received reordering SDU and the stored segment of MAC-ehs SDU;

    - if is more than one reordering SDUs in the reordering PDU:

        - deliver all MAC-d or MAC-c PDUs corresponding to all but first and last reordering SDUs in the reordering PDU to demultiplexing entity and store the last reordering SDU of the received reordering PDU.

Reference(s)

TS 25.321 clauses 9.2.2, 11.6.4.5.2 and 11.6.4.6

7.1.5a.4.3 Test purpose

1. To confirm that the UE performs MAC-ehs reordering and delivers RLC PDUs in order to RLC.
2. To confirm that the UE performs stall avoidance in case of missing MAC-ehs PDUs based on a) window based stall avoidance and b) timer based stall avoidance.
3. To confirm that the UE correctly discards partial MAC-ehs SDU segments in case of missing MAC-ehs PDUs.

7.1.5a.4.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration 1 x Interactive or background / UL: 8 kbps DL: [max bit rate depending on UE category] / UM PS RAB as specified in TS 34.108, clause 6.11.4f.2 (FDD) / 6.11.5.4.8.2 (1.28 Mcps TDD). The following parameters are specific for this test case:

Parameter	Value
MAC-ehs receiver window size	32
MAC-ehs reordering timer T1	400 ms

DL MAC header type is set as MAC-ehs.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Let T be the value of MAC-ehs reordering timer T1 parameter.

Test procedure

In this test procedure each DL RLC PDU consists of one RLC SDU of size 39 octets, special LI and one length indicator indicating the end of the SDU.

a) The SS transmits a MAC-ehs PDU with TSN = 0, SI = 00 and containing a full MAC-ehs SDU carrying RLC PDU with SN = 0

b) The SS checks that the RLC PDU corresponding to DL SN = 0 is looped back

c) The SS transmits a MAC-ehs PDU with TSN = 1, SI = 00 and containing a full MAC-ehs SDU carrying RLC PDU with SN = 1

d) The SS checks that the RLC PDU corresponding to DL SN = 1 is looped back

e) The SS repeats the transmission of the MAC-ehs PDUs in steps a) and c) with identical content except that the RLC PDUs have SN = 2 and 3

f) The SS checks that no data is looped back (the data is discarded in the UE)

g) The SS transmits a MAC-ehs PDU with TSN = 3, SI = 10 and containing a full MAC-ehs SDU carrying RLC PDU with SN = 3 as well as the start segment of a MAC-ehs SDU carrying RLC PDU with SN = 4

h) The SS waits 200 ms and checks that no data is looped back.

NOTE: T1 is 400ms and the middle value of 200ms is considered to assure that T1 has not expired in the UE.

i) The SS transmits a MAC-ehs PDU with TSN = 2, SI = 00 and containing a full MAC-ehs SDU carrying an RLC PDU with SN=2

j) The SS checks that the RLC PDUs corresponding to DL SN = 2 and 3 are looped back

k) The SS transmits a MAC-ehs PDU with TSN = 6, SI = 00 and containing a full MAC-ehs SDU carrying an RLC PDU with SN = 5

l) The SS transmits a MAC-ehs PDU with TSN = 7, SI = 00 and containing a full MAC-ehs SDU carrying an RLC PDU with SN = 6

m) The SS transmits a MAC-ehs PDU with TSN = 38, SI = 01 and containing the end segment of a MAC-ehs SDU carrying an RLC PDU with SN=7, as well as a full MAC-ehs SDU carrying an RLC PDU with SN = 8

n) The SS checks that the RLC PDUs corresponding to DL SN = 5 and 6 are looped back but the RLC PDUs corresponding to DL SN = 4, 7 and 8 are not looped back

o) The SS waits 400 ms and checks that the RLC PDU corresponding to DL SN = 8 is looped back after this time, but that the RLC PDUs with SN = 4 and 7 are not looped back

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	MAC-ehs PDU with TSN = 0 and SI = 00, containing a full MAC-ehs SDU carrying RLC PDU with SN = 0	
2	→	RLC PDU corresponding to DL SN 0	
3	←	MAC-ehs PDU with TSN = 1 and SI = 00, containing a full MAC-ehs SDU carrying RLC PDU with SN = 1	
4	→	RLC PDU corresponding to DL SN 1	
5	←	MAC-ehs PDU with TSN = 0 and SI = 00, containing a full MAC-ehs SDU carrying RLC PDU with SN = 2	The duplicated data is discarded in the UE
6	←	MAC-ehs PDU with TSN = 1 and SI = 00, containing a full MAC-ehs SDU carrying RLC PDU with SN = 3	The duplicated data is discarded in the UE
7	←	MAC-ehs PDU with TSN = 3 and SI = 10, containing a full MAC-ehs SDU carrying RLC PDU with SN = 3 and the start segment of a MAC-ehs SDU carrying RLC PDU with SN = 4	
8		SS waits 200 ms and checks that no data is looped back	Note: T1 is 400ms and the middle value of 200ms is considered to assure that T1 has not expired in the UE
9	←	MAC-ehs PDU with TSN = 2 and SI = 00, containing a full MAC-ehs SDU carrying RLC PDU with SN = 2	
10	→	RLC PDUs corresponding to DL SN 2,3	
11	←	MAC-ehs PDU with TSN = 6 and SI = 00, containing a full MAC-ehs SDU carrying RLC PDU with SN = 5	
12	←	MAC-ehs PDU with TSN = 7 and SI = 00, containing a full MAC-ehs SDU carrying RLC PDU with SN = 6	
13	←	MAC-ehs PDU with TSN = 38 and SI = 01, containing the end segment of a MAC-ehs SDU carrying RLC PDU with SN = 7 and a full MAC-ehs SDU carrying RLC PDU with SN = 8	SS need to transmit this PDU before timer T1 in UE expires (400 ms after reception of MAC-ehs PDU with TSN=6). Note: T_A
14	→	RLC PDUs corresponding to DL SN 5,6	The RLC PDUs corresponding to DL SN = 5,6 are looped back after reception of the MAC-ehs PDU in step 13, i.e. before timer T1 expires. See NOTE 5
15		SS waits T ms and checks that the RLC PDUs corresponding to DL SN = 4, 7 and 8 are not looped back during this time	
16	→	RLC PDU corresponding to DL SN 8	The RLC PDU corresponding to DL SN = 8 is looped back after expiry of T1. Note: $T_{B.}$ See NOTE 6

NOTE 1: The RLC SN in step 5,6 is increased since otherwise the data would be discarded by RLC even if the MAC-ehs reordering does not work correctly. Since the data is discarded the same RLC SN can be reused later in the test sequence.
NOTE 2: Void
NOTE3: In step 13, the timer T1 is restarted in the UE since the PDU with TSN = 38 cannot be delivered to higher layers.
NOTE 4: General timer tolerance as defined by 34.108 subclause 4.2.3 applies.
NOTE 5: RLC PDUs with UL SN=4 and 5 is looped back
NOTE 6: RLC PDU with UL SN=6 is looped back

Specific Message Contents

None

7.1.5a.4.5 Test requirements

1. After step 1, the RLC PDU corresponding to DL SN = 0 shall be looped back
2. After step 3, the RLC PDU corresponding to DL SN = 1 shall be looped back
3. After steps 5 and 6, no data shall be looped back
4. After step 7, no data shall be looped back and no RLC status report shall be received
5. After step 9, the RLC PDUs corresponding to DL SN = 2 and 3 shall be looped back
6. After step 13, the RLC PDUs corresponding to DL SN = 5 and 6 shall be looped back
7. In step 16, the RLC PDU corresponding to DL SN = 8 shall be looped back and $T_B - T_A$ shall be equal to T ms

7.1.5a.5 MAC-ehs transport block size selection

7.1.5a.5.1 Generic test procedure for the MAC-ehs transport block size selection test cases

NOTE: The reference to UE Categories refers to the UE capability as signalled in the Rel-7 IE "HS-DSCH physical layer category extension". This IE corresponds to the HS-DSCH category supported by the UE when MAC-ehs is configured.

Definition of test variables:

N_{codes}	Number of HS-DSCH codes (1..15, maximum number dependent on UE category)
M	Type of modulation scheme (QPSK, 16QAM, 64QAM)
k_i	TFRI signalled on the HS-SCCH value
$K_{0,I}$	See table 7.1.5a.5.3
k_t	Transport Block Size index $(=k_i + k_{0,I})$, see table 7.1.5a.5.4
TB_{size}	Transport Block size
MAC-ehs_header_size	MAC-ehs header size for the reference HS-DSCH radio bearer configuration under test.

Table 7.1.5a.5.3: Values of $k_{0,i}$ for different numbers of channelization codes and modulation schemes

Combination *i*	Modulation scheme	Number of channelization codes	$k_{0,i}$
0	QPSK	1	1
1		2	58
2		3	81
3		4	97
4		5	109
5		6	119
6		7	128
7		8	136
8		9	142
9		10	148
10		11	153
11		12	158
12		13	163
13		14	167
14		15	171
15	16QAM	1	58
16		2	97
17		3	119
18		4	136
19		5	148
20		6	158
21		7	167
22		8	174
23		9	181
24		10	187
25		11	192
26		12	197
27		13	201
28		14	206
29		15	209
30	64QAM	1	81
31		2	119
32		3	142
33		4	158
34		5	171
35		6	181
36		7	190
37		8	197
38		9	204
39		10	209
40		11	215
41		12	220
42		13	224
43		14	228
44		15	233

Table 7.1.5a.5.4: Mapping of HS-DSCH Transport Block Size for FDD to value of index k_t (=k_i + $k_{0,I}$)

Index	TB Size	Index	TB Size	Index	TB Size	Index	TB Size
1	120	86	1000	171	4592	256	21000
2	128	87	1016	172	4672	257	21384
3	136	88	1040	173	4760	258	21768
4	144	89	1056	174	4848	259	22160
5	152	90	1072	175	4936	260	22560
6	160	91	1096	176	5024	261	22968
7	168	92	1112	177	5112	262	23384
8	176	93	1136	178	5208	263	23808
9	184	94	1152	179	5296	264	24232
10	192	95	1176	180	5392	265	24672
11	200	96	1200	181	5488	266	25120
12	208	97	1216	182	5592	267	25568
13	216	98	1240	183	5688	268	26032
14	224	99	1264	184	5792	269	26504
15	232	100	1288	185	5896	270	26976
16	240	101	1312	186	6008	271	27464
17	248	102	1336	187	6112	272	27960
18	256	103	1360	188	6224	273	28464
19	264	104	1384	189	6336	274	28976
20	272	105	1408	190	6448	275	29504
21	280	106	1432	191	6568	276	30032
22	288	107	1456	192	6688	277	30576
23	296	108	1488	193	6808	278	31128
24	304	109	1512	194	6928	279	31688
25	312	110	1536	195	7056	280	32264
26	320	111	1568	196	7184	281	32848
27	328	112	1600	197	7312	282	33440
28	336	113	1624	198	7440	283	34040
29	344	114	1656	199	7576	284	34656
30	352	115	1688	200	7712	285	35280
31	360	116	1712	201	7856	286	35920
32	368	117	1744	202	7992	287	36568
33	376	118	1776	203	8136	288	37224
34	384	119	1808	204	8288	289	37896
35	392	120	1840	205	8440	290	38576
36	400	121	1872	206	8592	291	39272
37	408	122	1912	207	8744	292	39984
38	416	123	1944	208	8904	293	40704
39	424	124	1976	209	9064	294	41440
40	440	125	2016	210	9224	295	42192
41	448	126	2048	211	9392		
42	456	127	2088	212	9560		
43	464	128	2128	213	9736		
44	472	129	2168	214	9912		
45	480	130	2200	215	10088		
46	488	131	2240	216	10272		
47	496	132	2288	217	10456		
48	504	133	2328	218	10648		
49	512	134	2368	219	10840		
50	528	135	2408	220	11032		
51	536	136	2456	221	11232		

52	544	137	2496	222	11432		
53	552	138	2544	223	11640		
54	560	139	2592	224	11848		
55	576	140	2632	225	12064		
56	584	141	2680	226	12280		
57	592	142	2736	227	12504		
58	608	143	2784	228	12728		
59	616	144	2832	229	12960		
60	624	145	2880	230	13192		
61	640	146	2936	231	13432		
62	648	147	2984	232	13672		
63	664	148	3040	233	13920		
64	672	149	3096	234	14168		
65	688	150	3152	235	14424		
66	696	151	3208	236	14688		
67	712	152	3264	237	14952		
68	728	153	3328	238	15224		
69	736	154	3384	239	15496		
70	752	155	3448	240	15776		
71	768	156	3512	241	16064		
72	776	157	3576	242	16352		
73	792	158	3640	243	16648		
74	808	159	3704	244	16944		
75	824	160	3768	245	17256		
76	840	161	3840	246	17568		
77	848	162	3912	247	17880		
78	864	163	3976	248	18200		
79	880	164	4048	249	18536		
80	896	165	4120	250	18864		
81	912	166	4200	251	19208		
82	928	167	4272	252	19552		
83	952	168	4352	253	19904		
84	968	169	4432	254	20264		
85	984	170	4512	255	20632		

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off

User Equipment:

UE in idle mode

The following parameters are specific for this test case:

Common for all UE categories:

Parameter	Value
MAC-ehs receiver window size	16
Number of HARQ processes	1
Number of reordering queues	1

UE Category 1 to 4:

Parameter	Value
RLC Transmission window size	128
RLC Receiving window size	512

UE Category 5 and 6:

Parameter	Value
RLC Transmission window size	256
RLC Receiving window size	512

UE Category 7 and 8:

Parameter	Value
RLC Transmission window size	512
RLC Receiving window size	1536

UE Category 9 and 10:

Parameter	Value
RLC Transmission window size	512
RLC Receiving window size	2047

UE Category 11 and 12:

Parameter	Value
RLC Transmission window size	128
RLC Receiving window size	1024

UE Category 13 to 20:

Parameter	Value
RLC Transmission window size	512
RLC Receiving window size	2047

Test procedure

a) The SS establishes the reference radio bearer configuration "Interactive or background / UL:64 DL: [max bit rate depending on UE category] / PS RAB + UL:3.4 DL:3.4 kbps SRBs for DCCH" using enhanced Layer 2 configuration with Flexible RLC and MAC-ehs (Alt 3) as specified in TS 34.108, clause 6.10.2.4.5.1. See note 1.

b) The SS closes the test loop using UE test loop mode 1 setting the UL RLC SDU size parameter to 39 octets (312 bits).

c) The SS sets M= modulation scheme as specified in the test case.

d) The SS sets $N_{\underline{codes}}$ = 1.

e) The SS sets k_{0i} to the value according to table 7.1.5a.5.3 based on the actual value of M and $N_{\underline{codes}}$.

f) The SS sets the test parameter k_i to 0.

g) The SS calculates the index value k_t (=$k_i + k_{0,I}$) and look up the transport block size, TB_{size}, for the actual k_t in table 7.1.5a.5.4.

If TB_{size} is bigger than the UE capability for "Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI" then SS continues with step n) else step h). See note 2.

h) The SS calculates the coding rate using $Coding\_rate = (TB_{size} + N_{CRC}) / (N_{codes} \cdot N_{phy\_bits})$.

If *Coding_rate* falls within any of the ranges defined in table 14.1.3.2.1b then SS continues with step m), else proceed with step i). See note 4.

i) If the transport block size TB_{size} is >12040 bits the SS creates 4 DL RLC SDUs of size 8*FLOOR ((TB_{size} – 136 bit)/32) (largest possible RLC SDU size considering octet alignment and MAC-ehs and minimum RLC AM headers). If the transport block size TB_{size} is ≤ 12040 bits the SS creates 1 DL RLC SDUs of size 8*FLOOR((TB_{size} – 40 bit)/8). The SS creates a DL RLC PDU for each DL RLC SDU using the special value of HE field ('10') in the RLC PDU header. See note 3.

j) Void

k) The SS configures the HARQ transmission parameters according to TS 34.108 [9], table 6.1.5.1 based on the actual value of *M*. Then the SS transmits all the DL RLC PDUs generated in step i) concatenated into a MAC-ehs PDU.

l) The SS checks that the UE returned RLC SDUs has the same content as the first 312 bits of the test data sent by the SS in downlink for DL RLC SDU size greater than or equal to 312 bits. If the downlink RLC SDU size is less than 312 bits then the UE shall return 4 RLC SDUs where the first bits of each SDU has the same content as the RLC SDUs sent by the SS in downlink.

m) The SS increments the test parameter k_i by 1.

For UE category 13: if M=64QAM and *ki* is larger than 52 then SS continues with step n).

If k_i is less than 63 then SS repeats steps g) to m) else SS continues with step n).

n) The SS increments the test parameter N_{codes} *by 1*. If N_{codes} is less or equal to the UE capability for *"Maximum number of HS-DSCH codes received"* then the SS repeats test steps e) to n) else continue with step o). See note 2.

o) The SS opens the UE test loop.

p) The SS release the radio bearer.

q) The SS may optionally deactivate the radio bearer test mode.

NOTE 1: The SS configures the physical channel parameters according to the actual UE category under test.

NOTE 2: See table 14.1.3.1.1 in section 14.1.3.1 for FDD HS-DSCH physical layer and RLC and MAC-ehs capability parameters and there values for different UE FDD HS-DSCH physical layer categories (UE categories). The capability parameters having impact on the test procedure are: "Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI" *and "Maximum number of HS-DSCH codes received"*.

NOTE 3: The test data for DTCHs mapped on HS-DSCH is divided into 4 RLC SDUs to keep the maximum SDU size below or equal to 1500 octets (1500 octets is the limit of QoS parameter "Max SDU size" in SM). To allow for testing of the smallest TB sizes a single RLC PDU is used when the TB size is equal or below 12040 bits to reduce the L2 header overhead. 12040 bits corresponds to maximum RLC SDU size of 1500 octets (12000 bits) plus MAC-ehs header size of 24 bits and AMD PDU header size (16 bits).

NOTE 4: See table 14.1.3.2.1b in section 14.1.3.2.1b for those values of coding rate that must be avoided because of turbo coder irregularities.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	<--		SYSTEM INFORMATION (BCCH)	Broadcast
2	<--		PAGING TYPE 1 (PCCH)	Paging (PS domain, P-TMSI)
3	-->		RRC CONNECTION REQUEST (CCCH)	RRC
4	<--		RRC CONNECTION SETUP (CCCH)	RRC
5	-->		RRC CONNECTION SETUP COMPLETE (DCCH)	RRC
6	-->		SERVICE REQUEST (DCCH)	GMM
7	<--		SECURITY MODE COMMAND	RRC see note 1
8	-->		SECURITY MODE COMPLETE	RRC see note 1
9	<--		ACTIVATE RB TEST MODE (DCCH)	TC
10	-->		ACTIVATE RB TEST MODE COMPLETE (DCCH)	TC
11	<--		RADIO BEARER SETUP (DCCH)	RRC. For the PS radio bearer the 'pdcp info' IE shall be omitted.
12	-->		RADIO BEARER SETUP COMPLETE (DCCH)	RRC
13	<--		CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 RLC SDU size is set to 39 octets
14	-->		CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
15	SS			The SS calculates test data for the first TFRC (TFRI,N_{codes} and *M*).
16	<--		DOWNLINK MAC-hs PDU	Send test data. The MAC-hs PDU contains one or 4 RLC SDUs depending on TB size to be tested
17	-->		UPLINK RLC SDUs	The SS checks that the content of the received UL RLC SDUs are correct
18	SS			The SS calculates test data for next TFRC and repeat steps 16 to 18 until all TFRCs have been tested.
19	<--		OPEN UE TEST LOOP (DCCH)	TC
20	-->		OPEN UE TEST LOOP COMPLETE (DCCH)	TC
21			RB RELEASE	RRC
22	<--		DEACTIVATE RB TEST MODE	TC Optional step
23	-->		DEACTIVATE RB TEST MODE COMPLETE	TC Optional step
Note 1: In addition to activate integrity protection Step 6 and Step 7 are inserted in order to stop T3317 timer in the UE, which starts after transmitting SERVICE REQUEST message.				

7.1.5a.5.2 MAC-ehs transport block size selection / QPSK and 16QAM

7.1.5a.5.2.1 Definition and applicability

All UEs which support FDD, HS-PDSCH and MAC-ehs.

7.1.5a.5.2.2 Conformance requirement

For all transmissions of a transport block, the transport block size is derived from the TFRI value as specified below, except only in those cases of retransmissions where the Node-B selects a combination for which no mapping exists between the original transport block size and the selected combination of channelisation Code set and modulation type. In such cases, the transport block size index value signalled to the UE shall be set to 111111, i.e., k_i=63.

Let k_i be the TFRI signalled on the HS-SCCH value and let $k_{0,i}$ be the value in table 7.1.5a.5.1 or table 7.1.5a.5.2.2 (as configured by higher layers) corresponding to the modulation and the number of codes signalled on the HS-SCCH. Let k_t be the sum of the two values: $k_t = k_i + k_{0,i}$. The transport block size $L(k_t)$ can be obtained by accessing the position k_t in one of the tables in Annex A (normative) or by using one of the corresponding formulas below (informative).

The use of table 7.1.5a.5.2.2 requires MAC-ehs.

Formula corresponding to table 7.1.5a.5.2.1:

If $k_t < 40$

$$L(k_t) = 125 + 12 \cdot k_t$$

else

$$L(k_t) = \left\lfloor L_{\min} p^{k_t} \right\rfloor$$
$$p = 2085/2048$$
$$L_{\min} = 296$$

end

Table 7.1.5a.5.2.1: Table 0 of values of $k_{0,i}$ for different numbers of channelization codes and modulation schemes (QPSK and 16QAM)

Combination *i*	Modulation scheme	Number of channelization codes	$k_{0,i}$
0	QPSK	1	1
1		2	40
2		3	63
3		4	79
4		5	92
5		6	102
6		7	111
7		8	118
8		9	125
9		10	131
10		11	136
11		12	141
12		13	145
13		14	150
14		15	153
15	16QAM	1	40
16		2	79
17		3	102
18		4	118
19		5	131
20		6	141
21		7	150
22		8	157
23		9	164
24		10	169
25		11	175
26		12	180
27		13	184
28		14	188
29		15	192

NOTE: Some UE categories are only required to support values of K_i up to the value of 52, as described in [23].

Formula corresponding to table 7.1.5a.5.2.2:

If $k_t < 40$

$$L(k_t) = (14 + k_t) * 8$$

else

$$L(k_t) = \lfloor L_{\min} p^{k_t} \rfloor * 8$$

$$p = \left(\frac{5274}{27} \right)^{\frac{1}{296-1}}$$

$$L_{\min} = 27$$

end

Table 7.1.5a.5.2.2: Table 1 of values of $k_{0,i}$ for different numbers of channelization codes and modulation schemes (QPSK, 16QAM and 64QAM)

Combination *i*	Modulation scheme	Number of channelization codes	$k_{0,i}$
0	QPSK	1	1
1		2	58
2		3	81
3		4	97
4		5	109
5		6	119
6		7	128
7		8	136
8		9	142
9		10	148
10		11	153
11		12	158
12		13	163
13		14	167
14		15	171
15	16QAM	1	58
16		2	97
17		3	119
18		4	136
19		5	148
20		6	158
21		7	167
22		8	174
23		9	181
24		10	187
25		11	192
26		12	197
27		13	201
28		14	206
29		15	209
30	64QAM	1	81
31		2	119
32		3	142
33		4	158
34		5	171
35		6	181
36		7	190
37		8	197
38		9	204
39		10	209
40		11	215
41		12	220
42		13	224
43		14	228
44		15	233

NOTE: Some UE categories are only required to support values of K_i up to the value of 52, as described in 3GPP TS 25.306 .

……

The following table provides the mapping between k_t (as per the definition above) and the HS-DSCH Transport Block Size (L(k_t)) corresponding to table 7.1.5a.5.2.1:

Index	TB Size	Index	TB Size	Index	TB Size
1	137	86	1380	171	6324
2	149	87	1405	172	6438
3	161	88	1430	173	6554
4	173	89	1456	174	6673
5	185	90	1483	175	6793
6	197	91	1509	176	6916
7	209	92	1537	177	7041
8	221	93	1564	178	7168
9	233	94	1593	179	7298
10	245	95	1621	180	7430
11	257	96	1651	181	7564
12	269	97	1681	182	7700
13	281	98	1711	183	7840
14	293	99	1742	184	7981
15	305	100	1773	185	8125
16	317	101	1805	186	8272
17	329	102	1838	187	8422
18	341	103	1871	188	8574
19	353	104	1905	189	8729
20	365	105	1939	190	8886
21	377	106	1974	191	9047
22	389	107	2010	192	9210
23	401	108	2046	193	9377
24	413	109	2083	194	9546
25	425	110	2121	195	9719
26	437	111	2159	196	9894
27	449	112	2198	197	10073
28	461	113	2238	198	10255
29	473	114	2279	199	10440
30	485	115	2320	200	10629
31	497	116	2362	201	10821
32	509	117	2404	202	11017
33	521	118	2448	203	11216
34	533	119	2492	204	11418
35	545	120	2537	205	11625
36	557	121	2583	206	11835
37	569	122	2630	207	12048
38	581	123	2677	208	12266
39	593	124	2726	209	12488
40	605	125	2775	210	12713
41	616	126	2825	211	12943
42	627	127	2876	212	13177
43	639	128	2928	213	13415
44	650	129	2981	214	13657
45	662	130	3035	215	13904
46	674	131	3090	216	14155
47	686	132	3145	217	14411
48	699	133	3202	218	14671
49	711	134	3260	219	14936
50	724	135	3319	220	15206
51	737	136	3379	221	15481
52	751	137	3440	222	15761

53	764	138	3502	223	16045
54	778	139	3565	224	16335
55	792	140	3630	225	16630
56	806	141	3695	226	16931
57	821	142	3762	227	17237
58	836	143	3830	228	17548
59	851	144	3899	229	17865
60	866	145	3970	230	18188
61	882	146	4042	231	18517
62	898	147	4115	232	18851
63	914	148	4189	233	19192
64	931	149	4265	234	19538
65	947	150	4342	235	19891
66	964	151	4420	236	20251
67	982	152	4500	237	20617
68	1000	153	4581	238	20989
69	1018	154	4664	239	21368
70	1036	155	4748	240	21754
71	1055	156	4834	241	22147
72	1074	157	4921	242	22548
73	1093	158	5010	243	22955
74	1113	159	5101	244	23370
75	1133	160	5193	245	23792
76	1154	161	5287	246	24222
77	1175	162	5382	247	24659
78	1196	163	5480	248	25105
79	1217	164	5579	249	25558
80	1239	165	5680	250	26020
81	1262	166	5782	251	26490
82	1285	167	5887	252	26969
83	1308	168	5993	253	27456
84	1331	169	6101	254	27952
85	1356	170	6211		

The following table provides the mapping between k_t (as per the definition above) and the HS-DSCH Transport Block Size (L(k_t)) corresponding to table in table 7.1.5a.5.2.2:

Index	TB Size	Index	TB Size	Index	TB Size	Index	TB Size
1	120	86	1000	171	4592	256	21000
2	128	87	1016	172	4672	257	21384
3	136	88	1040	173	4760	258	21768
4	144	89	1056	174	4848	259	22160
5	152	90	1072	175	4936	260	22560
6	160	91	1096	176	5024	261	22968
7	168	92	1112	177	5112	262	23384
8	176	93	1136	178	5208	263	23808
9	184	94	1152	179	5296	264	24232
10	192	95	1176	180	5392	265	24672
11	200	96	1200	181	5488	266	25120
12	208	97	1216	182	5592	267	25568
13	216	98	1240	183	5688	268	26032
14	224	99	1264	184	5792	269	26504
15	232	100	1288	185	5896	270	26976
16	240	101	1312	186	6008	271	27464
17	248	102	1336	187	6112	272	27960
18	256	103	1360	188	6224	273	28464
19	264	104	1384	189	6336	274	28976
20	272	105	1408	190	6448	275	29504
21	280	106	1432	191	6568	276	30032
22	288	107	1456	192	6688	277	30576
23	296	108	1488	193	6808	278	31128
24	304	109	1512	194	6928	279	31688
25	312	110	1536	195	7056	280	32264
26	320	111	1568	196	7184	281	32848
27	328	112	1600	197	7312	282	33440
28	336	113	1624	198	7440	283	34040
29	344	114	1656	199	7576	284	34656
30	352	115	1688	200	7712	285	35280
31	360	116	1712	201	7856	286	35920
32	368	117	1744	202	7992	287	36568
33	376	118	1776	203	8136	288	37224
34	384	119	1808	204	8288	289	37896
35	392	120	1840	205	8440	290	38576
36	400	121	1872	206	8592	291	39272
37	408	122	1912	207	8744	292	39984
38	416	123	1944	208	8904	293	40704
39	424	124	1976	209	9064	294	41440
40	440	125	2016	210	9224	295	42192
41	448	126	2048	211	9392		
42	456	127	2088	212	9560		
43	464	128	2128	213	9736		
44	472	129	2168	214	9912		
45	480	130	2200	215	10088		
46	488	131	2240	216	10272		
47	496	132	2288	217	10456		
48	504	133	2328	218	10648		
49	512	134	2368	219	10840		
50	528	135	2408	220	11032		

51	536	136	2456	221	11232		
52	544	137	2496	222	11432		
53	552	138	2544	223	11640		
54	560	139	2592	224	11848		
55	576	140	2632	225	12064		
56	584	141	2680	226	12280		
57	592	142	2736	227	12504		
58	608	143	2784	228	12728		
59	616	144	2832	229	12960		
60	624	145	2880	230	13192		
61	640	146	2936	231	13432		
62	648	147	2984	232	13672		
63	664	148	3040	233	13920		
64	672	149	3096	234	14168		
65	688	150	3152	235	14424		
66	696	151	3208	236	14688		
67	712	152	3264	237	14952		
68	728	153	3328	238	15224		
69	736	154	3384	239	15496		
70	752	155	3448	240	15776		
71	768	156	3512	241	16064		
72	776	157	3576	242	16352		
73	792	158	3640	243	16648		
74	808	159	3704	244	16944		
75	824	160	3768	245	17256		
76	840	161	3840	246	17568		
77	848	162	3912	247	17880		
78	864	163	3976	248	18200		
79	880	164	4048	249	18536		
80	896	165	4120	250	18864		
81	912	166	4200	251	19208		
82	928	167	4272	252	19552		
83	952	168	4352	253	19904		
84	968	169	4432	254	20264		
85	984	170	4512	255	20632		

Reference(s)

3GPP TS 25.321, 9.2.3.1 and Annex A

7.1.5a.5.2.3 Test purpose

To verify that the UE selects the correct transport block size with MAC-ehs configured based on the TFRI value signalled on the HS-SCCH for the QPSK and 16QAM modulations schemes.

7.1.5a.5.2.4 Method of test

The test procedure in clause 7.1.5a.5.1 is executed twice.

Execution counter	Downlink Modulation Scheme (M)
1	QPSK
2	16QAM

7.1.5a.5.2.5 Test requirements

For execution counter 1 and 2; and for each TFRC the UE shall return a UL RLC SDUs with the same content as the first 312 bits of the test data sent by the SS in downlink for DL RLC SDU size greater than or equal to 312 bits. If the downlink RLC SDU size is less than 312 bits then the UE shall return 4 RLC SDUs where the first bits of each SDU has the same content as the RLC SDUs sent by the SS in downlink.

7.1.5a.5.3 MAC-ehs transport block size selection / 64QAM

7.1.5a.5.3.1 Definition and applicability

All UEs which support FDD, HS-PDSCH, MAC-ehs and 64QAM.

7.1.5a.5.3.2 Conformance requirement

See 7.1.5a.2.2

7.1.5a.5.3.3 Test purpose

To verify that the UE selects the correct transport block size with MAC-ehs configured based on the TFRI value signalled on the HS-SCCH for the 64QAM modulations scheme case.

7.1.5a.5.3.4 Method of test

The test procedure in clause 7.1.5a.5.1 is executed with M=64QAM.

7.1.5a.5.3.5 Test requirements

The UE shall for each TFRC return a UL RLC SDUs with the same content as the first 312 bits of the test data sent by the SS in downlink for DL RLC SDU size greater than or equal to 312 bits. If the downlink RLC SDU size is less than 312 bits then the UE shall return 4 RLC SDUs where the first bits of each SDU has the same content as the RLC SDUs sent by the SS in downlink.

7.1.5a.5.4 MAC-ehs transport block size selection (1.28Mcps TDD)

NOTE: The reference to UE Categories refers to the UE capability as signalled in the Rel-7 IE "HS-DSCH physical layer category extension". This IE corresponds to the HS-DSCH category supported by the UE when MAC-ehs is configured.

7.1.5a.5.4.1 Definition and applicability

All UEs which support 1.28Mcps TDD, HS-PDSCH and MAC-ehs.

7.1.5a.5.4.2 Conformance requirement

When MAC-ehs is used, the octet aligned table of transport block size defined as following shall be used.

NOTE: When in CELL_FACH, CELL_PCH or URA_PCH state with HS-DSCH reception, the octet aligned table of transport block size for the HS-DSCH physical layer category 9 shall be used.

If k is the signalled TFRI value then the corresponding HS-DSCH transport block size Lk is given by:

If k = 1..62

$$L_k = \lfloor L_{\min} p^{k-1} \rfloor * 8$$

where

$$p = \left(\frac{348}{30}\right)^{\frac{1}{63-1}}$$ if the HS-DSCH physical layer category is between 1 and 3 inclusively,

$$p = \left(\frac{700}{30}\right)^{\frac{1}{63-1}}$$ if the HS-DSCH physical layer category is between 4 and 6 inclusively,

$$p = \left(\frac{1052}{30}\right)^{\frac{1}{63-1}}$$ if the HS-DSCH physical layer category is between 7 and 9 inclusively,

$p = \left(\frac{1403}{30}\right)^{\frac{1}{63-1}}$ if the HS-DSCH physical layer category is between 10 and 12 inclusively,

$p = \left(\frac{1755}{30}\right)^{\frac{1}{63-1}}$ if the HS-DSCH physical layer category is between 13 and 15 inclusively,

$p = \left(\frac{1579}{30}\right)^{\frac{1}{63-1}}$ if the HS-DSCH physical layer category is between 16 and 18 inclusively,

$p = \left(\frac{2107}{30}\right)^{\frac{1}{63-1}}$ if the HS-DSCH physical layer category is between 19 and 21 inclusively,

$p = \left(\frac{2634}{30}\right)^{\frac{1}{63-1}}$ if the HS-DSCH physical layer category is between 22 and 24 inclusively,

and

$$L_{\min} = 30$$

If $k = 63$ then,

L_k = 2784 if the HS-DSCH physical layer category is between 1 and 3 inclusively,

5600 if the HS-DSCH physical layer category is between 4 and 6 inclusively,

8416 if the HS-DSCH physical layer category is between 7 and 9 inclusively,

11224 if the HS-DSCH physical layer category is between 10 and 12 inclusively,

14040 if the HS-DSCH physical layer category is between 13 and 15 inclusively,

12632 if the HS-DSCH physical layer category is between 16 and 18 inclusively,

16856 if the HS-DSCH physical layer category is between 19 and 21 inclusively,

21072 if the HS-DSCH physical layer category is between 22 and 24 inclusively.

If k=0, L_k indicates NULL and shall not be used to signal a transport block size in the TFRI.

Transport block sizes calculated by this formula shall equal the values indicated in the following tables:

Table 7.1.5a.5.4.1: HSDPA Transport Block Sizes for 1.28 Mcps TDD, for HS-DSCH physical layer category [1, 3], octet aligned

TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]
0	NULL	16	432	32	816	48	1536
1	240	17	448	33	848	49	1600
2	248	18	464	34	880	50	1664
3	256	19	488	35	920	51	1728
4	264	20	504	36	952	52	1800
5	280	21	528	37	992	53	1872
6	288	22	544	38	1032	54	1944
7	304	23	568	39	1072	55	2024
8	312	24	592	40	1120	56	2104
9	328	25	616	41	1160	57	2192
10	336	26	640	42	1208	58	2280
11	352	27	664	43	1256	59	2376

12	368	28	696	44	1312	60	2472
13	384	29	720	45	1360	61	2568
14	400	30	752	46	1416	62	2672
15	416	31	784	47	1472	63	2784

Table 7.1.5a.5.4.2: HSDPA Transport Block Sizes for 1.28 Mcps TDD, for HS-DSCH physical layer category [4, 6], octet aligned

TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]
0	NULL	16	512	32	1152	48	2608
1	240	17	536	33	1216	49	2744
2	248	18	568	34	1280	50	2888
3	264	19	592	35	1344	51	3040
4	272	20	624	36	1416	52	3200
5	288	21	656	37	1488	53	3368
6	304	22	696	38	1568	54	3544
7	320	23	728	39	1648	55	3728
8	336	24	768	40	1736	56	3920
9	360	25	808	41	1824	57	4128
10	376	26	848	42	1920	58	4336
11	392	27	896	43	2024	59	4568
12	416	28	944	44	2128	60	4808
13	440	29	992	45	2240	61	5056
14	464	30	1040	46	2360	62	5320
15	488	31	1096	47	2480	63	5600

Table 7.1.5a.5.4.3: HSDPA Transport Block Sizes for 1.28 Mcps TDD, for HS-DSCH physical layer category [7, 9], octet aligned

TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]
0	NULL	16	560	32	1416	48	3552
1	240	17	600	33	1504	49	3768
2	248	18	632	34	1592	50	3984
3	264	19	672	35	1688	51	4224
4	280	20	712	36	1784	52	4472
5	296	21	752	37	1888	53	4736
6	312	22	800	38	2000	54	5016
7	336	23	848	39	2120	55	5312
8	352	24	896	40	2248	56	5632
9	376	25	944	41	2376	57	5960
10	400	26	1000	42	2520	58	6312
11	424	27	1064	43	2664	59	6688
12	448	28	1128	44	2824	60	7080
13	472	29	1192	45	2992	61	7496
14	504	30	1264	46	3168	62	7944
15	528	31	1336	47	3360	63	8416

Table 7.1.5a.5.4.4: HSDPA Transport Block Sizes for 1.28 Mcps TDD, for HS-DSCH physical layer category [10, 12], octet aligned

TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]
0	NULL	16	608	32	1640	48	4424
1	240	17	640	33	1744	49	4704
2	248	18	688	34	1856	50	5008
3	264	19	728	35	1976	51	5328
4	288	20	776	36	2096	52	5672
5	304	21	824	37	2232	53	6032
6	320	22	880	38	2376	54	6416
7	344	23	936	39	2528	55	6832
8	368	24	992	40	2688	56	7264
9	392	25	1056	41	2864	57	7736
10	416	26	1128	42	3048	58	8224
11	440	27	1200	43	3240	59	8752
12	472	28	1280	44	3448	60	9312
13	504	29	1360	45	3672	61	9912
14	536	30	1448	46	3904	62	10544
15	568	31	1536	47	4160	63	11224

Table 7.1.5a.5.4.5 : HSDPA Transport Block Sizes for 1.28 Mcps TDD, for HS-DSCH physical layer category [13,15], octet aligned

TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]
0	NULL	16	640	32	1832	48	5240
1	240	17	680	33	1960	49	5600
2	256	18	728	34	2088	50	5976
3	272	19	776	35	2232	51	6384
4	288	20	832	36	2384	52	6816
5	312	21	888	37	2544	53	7280
6	328	22	952	38	2720	54	7776
7	352	23	1016	39	2904	55	8304
8	376	24	1080	40	3096	56	8864
9	400	25	1152	41	3312	57	9464
10	432	26	1232	42	3536	58	10112
11	456	27	1320	43	3776	59	10792
12	488	28	1408	44	4032	60	11528
13	520	29	1504	45	4304	61	12312
14	560	30	1608	46	4600	62	13144
15	600	31	1712	47	4912	63	14040

Table 7.1.5a.5.4.6: HSDPA Transport Block Sizes for 1.28 Mcps TDD, for HS-DSCH physical layer category [16,18], octet aligned

TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]
0	NULL	16	624	32	1736	48	4840
1	240	17	664	33	1856	49	5160
2	248	18	704	34	1976	50	5496
3	272	19	752	35	2104	51	5864
4	288	20	808	36	2248	52	6248
5	304	21	856	37	2392	53	6664
6	328	22	912	38	2552	54	7104
7	352	23	976	39	2720	55	7568
8	368	24	1040	40	2896	56	8072
9	400	25	1112	41	3088	57	8600
10	424	26	1184	42	3296	58	9176
11	448	27	1264	43	3512	59	9776
12	480	28	1344	44	3744	60	10424
13	512	29	1432	45	3992	61	11112
14	544	30	1528	46	4256	62	11848
15	584	31	1632	47	4536	63	12632

Table 7.1.5a.5.4.7: HSDPA Transport Block Sizes for 1.28 Mcps TDD, for HS-DSCH physical layer category [19,21], octet aligned

TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]
0	NULL	16	664	32	2008	48	6024
1	240	17	712	33	2152	49	6448
2	256	18	768	34	2304	50	6904
3	272	19	824	35	2464	51	7400
4	288	20	880	36	2640	52	7920
5	312	21	944	37	2832	53	8488
6	336	22	1008	38	3032	54	9088
7	360	23	1080	39	3248	55	9736
8	384	24	1160	40	3480	56	10424
9	408	25	1240	41	3728	57	11168
10	440	26	1328	42	3992	58	11960
11	472	27	1424	43	4272	59	12808
12	504	28	1528	44	4576	60	13720
13	544	29	1632	45	4904	61	14688
14	584	30	1752	46	5248	62	15736
15	624	31	1872	47	5624	63	16856

Table 7.1.5a.5.4.8: HSDPA Transport Block Sizes for 1.28 Mcps TDD, for HS-DSCH physical layer category [22,24], octet aligned

TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]	TB index (k)	TB size [bits]
0	NULL	16	704	32	2248	48	7136
1	240	17	760	33	2416	49	7664
2	256	18	816	34	2592	50	8240
3	272	19	872	35	2792	51	8856
4	296	20	944	36	3000	52	9520
5	320	21	1016	37	3224	53	10232
6	344	22	1088	38	3464	54	11000
7	368	23	1168	39	3720	55	11824
8	392	24	1256	40	4000	56	12712
9	424	25	1352	41	4304	57	13664
10	456	26	1456	42	4624	58	14688
11	488	27	1560	43	4968	59	15784
12	528	28	1680	44	5344	60	16968
13	568	29	1808	45	5744	61	18232
14	608	30	1944	46	6176	62	19600
15	656	31	2088	47	6632	63	21072

Reference(s)

3GPP TS 25.321, 9.2.3.3

7.1.5a.5.4.3 Test purpose

To verify that the UE selects the correct transport block size with MAC-ehs configured based on the TFRI value signalled on the HS-SCCH.

7.1.5a.5.4.4 Method of test

Definition of test variables:

N_{slots}	Number of HS-DSCH slots (1- 6 dependent on UE category)
N_{codes}	Number of HS-DSCH codes per timeslot, 1 to 16
k	TFRI signalled on the HS-SCCH value (see Table 7.1.5a.5.4.x)
TB_{size}	Transport Block size (see Table 7.1.5a.5.4.x)
N_{PDUs}	Number of MAC-d PDUs
MAC-hs_header_size	MAC-hs header size for the reference HS-DSCH radio bearer configuration under test.
MAC-d_PDU_size	MAC-d PDU size for the reference HS-DSCH radio bearer configuration under test.

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off

User Equipment:

UE in idle mode

The following parameters are specific for this test case:

Common for all UE categories:

Parameter	Value
MAC-d PDU size	336 bits
MAC-hs receiver window size	16
Number of HARQ processes	1
Number of reordering queues	1

UE Category 1 to 3:

Parameter	Value
RLC Transmission window size	128
RLC Receiving window size	512

UE Category 4 to 6

Parameter	Value
RLC Transmission window size	256
RLC Receiving window size	512

UE Category 7 to 9:

Parameter	Value
RLC Transmission window size	512
RLC Receiving window size	1536

UE Category 10 to 12:

Parameter	Value
RLC Transmission window size	512
RLC Receiving window size	1536

UE Category 13 to 15:

Parameter	Value
RLC Transmission window size	512
RLC Receiving window size	1536

UE Category 16 to 24:

Parameter	Value
RLC Transmission window size	512
RLC Receiving window size	2047

The test procedure in clause 7.1.5.6a is executed.

7.1.5a.5.4.5 Test requirements

For each TFRC the UE shall return a UL RLC SDUs with the same content as the first 312 bits of the test data sent by the SS in downlink for DL RLC SDU size greater than or equal to 312 bits. If the downlink RLC SDU size is less than 312 bits then the UE shall return 4 RLC SDUs where the first bits of each SDU has the same content as the RLC SDUs sent by the SS in downlink.

7.1.5a.6 UE Identification on HS-PDSCH in CELL_FACH

7.1.5a.6.1 Definition and applicability

All UEs which support FDD or 1.28 Mcps TDD and HS-PDSCH in CELL_FACH.

7.1.5a.6.2 Conformance requirement

In FDD and 1.28 Mcps TDD, the MAC PDU header for DTCH and DCCH mapped on HS-DSCH CELL_FACH, CELL_PCH state is as shown in figure 9.2.1.1c-1.

- there is no MAC-d header included for DTCH and DCCH.
- there is no MAC-c header included for DTCH and DCCH when UE dedicated H-RNTI is used.

Whenever the variable HS_DSCH_RECEPTION_CELL_FACH_STATE is set to TRUE, the UE shall:

1> set the variable HS_DSCH_RECEPTION_GENERAL to TRUE;

1> use the IE "HS-DSCH common system information" in System Information Block type 5 or System Information Block type 5bis;

1> for FDD, receive the HS-SCCH(s) according to the IE "HS-SCCH channelisation code" on the serving cell applying the scrambling code as received in the IE "DL Scrambling code" as received in IE "HS-DSCH common system information";

1> for 1.28 Mcps TDD, receive the HS-SCCH(s) according to the stored HS-SCCH configuration, applying the HS-PDSCH midamble code according to the stored HS-PDSCH midamble configuration;

1> perform HS-DSCH reception procedures:

2> if the UE has a stored IE "HARQ info":

3> act on subclause 8.6.5.6b for the stored IE "HARQ info".

2> else:

3> act on subclause 8.6.5.20 for the IE "HARQ System info" as received in IE "HS-DSCH common system information".

2> and use the value of the variable H_RNTI as UE identity in the HS-SCCH reception procedure in the physical layer.

When the variable HS_DSCH_RECEPTION_CELL_FACH_STATE is set to TRUE the UE shall:

1> use the value of the variable H_RNTI as UE identity in the HS-SCCH reception procedure in the physical layer.

3GPP TS 25.321 clause 9.2.1.1c

3GPP TS 25.331 clauses 8.5.36, 8.6.3.1b

7.1.5a.6.3 Test purpose

1. To confirm that the UE can receive data on DCCH (SRB#1) using common H-RNTI in CELL_FACH state.

7.1.5a.6.4 Method of test

Initial Condition

System Simulator: 1 cell

UE: CELL_FACH state as specified in clause 7.4 of TS 34.108, with dedicated H-RNTI assigned. SIB5 uses default message in 34.108 section 6.10b, condition B1, with the exception of the following parameters

Information Element	Value/remark
- HS-DSCH paging system information	Not Present

Related ICS/IXIT statement(s)

- UE supports FDD or 1.28 Mcps TDD
- UE supports HS-PDSCH in CELL_FACH

Test Procedure

The UE is in CELL_FACH state with SRBs mapped to HS-DSCH and RACH. The SS transmits a UE CAPABILITY ENQUIRY message on RB1 over HS-DSCH but with unmatched UE Id on HS-SCCH. The UE does not respond to this. SS transmits a UE CAPABILITY ENQUIRY message on RB2 over HS-DSCH with matched UE Id on HS-SCCH. After receiving the message, the UE shall transmit a UE CAPABILITY INFORMATION message on the uplink DCCH which includes the requested capabilities. The SS transmits a UE CAPABILITY INFORMATION CONFIRM message to the UE to complete the UE capability enquiry procedure.

Expected sequence

Step	Direction		Message	Comment
	UE	SS		
1				The UE is brought to CELL_FACH state with dedicated H-RNTI
2	←		UE CAPABILITY ENQUIRY	Sent on HS-DSCH using UM RLC but sent with unmatched H-RNTI on HS-SCCH. Use default message
3				SS waits 10 seconds and checks that UE does not respond
4	←		UE CAPABILITY ENQUIRY	Sent on HS-DSCH using AM RLC but sent with matched H-RNTI on HS-SCCH. Use default message.
5	→		UE CAPABILITY INFORMATION	Use default message.
6	←		UE CAPABILITY INFORMATION CONFIRM	Use default message. SRB is sent on DCCH using AM RLC.

7.1.5a.6.5 Test requirement

At step 3 the UE shall not respond to the UE CAPABILITY ENQUIRY message sent in step 2.

After step 4, the UE shall transmit a UE CAPABILITY INFORMATION message on the uplink DCCH to respond to the downlink UE CAPABILITY ENQUIRY message with correct contents.

7.1.5a.7 HARQ retransmissions without ACK/NACK signalling in CELL_FACH

7.1.5a.7.1 Definition and applicability

All UEs which support FDD and HS-PDSCH in CELL_FACH.

7.1.5a.7.2 Conformance requirement

The HS-SCCH reception procedure is as defined in subclause 6A.1.1.

If a UE detects that one of the monitored HS-SCCHs carries consistent control information intended for this UE, the UE shall perform the following:

- Start receiving the HS-PDSCHs indicated by this consistent control information
- If the CRC of the HS-SCCH is OK, the transport block size information shall be derived from the signalled TFRI value as defined in [9]. If the 'Hybrid-ARQ process information' is not included in the set configured by upper layers, the UE shall discard the information received on this HS-SCCH and on the HS-PDSCHs.

Unless indicated by higher layers, the UE shall not transmit any HARQ-ACK or CQI information and DTX shall be used on all the HS-DPCCH subframes.

3GPP TS 25.214 clauses 6A.1.1A

7.1.5a.7.3 Test Purpose

To confirm that the UE can perform the HARQ Retransmissions without ACK/NACK Signalling.

7.1.5a.7.4 Method of test

Initial Condition

System Simulator: 1 cell, default parameters, Ciphering Off.

The radio bearer is placed into UE test loop mode 1 and configured to return UL RLC SDUs of the same size as received in DL.

UE: CELL_FACH state as specified in clause 7.4 of TS 34.108, with dedicated H-RNTI. SIB5 uses default message in 34.108 section 6.10b, condition B1, with the exception of the following parameters

Information Element	Value/remark
- HS-DSCH paging system information	Not Present

Related ICS/IXIT statement(s)

- UE supports FDD
- UE supports HS-PDSCH in CELL_FACH

Test Procedure

The UE is in CELL_FACH state and has a radio bearer established which is mapped to HS-DSCH and RACH. The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed with default Radio Bearer according to RB setup (condition A24). With the exception of the following parameters which are specific for this test case:

Parameter	Value
PDCP info	Not Present
Polling info	
- Timer Poll Prohibit	Not Present
- Timer_poll	Not Present

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

In this test procedure each MAC-ehs PDU contains one RLC PDU carrying one SDU of size 39 octets and one length indicator indicating the end of the SDU.

Expected sequence

Step	Direction		Message	Comment
	UE	SS		
1				The UE is in CELL_FACH state with dedicated H-RNTI
2			RB Establishment	See generic procedures
3			Close UE Test Loop	
4	←		MAC-ehs PDU sent	Correct CRC
5	→		RLC Loop Backed PDU	SS validates that UE sends loop backed PDU correctly, while UE does not send HARQ ACK or NACK
6	←		MAC-ehs PDU sent	Erroneous CRC
7				SS checks for 5 sec that UE does not send loop backed PDU. UE does not send HARQ ACK or NACK
8			Open UE Test Loop	See generic procedures
9			RB Release	

Specific Message Contents

None.

7.1.5a.7.5 Test requirement

1. At Step 5, the UE shall loop back the RLC PDU.
2. After Step 6, no data shall be looped back.
3. At Step 5 & 7, the UE shall not send HARQ ACK or NACK.

7.1.5a.8 HARQ retransmissions without ACK/NACK signalling in CELL_FACH when Dedicated H-RNTI is not allocated (1.28 Mcps TDD)

7.1.5a.8.1 Definition and applicability

All UEs which support 1.28Mcps TDD and HS-PDSCH in CELL_FACH.

7.1.5a.8.2 Conformance requirement

If the UE is configured without dedicated UE identity, the UE shall not transmit an HS-SICH. If the UE is configured with a dedicated UE identity, but the HS-SCCH is an uplink synchronization establishment order, then its associated HS-SICH shall not be transmitted. Otherwise, the channel quality indication shall be transmitted on HS-SICH, and the HS-DSCH channel quality indication procedure is the same as that in CELL_DCH state of 1.28Mcps TDD, cf. 5.9.2.

- Schedules new transmissions and retransmissions:
    - When transmitting for a UE in CELL_DCH state the scheduler determines based on the status reports from HARQ Processes if either a new transmission or a retransmission should be made. A new transmission can however be initiated on a HARQ process at any time. Based on a delay attribute provided by upper layers, the scheduler may decide to discard any 'out-of-date' MAC-ehs SDU.
    - In FDD when transmitting for a UE in CELL_FACH state the scheduler determines based on RRM and IE "Transmitted Power Level" received on Iub FP the number of retransmission that should be made after new transmission. If HARQ feedback is configured, the scheduler may stop retransmission based on the status reports from HARQ processes. A new transmission can however be initiated on a HARQ process at any time. Based on a delay attribute provided by upper layers, the scheduler may decide to discard any 'out-of-date' MAC-ehs SDU.
    - In 1.28Mcps TDD, when transmitting CCCH or DCCH with common H-RNTI for a UE in CELL_FACH state the scheduler determines based on RRM and IE "Transmitted Power Level" received on Iub FP the

number of retransmission that should be made after new transmission. Based on a delay attribute provided by upper layers, the scheduler may decide to discard any 'out-of-date' MAC-ehs SDU.

References(s)

3GPP TS 25.224 clauses 5.9A.2, 3GPP TS 25.321 clauses 11.6.3.1

7.1.5a.8.3 Test Purpose

To confirm that the UE can perform the HARQ Retransmissions without ACK/NACK Signalling in CELL_FACH when Dedicated H-RNTI is not allocated.

7.1.5a.8.4 Method of test

Initial Condition

System Simulator: 1 cell, default parameters, Ciphering Off.

The radio bearer is placed into UE test loop mode 1 and configured to return UL RLC SDUs of the same size as received in DL.

UE: CELL_FACH state as specified in clause 7.4 of TS 34.108, with dedicated H-RNTI. SIB5 uses default message in 34.108 section 6.1.0b, condition B1, with the exception of the following parameters

Information Element	Value/remark
- HS-DSCH paging system information	Not Present

Related ICS/IXIT statement(s)

- UE supports 1.28Mcps TDD
- UE supports HS-PDSCH in CELL_FACH

Test Procedure

The UE is in CELL_FACH state and has a radio bearer established which is mapped to HS-DSCH and E-DCH. The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed with default Radio Bearer according to RB setup (condition A18). With the exception of the following parameters which are specific for this test case:

Parameter	Value
Polling info	
- Timer Poll Prohibit	Not Present
- Timer_poll	Not Present

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

In this test procedure each MAC-ehs PDU contains one RLC PDU carrying one SDU of size 39 octets and one length indicator indicating the end of the SDU.

Expected sequence

Step	Direction		Message	Comment
	UE	SS		
1				The UE is in CELL_FACH state without dedicated H-RNTI
2			RB Establishment	See generic procedures
3			Close UE Test Loop	
4	←		MAC-ehs PDU sent	Erroneous CRC
5				SS checks for 5 sec that UE does not send loop backed PDU. UE does not send HARQ ACK or NACK
6	←		MAC-ehs PDU sent	Correct CRC
7	→		RLC Loop Backed PDU	SS validates that UE sends loop backed PDU correctly, while UE does not send HARQ ACK or NACK
8			Open UE Test Loop	See generic procedures
9			RB Release	

Specific Message Contents

None.

7.1.5a.8.5 Test requirement

1. At step 4, SS sends a MAC-ehs PDU with erroneous CRC.
2. At step 6, SS sends a MAC-ehs PDU with correct CRC.
3. At step 7, SS receives the loop backed PDU.

7.1.5a.9 HARQ retransmissions with ACK/NACK signalling in CELL_FACH when Dedicated H-RNTI is allocated (1.28 Mcps TDD)

7.1.5a.9.1 Definition and applicability

All UEs which support 1.28Mcps TDD and HS-PDSCH in CELL_FACH.

7.1.5a.9.2 Conformance requirement

If the UE is configured without dedicated UE identity, the UE shall not transmit an HS-SICH. If the UE is configured with a dedicated UE identity, but the HS-SCCH is an uplink synchronization establishment order, then its associated HS-SICH shall not be transmitted. Otherwise, the channel quality indication shall be transmitted on HS-SICH, and the HS-DSCH channel quality indication procedure is the same as that in CELL_DCH state of 1.28Mcps TDD, cf. 5.9.2.

- Schedules new transmissions and retransmissions:
  - When transmitting for a UE in CELL_DCH state the scheduler determines based on the status reports from HARQ Processes if either a new transmission or a retransmission should be made. A new transmission can however be initiated on a HARQ process at any time. Based on a delay attribute provided by upper layers, the scheduler may decide to discard any 'out-of-date' MAC-ehs SDU.
  - In FDD when transmitting for a UE in CELL_FACH state the scheduler determines based on RRM and IE "Transmitted Power Level" received on Iub FP the number of retransmission that should be made after new transmission. If HARQ feedback is configured, the scheduler may stop retransmission based on the status reports from HARQ processes. A new transmission can however be initiated on a HARQ process at any time. Based on a delay attribute provided by upper layers, the scheduler may decide to discard any 'out-of-date' MAC-ehs SDU.

- In 1.28Mcps TDD, when transmitting CCCH or DCCH with common H-RNTI for a UE in CELL_FACH state the scheduler determines based on RRM and IE "Transmitted Power Level" received on Iub FP the number of retransmission that should be made after new transmission. Based on a delay attribute provided by upper layers, the scheduler may decide to discard any 'out-of-date' MAC-ehs SDU.

- In 1.28Mcps TDD, When transmitting or retransmitting DCCH/DTCH with dedicated H-RNTI for a UE in CELL_FACH state, if In SYNC state is not indicated by physical layer as in [18], then the synchronization Command via HS-SCCH shall be sent to the UE firstly, the transmitting or retransmitting DCCH/DTCH shall not be initiated or resumed until In-SYNC state is detected as in [18]. The scheduler determines based on the status reports from HARQ Processes if either a new transmission or a retransmission should be made. Based on a delay attribute provided by upper layers, the scheduler may decide to discard any 'out-of-date' MAC-ehs SDU.

References(s)

3GPP TS 25.224 clauses 5.9A.2, 3GPP TS 25.321 clauses 11.6.3.1

7.1.5a.9.3 Test Purpose

To confirm that the UE can perform the HARQ Retransmissions with ACK/NACK Signalling in CELL_FACH when Dedicated H-RNTI is allocated.

7.1.5a.9.4 Method of test

Initial Condition

System Simulator: 1 cell, default parameters, Ciphering Off.

The radio bearer is placed into UE test loop mode 1 and configured to return UL RLC SDUs of the same size as received in DL.

UE: CELL_FACH state as specified in clause 7.4 of TS 34.108, with dedicated H-RNTI. SIB5 uses default message in 34.108 section 6.1.0b, condition B1, with the exception of the following parameters

Information Element	Value/remark
- HS-DSCH paging system information	Not Present

Related ICS/IXIT statement(s)

- UE supports 1.28Mcps TDD
- UE supports HS-PDSCH in CELL_FACH

Test Procedure

The UE is in CELL_FACH state and has a radio bearer established which is mapped to HS-DSCH and E-DCH. The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed with default Radio Bearer according to RB setup (condition A18). With the exception of the following parameters which are specific for this test case:

Parameter	Value
Polling info	
- Timer Poll Prohibit	Not Present
- Timer_poll	Not Present

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

In this test procedure each MAC-ehs PDU contains one RLC PDU carrying one SDU of size 39 octets and one length indicator indicating the end of the SDU.

Expected sequence

Step	Direction		Message	Comment
	UE	SS		
1				The UE is in CELL_FACH state with dedicated H-RNTI
2			RB Establishment	See generic procedures
3			Close UE Test Loop	
4	←		MAC-ehs PDU sent	Erroneous CRC
5	→		HS-SICH	UE sends HARQ NACK
6	←		MAC-ehs PDU sent	Correct CRC
7	→		RLC Loop Backed PDU	SS validates that UE sends loop backed PDU correctly, while UE does not send HARQ ACK or NACK
8			Open UE Test Loop	See generic procedures
9			RB Release	

Specific Message Contents

None.

7.1.5a.9.5 Test requirement

1. At step 4, SS sends a MAC-ehs PDU with erroneous CRC.
2. At step 6, SS sends a MAC-ehs PDU with correct CRC.
3. At step 7, SS receives the loop backed PDU.

7.1.5a.10 MAC-ehs data transmission with enhanced TS0 (1.28 Mcps TDD)

7.1.5a.10.1 Definition and applicability

All UEs which support HS-PDSCH and 1.28Mcps TDD and MAC-ehs and enhanced TS0.

7.1.5a.10.2 Conformance requirement

For 1.28 Mcps, the timeslots to be used for HS-PDSCH resources are signalled by the bits $x_{ts,1}, x_{ts,2}, \ldots, x_{ts,5}$, where bit $x_{ts,n}$ carries the information for timeslot n+1. Timeslot 1 cannot be used for HS-DSCH resources. If the signalling bit is set (i.e. equal to 1), then the corresponding timeslot shall be used for HS-PDSCH resources. Otherwise, the timeslot shall not be used. All used timeslots shall use the same channelisation code set, as signalled by the channelisation code set information bits.

When indicated by the higher layer that Timeslot 0 can be used for HS-PDSCH, bit $x_{ts,1}$ carries the information for timeslot 0. If $x_{ts,1}$ is set (i.e. equal to 1), Timeslot 0 shall be used for HS-PDSCH resource. Otherwise, Timeslot 0 shall not be used.

Reference(s)

TS 25.222 clause 4.6.1.2.1

7.1.5a.10.3 Test purpose

To verify that the UE can receive the data transmitted in TS0 with MAC-ehs.

7.1.5a.10.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off cell1 configures 3 carrier frequency, one is primary frequency, other are secondary frequencies. The frequency relation show as below:

Parameter	Cell 1
UTRA RF Channel Number1	Ch. 1
UTRA RF Channel Number2	Ch. 2
UTRA RF Channel Number3	Ch.3

User Equipment:

UE in idle mode

Test procedure

a) The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.5.4.7.6 using condition A11 as specified in clause 9.1 of TS 34.108.

b) The SS closes the test loop using UE test loop mode 1 setting the UL RLC SDU size parameter to 39 octets (312 bits).

c) The SS transmits a MAC-ehs PDU in TS0.

d) The SS checks that the UE returned RLC SDUs has the same content as the first 312 bits of the test data sent by the SS in downlink.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	<--		RADIO BEARER SETUP (DCCH)	RRC. For the PS radio bearer the 'pdcp info' IE shall be omitted.
2	-->		RADIO BEARER SETUP COMPLETE (DCCH)	RRC
3	<--		CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 RLC SDU size is set to 39 octets
4	-->		CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
5	<--		DOWNLINK MAC-ehs PDU	Send test data inTS0
6	-->		UPLINK RLC SDUs	The SS checks that the content of the received UL RLC SDUs are correct

Specific Message Contents

RADIO BEARER SETUP (Step 1)

Use the same message as specified for "Packet to CELL_DCH / E-DCH / HS-DSCH using three multiplexing options (3/3) and SRBs mapped on DCH/DCH" in 34.108 with the following exceptions:

Information Element	Value/remark
Downlink HS-PDSCH Information	Not Present
- CHOICE mode	TDD
- CHOICE *TDD option*	1.28 Mcps
- TS0 Indicator	TRUE
Multi-frequency Info	
- Second Frequency Info	UTRA RF Channel Number2

7.1.5a.10.5 Test requirements

In step6 the UE shall return a UL RLC SDUs with the same content as the first 312 bits of the test data sent by the SS in downlink.

7.1.5b HS-SCCH Less Operation

7.1.5b.1 HARQ procedure for HS-SCCH less operation

7.1.5b.1.1 Definition and applicability

All UEs which support HS-SCCHless HS-DSCH.

7.1.5b.1.2 Conformance requirement

When the HS-SCCH less mode of operation is enabled, the UE shall be able to store 13 TTIs in a cyclic soft buffer.

For each received MAC-hs PDU provided by the lower layers the UE shall:

- If the associated HS-SCCH corresponds to an HS-SCCH less retransmission as defined in subclause 4.6A.2.1.2 of [16]:
  - if the data in the soft buffer identified by the TTI [5*CFN + subframe number - 6 – PTR]**mod** 13 has not been decoded successfully:
    - combine the received data with the data currently in the soft buffer identified by [5*CFN + subframe number - 6 – PTR]**mod** 13 where PTR is the value of the pointer to the previous transmission as defined in subclause 4.6A.2.1.2.1 of [16].
  - If the data in the soft buffer has been successfully decoded and no error was detected;
    - deliver the decoded MAC-hs PDU to the reordering entity;
    - generate a positive acknowledgement (ACK) of the data corresponding to this TTI.
  - else:
    - place the combined data for the HS-SCCH less TTI in the soft buffer identified by [5*CFN + subframe number]**mod** 13, replacing any data previously stored in that buffer.
  - generate a negative acknowledgement (NACK) of the data corresponding to this TTI.
- Else if the associated HS-SCCH corresponds to a HS-SCCH type 1 as defined in subclause 4.6 of [16];
  - process the received MAC-hs PDU provided by the lower layers as per subclause 11.6.2.2.
- Else;
  - If the data has been successfully decoded and no error was detected;
    - deliver the decoded MAC-hs PDU to the reordering entity;
    - generate a positive acknowledgement (ACK) of the data corresponding to this TTI.
  - else
  - place the data for the HS-SCCH less TTI in the soft buffer identified by [5*CFN + subframe number]**mod** 13, replacing any data previously stored in that buffer.

Reference(s)

TS 25.321 clauses 11.6.2.7

7.1.5b.1.3 Test purpose

To verify that

1. UE is able to operate in HS-SCCH less mode of operation..
2. When multiple transport block sizes are configured, UE is able to decode the Transport block correctly on first Transmission.
3. UE is able to combine data in soft buffer and data received and decode combined data.

4. UE does not transmit NACK for HS-SCCH less mode of operation

7.1.5b.1.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration Streaming or interactive or background / UL: [max bit rate depending on UE category and TTI] DL: [max bit rate depending on UE category] / UM PS RAB + UL: [max bit rate depending on UE category and TTI] DL: [max bit rate depending on UE category] SRBs for DCCH on E-DCH and HS-DSCH, as specified in TS 34.108, clause 6.11.4i.1 with the logical channel, MAC-hs queue identity set to:

Logical Channel ID	Mac-hs Queue ID	Comment
7	0	RB5

The following parameters are specific for this test case:

Parameter	Value
DTX_DRX_STATUS	FALSE
HS-SCCH less information	
- HS-PDSCH Code Index	14
- Transport Block Size List	4 elements
- Transport Block Size Index	20 [365, sufficient for one MAC-hs SDU 0f 336 + MAC-hs header of 21]
- HS-PDSCH Second Code Support	FALSE
- Transport Block Size Index	48 [699, sufficient for 2 MAC-hs SDU of 336 + MAC-hs header of 21]
- HS-PDSCH Second Code Support	FALSE
- Transport Block Size Index	70[1036, sufficient for 3 MAC-hs SDU of 336 + MAC-hs header of 21]
- HS-PDSCH Second Code Support	TRUE
- Transport Block Size Index	86 [1380, sufficient for 4 MAC-hs SDU of 336 + MAC-hs header of 21]
- HS-PDSCH Second Code Support	TRUE

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Test procedure

In this test procedure each MAC-hs PDU contains one RLC PDU carrying one SDU of size 39 octets and one length indicator indicating the end of the SDU.

a) The SS transmits a MAC-hs PDU where:

1. The TSN = 0

2. The MAC-hs PDU contains a RLC PDU with SN=0.

Using HS-SCCH less mode of operation.

b) The SS checks that a Positive acknowledgement is received and RLC PDUis loop backed by UE

c) The SS transmits a MAC-hs PDU where:

1. The TSN = 1

2. The MAC-hs PDU contains 2 RLC PDU's with SN=1&2.

3. The physical layer CRC is modified such that the CRC check in the UE will fail

The MAC-hs PDU is transmitted in a CFN, Subframe number such that by [5*CFN + subframe number] **mod** 13 = X, using HS-SCCH less mode of operation.

d) The SS checks that no negative acknowledgement is received and no RLC PDU loop backed by UE

e) The SS re-transmits a MAC-hs PDU with the same content as in step c) but where the CRC is correct, using HS-SCCH Type-2, in next available CFN & subframe satisfying [5*CFN + subframe number - 6 – PTR]**mod** 13=X as in step c.

f) The SS checks that a positive acknowledgement is received and RLC PDU's for SN 1,2 are loop backed by UE.

g) The SS transmits a MAC-hs PDU where:

1. The TSN = 2

2. The MAC-hs PDU contains 3 RLC PDU's with SN=3,4&5.

3. The physical layer CRC is modified such that the CRC check in the UE will fail

The MAC-hs PDU is transmitted in a CFN, Subframe number such that by [5*CFN + subframe number] **mod** 13 = X, using HS-SCCH less mode of operation.

h) The SS checks that no negative acknowledgement is received and no RLC PDU loop backed by UE

i) The SS re-transmits a MAC-hs PDU with the same content as in step g) again with an incorrect CRC, using HS-SCCH Type-2, in next available CFN & subframe satisfying [5*CFN + subframe number - 6 – PTR]**mod** 13=X as in step g [second transmission]. Further [5*CFN + subframe number]**mod** 13 = Y.

j) The SS checks that a negative acknowledgement is received and no RLC PDU loop backed by UE.

k) The SS re-transmits a MAC-hs PDU with the same content as in step g) but where the CRC is correct, using HS-SCCH Type-2, in next available CFN & subframe satisfying [5*CFN + subframe number - 6 – PTR]**mod** 13=Y as in step i[final transmission].

l) The SS checks that a positive acknowledgement is received and RLC PDU's for SN 3,4,5 are loop backed by UE.

m) The SS repeats steps g to l, with TSN=3 and MAC-hs PDU consisting of 4 RLC PDU's with SN=6,7,8&9

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	MAC-hs PDU containing one RLC PDU with SN=0	HS-SCCH Less operation
2	->	MAC-hs ACK	
3	->	RLC Loop Backed PDU with SN=0	
4	←	MAC-hs PDU containing 2 RLC PDU's with SN=1&2	Erroneous CRC, [5*CFN + subframe number]**mod** 13 = X
5			SS checks no MAC-hs negative acknowledgement or loop backed data is received
6	←	MAC-hs PDU containing 2 RLC PDU's with SN=1&2	First Transmission, Correct CRC, [5*CFN + subframe number - 6 – PTR]**mod** 13=X [second transmission]
7	→	MAC-hs positive acknowledgement	
8	→	RLC Loop Backed PDU's with SN=1&2	
9	←	MAC-hs PDU containing 3 RLC PDU's with SN=3,4&5	Erroneous CRC, [5*CFN + subframe number]**mod** 13 = X
10			SS checks no MAC-hs negative acknowledgement or loop backed data is received
11	←	MAC-hs PDU containing 3 RLC PDU's with SN=3,4&5	Second Transmission, Erroneous CRC, [5*CFN + subframe number - 6 – PTR]**mod** 13=X [second transmission] Further [5*CFN + subframe number]**mod** 13 = Y
12	→	MAC-hs negative acknowledgement	
13	←	MAC-hs PDU containing 3 RLC PDU's with SN=3,4&5	Third Transmission, Correct CRC, [5*CFN + subframe number - 6 – PTR] **mod** 13 = Y [Final transmission]
14	→	MAC-hs positive acknowledgement	
15	→	RLC Loop Backed PDU's with SN=3,4&5	
16	←	MAC-hs PDU containing 4 RLC PDU's with SN=6,7,8&9	Erroneous CRC, [5*CFN + subframe number] **mod** 13 = XX
17			SS checks no MAC-hs negative acknowledgement or loop backed data is received
18	←	MAC-hs PDU containing 4 RLC PDU's with SN=6,7,8&9	Second Transmission, Erroneous CRC, [5*CFN + subframe number - 6 – PTR]**mod** 13=XX [second transmission] Further [5*CFN + subframe number]**mod** 13 = YY *Note
19	→	MAC-hs negative acknowledgement	
20	←	MAC-hs PDU containing 4 RLC PDU's with SN=6,7,8&9	Third Transmission, Correct CRC, [5*CFN + subframe number - 6 – PTR]**mod** 13=YY [Final transmission] *Note
21	→	MAC-hs positive acknowledgement	
22	→	RLC Loop Backed PDU's with SN=6,7,8&9	
Note: the CRC calculations made in steps 16, 18 &20 [9, 11 & 13] is in such a way that, it will result in CRC error in steps 16 & 18 [9 & 11] and no CRC error in step 20 [13], after combination of new data in step 20 [13] and stored data in UE after step 18[11].			

Specific Message Contents

None

7.1.5b.1.5 Test requirements

1. After steps 11 & 18, a MAC-hs negative acknowledgement shall be received.
2. After steps 1, 6, 13 & 20, a MAC-hs Positive acknowledgement shall be received
3. After steps 4, 9 & 16 no MAC-hs NACK shall be received by SS.
4. After step 1, RLC Loop Backed PDU with SN=1 is received.
5. After step 6, RLC Loop Backed PDU's with SN=2 & 3 is received
6. After step 13, RLC Loop Backed PDU's with SN=4, 5 & 6 are received
7. After step 20, RLC Loop Backed PDU's with SN=7, 8, 9 & 10 are received

7.1.5c HS-DSCH SPS Operation

7.1.5c.1 HARQ procedure for HS-DSCH SPS operation

7.1.5c.1.1 Definition and applicability

All UEs which support 1.28Mcps TDD and SPS operation.

7.1.5c.1.2 Conformance requirement

When the HS-DSCH SPS operation is enabled, the UE shall maintain cyclic virtual IR buffers with number of N where N is configured by higher layer as in [7]. And the value tagged to the virtual IR buffers should be all set to NULL.

For each received MAC-hs PDU provided by the lower layers the UE shall:

- If the associated HS-SCCH corresponds to an HS-SCCH SPS retransmission as defined in subclause 4.6C of [19]:
  - if the data in the virtual IR buffer tagged with the value [2*CFN + subframe number - 4 – PTR] mod 512 has not been decoded successfully:
    - combine the received data with the data currently in the virtual IR buffer tagged with the value [2*CFN + subframe number - 4 - PTR] mod 512, where PTR is the value of the pointer to the previous transmission as defined in subclause 4.6C of [19].
  - If the data in the virtual IR buffer has been successfully decoded and no error was detected:
    - deliver the decoded MAC-hs PDU to the reordering entity;
    - generate a positive acknowledgement (ACK) of the data corresponding to this TTI;
      - tag the virtual IR buffer with the value NULL.
  - else:
    - generate a negative acknowledgement (NACK) of the data corresponding to this TTI;
    - tag the virtual IR buffer with the value [2*CFN + subframe number].
  - else:
    - generate a positive acknowledgement (ACK) of the data corresponding to this TTI;
    - discard the received data.
- Else if the associated HS-SCCH corresponds to a HS-SCCH as defined in subclause 4.6 of [19]:
  - process the received MAC-hs PDU provided by the lower layers as per subclause 11.6.2.2.

- Else if the TTI is allocated to the UE with HS-DSCH SPS resources:
  - if there is virtual IR buffer of which the tagged value is set to NULL:
    - place the received data for the HS-DSCH SPS TTI in any of the virtual IR buffers of which the tagged value is set to NULL.
  - else:
    - place the received data for the HS-DSCH SPS TTI in the virtual IR buffer which contains the oldest MAC-hs PDU, replacing any data previously stored in this buffer.
  - If the received data has been successfully decoded and no error was detected;
    - deliver the decoded MAC-hs PDU to the reordering entity;
    - generate a positive acknowledgement (ACK) of the data corresponding to this TTI;
    - tag the virtual IR buffer with the value NULL.
  - else:
    - generate a negative acknowledgement (NACK) of the data corresponding to this TTI;
    - tag the virtual IR buffer with the value [2*CFN + subframe number].
- For the data stored in each virtual IR buffer of which the tagged value is not set to NULL, if the time waiting for retransmission has been longer than 4+PTRmax TTIs, where PTRmax is the maximum value that can be indicated by PTR:
  - tag the virtual IR buffer with the value NULL.

Reference(s)

TS 25.321 clauses 11.6.2.8

7.1.5c.1.3 Test purpose

To verify that

1. UE is able to operate in SPS operation..
2. UE is able to decode the Transport block correctly on first Transmission.
3. UE is able to combine data in soft buffer and data received and decode combined data.

7.1.5c.1.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration Streaming or interactive or background / UL: [max bit rate depending on UE category and TTI] DL: [max bit rate depending on UE category] / PS RAB + UL: [max bit rate depending on UE category and TTI] DL: [max bit rate depending on UE category] SRBs for DCCH on E-DCH and HS-DSCH, as specified in TS 34.108, clause 6.11.5.4.7.4 with the logical channel, MAC-hs/MAC-ehs queue identity set to:

Logical Channel ID	Mac-hs Queue ID	Comment
7	0	RB5

The following parameters are specific for this test case:

Parameter	Value
CONTROL_CHANNEL_DRX_STATUS	FALSE
Transport Block Size List	1 element
- Transport Block Size Index	9 [sufficient for one MAC-hs SDU 0f 336 + MAC-hs header of 21]
HARQ Info for Semi-Persistent Scheduling	
- Number of Processes	8
- Process Memory size	hms6400

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Test procedure

In this test procedure each MAC-hs PDU contains one RLC PDU carrying one SDU of size 39 octets and one length indicator indicating the end of the SDU.

a) The SS transmits a MAC-hs PDU where:

   1. The TSN = 0

   2. The MAC-hs PDU contains a RLC PDU with SN=0.

   Using HS-DSCH SPS resource.

b) The SS checks that a Positive acknowledgement is received and RLC PDU is loop backed by UE

c) The SS transmits a MAC-hs PDU where:

   1. The TSN = 1

   2. The MAC-hs PDU contains 1 RLC PDU with SN=1.

   3. The physical layer CRC is modified such that the CRC check in the UE will fail

      The MAC-hs PDU is transmitted in a CFN, Subframe number such that by 2*CFN + subframe number =X, using HS-DSCH SPS resource.

d) The SS checks that a negative acknowledgement is received and no RLC PDU loop backed by UE

e) The SS re-transmits a MAC-hs PDU with the same content as in step c) but where the CRC is correct, using HS-SCCH Type-3, in next available CFN & subframe satisfying [2*CFN + subframe number - 4 – PTR] mod 512 = X as in step c.

f) The SS checks that a positive acknowledgement is received and RLC PDU's for SN 1 are loop backed by UE.

g) The SS transmits a MAC-hs PDU where:

   1. The TSN = 2

   2. The MAC-hs PDU contains 2 RLC PDU's with SN=2.

   3. The physical layer CRC is modified such that the CRC check in the UE will fail

   The MAC-hs PDU is transmitted in a CFN, Subframe number such that by 2*CFN + subframe number = X, using HS-DSCH SPS operation.

h) The SS checks that a negative acknowledgement is received and no RLC PDU loop backed by UE

i) The SS re-transmits a MAC-hs PDU with the same content as in step g) again with an incorrect CRC, using HS-SCCH Type-3, in next available CFN & subframe satisfying [2*CFN + subframe number - 4 – PTR] mod 512 = X as in step g [second transmission]. Further 2*CFN + subframe number = Y.

j) The SS checks that a negative acknowledgement is received and no RLC PDU loop backed by UE.

k) The SS re-transmits a MAC-hs PDU with the same content as in step g) but where the CRC is correct, using HS-SCCH Type-3, in next available CFN & subframe satisfying [2*CFN + subframe number - 4 – PTR] mod 512 = Y as in step i[final transmission].

l) The SS checks that a positive acknowledgement is received and RLC PDU for SN 3 is loop backed by UE.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		MAC-hs PDU containing one RLC PDU with SN=0	SPS operation
2	->		MAC-hs ACK	
3	->		RLC Loop Backed PDU with SN=0	
4	←		MAC-hs PDU containing one RLC PDU with SN=1	Erroneous CRC, 2*CFN + subframe number = X
5			MAC-hs negative acknowledgement	SS checks a MAC-hs negative acknowledgement
6	←		MAC-hs PDU containing one RLC PDU with SN=1	First Transmission, Correct CRC, [2*CFN + subframe number - 4 – PTR] mod 512 =X [second transmission]
7	→		MAC-hs positive acknowledgement	
8	→		RLC Loop Backed PDU's with SN=1	
9	←		MAC-hs PDU containing one RLC PDU with SN=2	Erroneous CRC, 2*CFN + subframe number = X
10			MAC-hs negative acknowledgement	SS checks a MAC-hs negative acknowledgement
11	←		MAC-hs PDU containing one RLC PDU's with SN=2	Second Transmission, Erroneous CRC, [2*CFN + subframe number - 4 – PTR] mod 512=X [second transmission] Further 2*CFN + subframe number = Y
12	→		MAC-hs negative acknowledgement	
13	←		MAC-hs PDU containing one RLC PDU with SN=2	Third Transmission, Correct CRC, [2*CFN + subframe number - 4 – PTR] mod 512 = Y [Final transmission]
14	→		MAC-hs positive acknowledgement	
15	→		RLC Loop Backed PDU's with SN=2	
Note: the CRC calculations made in steps 9, 11 & 13 is in such a way that, it will result in CRC error in steps 9 & 11 and no CRC error in step 13, after combination of new data in step 13 and stored data in UE after step 11.				

Specific Message Contents

None

7.1.5c.1.5 Test requirements

1. After steps 4, 9, 11, a MAC-hs negative acknowledgement shall be received.
2. After steps 1, 6, 13, a MAC-hs Positive acknowledgement shall be received
3. After step 1, RLC Loop Backed PDU with SN=0 is received.
4. After step 6, RLC Loop Backed PDU with SN=1 is received
5. After step 13, RLC Loop Backed PDU with SN=2 is received

7.1.6 E-DCH MAC-es/e

7.1.6.1 MAC-es/e multiplexing

7.1.6.1.1 MAC-es/e multiplexing without RRC restrictions

7.1.6.1.1.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.1.1.2 Conformance requirement

From 25.321 clause 9.1.5:

In the case of E-DCH there are two MAC sublayers, MAC-e and MAC-es. MAC-es sits on top of MAC-e and receives PDUs directly from MAC-d. MAC-es SDUs (i.e. MAC-d PDUs) of the same size, coming from a particular logical channel can be multiplexed together into a single MAC-es payload. To this payload is prepended the MAC-es header (see subclause 9.2.4.1). The number of PDUs, as well as the DDI value identifying the logical channel, the MAC-d flow and the MAC-es SDU size are included as part of the MAC-e header. In case sufficient space is left in the E-DCH transport block or if Scheduling Information needs to be transmitted, an SI will be included at the end of the MAC-e PDU (see subclause 9.2.4.2). Multiple MAC-es PDUs, but only one MAC-e PDU can be transmitted in a TTI.

[…]

From 25.331 clause 8.6.5.18:

1> if the IE "E-DCH MAC-d flow multiplexing list" is included:

2> only multiplex MAC-d PDU's from the E-DCH MAC-d flow indicated in the IE "E-DCH MAC-d flow identity" with MAC-d PDU's from E-DCH MAC-d flows with which multiplexing in the same MAC-e PDU is allowed in accordance to the IE "E-DCH MAC-d flow multiplexing list".

[…]

Reference(s)

TS 25.321 clause 9.1.5, TS 25.331 clause 8.6.5.18

7.1.6.1.1.3 Test purpose

The purpose of this test case is to verify that the UE multiplexes data from different logical channels in the same TTI when no restriction on the multiplexing is configured by RRC.

7.1.6.1.1.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4d(FDD) /6.11.5.4.7.7(1.28Mcps TDD) using condition A15(FDD) /A14(1.28Mcps TDD) as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the testcase			

The following parameters are specific for this test case:

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99) (FDD)
T-WAIT	200 ms (see 25.331 10.3.6.103)(1.28Mcps TDD)
E-DCH MAC-d flow multiplexing list	11111111 (See 25.331 10.3.5.1b) Note 1
Note 1: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3.

a) The SS has not issued any scheduling grants for E-DCH to the UE

b) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

c) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

d) The SS waits for an SI to be received that indicates that data is available on both logical channels (can be identified from the content of the SI)

e) The SS issues an absolute grant that allows the UE to send with a high rate (signalling value 10, allowing a rate well above 2 SDUs/TTI)

f) The SS waits until data is received and verifies that data from the two LCHs is received in the same TTI

NOTE: The UE may send an SI after step 1 but this SI would only indicate data on LCH2. This SI will be ignored.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	1 RLC PDU on LCH 2	
2	←	1 RLC PDU on LCH 1	
3	→	Potential SI indicating data on LCH 2	This SI is ignored by the SS
4	→	SI indicating data on LCH 1 and LCH 2	This can be verified from the indicated fraction of data on LCH1
5	←	Absolute grant allowing UE to transmit on E-DCH	This grant must be sufficiently high to allow a rate corresponding to at least 2 RLC PDUs/TTI, signalling value 10
6	→	MAC e/es PDU containing 1 RLC PDU on LCH 1 and one RLC PDU on LCH 2	

Specific Message Contents

None

7.1.6.1.1.5 Test requirements

1. After step 2 the SS shall receive an SI indicating that data is available on LCH 1 and LCH 2 but no RLC PDUs shall be received

2. In step 6, the SS shall receive 1 RLC PDU on LCH 1 and one RLC PDU on LCH 2 in the same TTI

7.1.6.1.2 MAC-es/e multiplexing with RRC restrictions

7.1.6.1.2.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.1.2.2 Conformance requirement

From 25.321 clause 9.1.5:

In the case of E-DCH there are two MAC sublayers, MAC-e and MAC-es. MAC-es sits on top of MAC-e and receives PDUs directly from MAC-d. MAC-es SDUs (i.e. MAC-d PDUs) of the same size, coming from a particular logical channel can be multiplexed together into a single MAC-es payload. To this payload is prepended the MAC-es header (see subclause 9.2.4.1). The number of PDUs, as well as the DDI value identifying the logical channel, the MAC-d flow and the MAC-es SDU size are included as part of the MAC-e header. In case sufficient space is left in the E-DCH transport block or if Scheduling Information needs to be transmitted, an SI will be included at the end of the MAC-e PDU (see subclause 9.2.4.2). Multiple MAC-es PDUs, but only one MAC-e PDU can be transmitted in a TTI.

[…]

From 25.331 clause 8.6.5.18:

1> if the IE "E-DCH MAC-d flow multiplexing list" is included:

2> only multiplex MAC-d PDU's from the E-DCH MAC-d flow indicated in the IE "E-DCH MAC-d flow identity" with MAC-d PDU's from E-DCH MAC-d flows with which multiplexing in the same MAC-e PDU is allowed in accordance to the IE "E-DCH MAC-d flow multiplexing list".

[…]

Reference(s)

TS 25.321 clause 9.1.5, TS 25.331 clause 8.6.5.18

7.1.6.1.2.3 Test purpose

The purpose of this test case is to verify that the UE does not multiplex data from different logical channels in the same TTI when the multiplexing has been restricted by RRC.

7.1.6.1.2.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4d (FDD) /6.11.5.4.7.7(1.28Mcps TDD) using condition A15(FDD) /A14(1.28Mcps TDD) as specified in clause 9.1 of TS 34.108.The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the test case			

The following parameters are specific for this test case:

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99) (FDD)
T-WAIT	200 ms (see 25.331 10.3.6.103)(1.28Mcps TDD)
E-DCH MAC-d flow multiplexing list	00000000 (See 25.331 10.3.5.1b) Note 1
Note 1: This configuration means that no multiplexing is allowed	

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3.

a) The SS has not issued any scheduling grants for E-DCH to the UE

b) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

c) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

d) The SS waits for an SI to be received that indicates that data is available on both logical channels (can be identified from the content of the SI)

e) The SS issues an absolute grant that allows the UE to send with a high rate (signalling value 10, allowing rates well above 2 SDUs/TTI)

f) The SS waits until data is received and verifies that only data from LCH1 is received in the first TTI

g) The SS verifies that data from LCH2 is received (in a separate TTI from the data from LCH1)

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		1 RLC PDU on LCH 2	
2	←		1 RLC PDU on LCH 1	
3	→		Potential SI indicating data on LCH 2	This SI is ignored by the SS
4	→		SI indicating data on LCH 1 and LCH 2	This can be verified from the indicated fraction of data on LCH1
5	←		Absolute grant allowing UE to transmit on E-DCH	This grant must be sufficiently high to allow a rate corresponding to at least 2 RLC PDUs/TTI, signalling value 10
6	→		MAC e/es PDU containing 1 RLC PDU on LCH 1	
7	→		MAC e/es PDU containing 1 RLC PDU on LCH 2	

Specific Message Contents

None

7.1.6.1.2.5 Test requirements

1. After step 2 the SS shall receive an SI indicating that data is available on LCH 1 and LCH 2 but no RLC PDUs shall be received

2. In step 6, the SS shall receive 1 RLC PDU on LCH 1 but no data from LCH 2

3. In step 7, the SS shall receive 1 RLC PDU on LCH 2 but no data from LCH 1

7.1.6.1.3 Correct settings of MAC-es/e header fields

7.1.6.1.3.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.1.3.2 Conformance requirement

Extract from 25.321:

[…]

- Transmission Sequence Number (TSN):
  The TSN field provides the transmission sequence number for the MAC-es PDU. This information is used for reordering purposes to support in-sequence delivery to higher layers. The length of the TSN field is 6 bits.

[…]

- For FDD: Data description indicator (DDI):
  The DDI field identifies the logical channel, MAC-d flow and size of the MAC-d PDUs concatenated into the associated MAC-es PDU. The mapping between the DDI values and the logical channel ID, MAC-d flow and PDU size is provided by higher layers. The length of the DDI field is 6 bits. When, due to the quantization in the transport block sizes that can be supported or triggering of the Scheduling Information, the size of the data plus header is less than or equal to the TB size of the E-TFC selected by the UE minus 24 bits, the DDI value [111111] shall be appended at the end of the MAC-e header and a Scheduling Information shall be concatenated into this MAC-e PDU, where DDI value [111111] indicates that there is a Scheduling Information concatenated in this MAC-e PDU. Otherwise, if the size of the data plus header is less than or equal to the TB size of the E-TFC selected by the UE minus 18 bits, a Scheduling Information shall be concatenated into this MAC-e PDU. In any other case it is understood that another MAC-es PDU or Scheduling Information does not fit and it is therefore not necessary to reserve room in the transport block for an additional DDI field.

- For TDD: When, due to the quantization in the transport block sizes that can be supported or triggering of the Scheduling Information (due to timer expiry, see subclauses 11.9.1.4a and 11.9.1.5), the size of the data plus header is less than or equal to the TB size of the E-TFC selected by the UE minus 29bits, the DDI value [111111] shall be appended at the end of the MAC-e header and a Scheduling Information shall be concatenated into this MAC-e PDU, where DDI value [111111] indicates that there is a Scheduling Information concatenated in this MAC-e PDU. Otherwise, if the size of the data plus header is less than or equal to the TB size of the E-TFC selected by the UE minus 23 bits, a Scheduling Information shall be concatenated into this MAC-e PDU. In any other case it is understood that another MAC-es PDU or Scheduling Information does not fit and it is therefore not necessary to reserve room in the transport block for an additional DDI field.

- Number of MAC-d PDUs (N):
  The number of consecutive MAC-d PDUs corresponding to the same DDI value. The length of the N field is 6 bits.

Reference(s)

TS 25.321 clauses 9.2.4.1, 9.2.4.2

7.1.6.1.3.3 Test purpose

The purpose of this test case is to verify that the UE sets the MAC-es/e header fields in a correct way.

7.1.6.1.3.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4d (FDD) /6.11.5.4.7.7(1.28Mcps TDD) using condition A15(FDD) /A14(1.28Mcps TDD) as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the testcase			

The following parameters are specific for this test case:

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99) (FDD)
T-WAIT	200 ms (see 25.331 10.3.6.103)(1.28Mcps TDD)
E-DCH MAC-d flow multiplexing list	11111111 (See 25.331 10.3.5.1b) Note 1
Note 1: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3.

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS transmits 4 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

c) The SS issues an absolute grant that allows the UE to send with a high rate (signalling value 10, allowing rates well above 5 SDUs/TTI)

d) The SS waits until data is received and checks the values of the header parameters

e) The SS removes the scheduling grant for E-DCH for the UE

f) The SS transmits three SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

g) The SS transmits two SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

h) The SS issues an absolute grant that allows the UE to send with a high rate (signalling value 10, allowing rates well above 5 SDUs/TTI)

i) The SS waits until data is received and checks the values of the header parameters

j) The SS transmits two SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

k) The SS waits until data is received and checks the values of the header parameters

Expected sequence

Step	Direction		Message	Comments
	UE	SS		

1	←	4 RLC PDUs on LCH 2	
2	→	SI indicating data on LCH 2	
3	←	Absolute grant allowing UE to transmit on E-DCH	This grant must be sufficiently high to allow a rate corresponding to at least 5 RLC PDUs/TTI, signalling value 10
4	→	1 MAC-es PDU containing 4 RLC PDUs on LCH 2	SS checks header fields
5	←	Removal of scheduling grant for UE	
6	←	3 RLC PDUs on LCH 2	
7	←	2 RLC PDUs on LCH 1	
8	→	Potential SI indicating data on LCH 2	This SI is ignored by the SS
8a		SI indicating data on LCH1 and LCH 2	
9	←	Absolute grant allowing UE to transmit on E-DCH	This grant must be sufficiently high to allow a rate corresponding to at least 5 RLC PDUs/TTI, signalling value 10
10	→	2 MAC-es PDUs containing 2 RLC PDUs on LCH 1 and 3 RLC PDUs on LCH 2 respectively	SS checks header fields
11	←	2 RLC PDUs on LCH 2	
12	→	1 MAC-es PDU containing 2 RLC PDUs on LCH 2	SS checks header fields

Specific Message Contents

None

7.1.6.1.3.5 Test requirements

1. After step 4, the SS shall receive 1 MAC-es PDU shall be received where:

   - The TSN is set to 0, DDI is set to 6 and N is set to 4

2. After step 10, the SS shall receive 2 MAC-es PDUs shall be received where:

   - For MAC-es PDU 1: The TSN is set to 0, DDI is set to 5 and N is set to 2

   - For MAC-es PDU 2: The TSN is set to 1, DDI is set to 6 and N is set to 3

3. After step 12, the SS shall receive 1 MAC-es PDU where:

   - The TSN is set to 2, DDI is set to 6 and N is set to 2

7.1.6.2 MAC-es/e – Scheduling

7.1.6.2.1 Correct settings of MAC-es/e scheduling information

7.1.6.2.1.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.2.1.2 Conformance requirement

Extract From 25.321 clause 9.2.5.3.2:

This information includes the following fields:

The Scheduling Information shall not be transmitted if the Total E-DCH Buffer Status is zero, even if it was triggered by one of the configured triggering mechanisms.

[…]

If data with higher priority than the data already in the transmission buffer arrives, the transmission of a Scheduling Information shall be triggered.

[…]

- Highest priority Logical channel ID (HLID):
  The HLID field identifies unambiguously the highest priority logical channel with available data. If multiple logical channels exist with the highest priority, the one corresponding to the highest buffer occupancy will be reported. The length of the HLID is 4 bits. In case the TEBS is indicating index 0 (0 bits), the HLID shall indicate the value "0000".

- Fields related to amount of available data:

- Total E-DCH Buffer Status (TEBS):
  The TEBS field identifies the total amount of data available across all logical channels for which reporting has been requested by the RRC. The length of this field is 5 bits. The values taken by TEBS are shown in [Ts 25.321] Table 9.2.5.3.2.1.

- Highest priority Logical channel Buffer Status (HLBS):
  The HLBS field indicates the amount of data available from the logical channel identified by HLID, relative to the highest value of the buffer size range reported by TEBS when the reported TEBS index is not 31, and relative to 50000 bits when the reported TEBS index is 31. The length of HLBS is 4 bits. The values taken by HLBS are shown in [TS 25.321] table 9.2.5.3.2.2. In case the TEBS field is indicating index 0 (0 bits), the HLBS field shall indicate index 0.

[…]

Extract From 25.321 clause 9.2.4.2:

- Data description indicator (DDI):
  The DDI field identifies the logical channel, MAC-d flow and size of the MAC-d PDUs concatenated into the associated MAC-es PDU. The mapping between the DDI values and the logical channel ID, MAC-d flow and PDU size is provided by higher layers. The length of the DDI field is 6 bits.

- For FDD: When, due to the quantization in the transport block sizes that can be supported or triggering of the Scheduling Information, the size of the data plus header is less than or equal to the TB size of the E-TFC selected by the UE minus 24 bits, the DDI value [111111] shall be appended at the end of the MAC-e header and a Scheduling Information shall be concatenated into this MAC-e PDU, where DDI value [111111] indicates that there is a Scheduling Information concatenated in this MAC-e PDU. Otherwise, if the size of the data plus header is less than or equal to the TB size of the E-TFC selected by the UE minus 18 bits, a Scheduling Information shall be concatenated into this MAC-e PDU. In any other case it is understood that another MAC-es PDU or Scheduling Information does not fit and it is therefore not necessary to reserve room in the transport block for an additional DDI field.

- For TDD: When, due to the quantization in the transport block sizes that can be supported or triggering of the Scheduling Information (due to timer expiry, see subclauses 11.9.1.4a and 11.9.1.5), the size of the data plus header is less than or equal to the TB size of the E-TFC selected by the UE minus 29bits, the DDI value [111111] shall be appended at the end of the MAC-e header and a Scheduling Information shall be concatenated into this MAC-e PDU, where DDI value [111111] indicates that there is a Scheduling Information concatenated in this MAC-e PDU. Otherwise, if the size of the data plus header is less than or equal to the TB size of the E-TFC selected by the UE minus 23 bits, a Scheduling Information shall be concatenated into this MAC-e PDU. In any other case it is understood that another MAC-es PDU or Scheduling Information does not fit and it is therefore not necessary to reserve room in the transport block for an additional DDI field.

[…]

Extract From 25.321 clause 9.2.6.3:

This control information is used by UEs to indicate to the Node B the amount of resources they require. Scheduling Information is sent via the E-PUCH in the MAC-e header when the UE is granted resource and by the E-RUCCH when no resource has been granted. Scheduling Information consists of three components as defined in subclause 9.2.6.3.3.

- Buffer Information: This consists of:

  - Highest priority Logical Channel (HLID)

  - Total E-DCH Buffer Status (TEBS)

  - Highest priority Logical channel Buffer Status (HLBS)

- UE Power Headroom (UPH): The UPH field indicates the ratio of the maximum UE transmission power and the calculated UE transmit power defined as in [18] that would result for β_e equal to 0. The length of UPH is 5 bits.
- Serving and Neighbour Cell Pathloss (SNPL): This may be used by the Node-B to assist with its estimation of the degree of inter cell interference each UE will generate and hence the absolute grant power value and physical resources to assign . The length of SNPL is 5 bits.

The length of TEBS field is 5 bits, the values taken by TEBS are shown in Table 9.2.5.3.2-1. The length of HLBS is 4 bits, the values taken by HLBS are shown in table 9.2.5.3.2-2.

The Scheduling Information message is represented in figure 9.2.6.3-1.

SNPL (5 bits)	UPH (5 bits)	TEBS (5 bits)	HLBS (4 bits)	HLID (4 bits)

Figure 9.2.6.3.-1: Scheduling Information format

If Scheduling Information is sent via the E-RUCCH then the E-RNTI is also sent via the E-RUCCH, as shown by Figure 9.2.6.3-2:

Scheduling Information (23 bits)	E-RNTI (16 bits)

Figure 9.2.6.3-2: Format of information sent on E-RUCCH

–

[…]

Scheduling information reports will be triggered differently depending on the value of the variable Serving_Grant after the Serving Grant Update function. The triggering of a report shall be indicated to the E-TFC selection function at the first new transmission opportunity (this process may be delayed in case the HARQ processes are occupied with re-transmissions).

Extract From 25.321 clause 11.9.1.5:

[…]

If a UE has no Grant and the TEBS becomes larger than zero, the transmission of Scheduling Information shall be triggered via E-RUCCH.

If the UE has a Grant, the scheduling information needs to be included in the MAC-e PDU according to subclause 9.2.4.2, and it shall be transmitted regardless of TEBS status. Additional timer mechanism is used to avoid long pause duration of scheduling information reporting (period defined by RRC and set the same value as below T_WAIT). When the scheduling information is included in MAC-e PDU and sent, the timer will be reset and restarted immediately; when the timer expires, scheduling information shall be sent in a new MAC-e PDU.

RRC can configure MAC with a delay timer to be used when the UE transits from having a Grant to not having a Grant and the TEBS is still larger than zero. The delay timer T_WAIT shall be started once the Grant expires and shall be stopped and reset when a Grant is received. When T_WAIT expires, the transmission of a Scheduling Information shall be triggered via E-RUCCH (T_WAIT shall be stopped and reset).

Reference(s)

TS 25.321 clause 9.2.5.3.2, 9.2.4.2, 9.2.6.3, 11.8.1.6, 11.9.1.5

7.1.6.2.1.3 Test purpose

The purpose of this test case is to verify that the UE sends the E-DCH scheduling information with correct content and with correct triggers.

7.1.6.2.1.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4d (FDD) /6.11.5.4.7.7(1.28Mcps TDD) using condition A15(FDD) /A14(1.28Mcps TDD) as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the testcase			

The following parameters are specific for this test case:

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99) (FDD)
Periodicity for Scheduling Info – grant	100ms (FDD)
T-WAIT	200 ms (see 25.331 10.3.6.103)(1.28Mcps TDD)
T-RUCCH	600 ms (see 25.331 10.3.6.103)(1.28Mcps TDD)
E-DCH MAC-d flow multiplexing list	11111111 (See 25.331 10.3.5.1b) Note 1
E-DCH Transport Block Size Table	0
Note 1: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3.

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS waits for at least 1000 ms and verifies that no SI is received

c) The SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

d) The SS waits until an SI is received at time **T0**

e) The SS waits until the next SI is received at time **T1** and checks the content

f) The SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1 at time **T2**

g) The SS waits until the next SI is received at time **T3** and checks the content

h) The SS issues an absolute grant that allows the UE to transmit 1 SDUs/TTI (absolute grant signalling value 4)

i) The SS waits until all data has been received

j) The SS removes the scheduling grant for the UE

k) The SS transmits 24 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1

l) The SS issues an absolute grant that allows the UE to transmit 1 SDUs/TTI (absolute grant signalling value 4)

m) The SS waits until the next SI is received with payload at time **T4**

n) The SS waits until the next SI is received with payload at time **T5**

o) The SS waits until all data is received

p) Void

q) The SS issues an absolute grant that allows the UE to transmit 5 SDUs/TTI (absolute grant signalling value 8)

r) The SS transmits 5 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

s) The SS waits until the 5 SDUs are received and checks that contain both a regular SI and the special DDI (value = 63) NOTE

NOTE: 5 336 bit PDUs and 18 bit Mac-e/es header require a TB size of 1698 bits. The nearest higher TB size is 1749, which easily holds an SI + the special length indicator.

Expected sequence

Step	Direction UE SS	Message	Comments
1	SS		After the radio bearer has been established the SS waits 1000 ms. No SI shall be received during this time
2	←	1 RLC PDUs on LCH 2	
3	→	SI indicating data on LCH 2	Time **T0**
4	→	SI indicating data on LCH 2	Time **T1**
5	←	1 RLC PDUs on LCH 1	Time **T2**
6	→	SI indicating data on LCH 1 and LCH 2	Time **T3.** Presence of data on LCH 1 and LCH 2 can be verified from the indicated fraction of data on LCH1
7	←	Absolute grant allowing the UE to transmit 1 RLC PDUs per TTI	Signalling value 4
8	→	Data on LCH 1 and LCH 2	
8a	←	Removal of absolute grant	Signalling value 1
9	←	24 RLC PDUs on LCH 1	
9a	←	Absolute grant allowing the UE to transmit 1 RLC PDUs per TTI	Signalling value 4
10	→	Data and SI	Time **T4**
11	→	Data only	
12	→	Data and SI	Time **T5**
13	→	Data only	
14	SS		After all data has been received, SS waits 1000ms. No SI shall be received during this time.
15	←	void	
16	→	void	
17	←	Absolute grant allowing the UE to transmit 5 RLC PDUs per TTI	Signalling value 8
18	←	5 RLC PDUs on LCH 1	
19	→	Data and SI	The received transport block shall in addition to the 5 PDUs contain a regular SI and the special DDI (value = 63). As there is no data left in buffers, TEBS is set as 0, HLID is set as '0000' and HLBS is set as 0.
NOTE 1: General timer tolerance as defined by 34.108 sub-clause 4.2.3 applies. NOTE 2: Step 10 and 11 can occur in any order. SS should accept these PDUs in any order and verify the time difference between T5 and T4 as per the test requirement.			

Specific Message Contents

None

7.1.6.2.1.5 Test requirements

1. In step 1 the SS shall not receive any SI since the UE buffer is empty

2. In step 3 the SS shall receive an SI (content ignored)

3. In step 4 the SS shall receive an SI indicating

- Total E-DCH Buffer Status (TEBS) Index = 6 (32 < TEBS ≤ 42).
- Highest priority Logical channel ID (HLID) = LCH 2.
- Highest Priority Logical Channel Buffer Status (HLBS) Index = 15 (82% < HLBS ≤ 100%).

4. In step 6 the SS shall receive an SI indicating
   - Total E-DCH Buffer Status (TEBS) Index = 9 (73 < TEBS ≤ 97).
   - Highest priority Logical channel ID (HLID) = LCH 1.
   - Highest Priority Logical Channel Buffer Status (HLBS) Index=11(37 < HLBS ≤ 45).
5. T1-T0 shall equal 500 ms
6. T3-T2 shall be less then 120 ms. Note 1.
7. T5-T4 shall equal 100ms
8. In step 14, the SS shall not receive any SI since the UE buffer is empty.
9. In step 19, the received transport block shall in addition to the payload include a regular SI and the special DDI (value = 63). TEBS, HLID and HLBS shall be set as zero.

NOTE 1. 120ms = 2 TTI(for Data to be transmitted from RLC to MAC) + Maximum UE test loop delay (10*TTI according to 34.109=100ms).

7.1.6.2.2 Happy bit setting

7.1.6.2.2.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.2.2.2 Conformance requirement

The happy bit is a single bit field that is passed from MAC to the physical layer for inclusion on the E-DPCCH. This field takes two values, “Not Happy” and “Happy” indicating respectively whether the UE could use more resources or not. The setting of the Happy Bit is defined in subclause [TS 25.321] 11.8.1.5.

[…]

The Happy Bit is included on the E-DPCCH for every E-DCH transmission. E-DCH transmissions shall not be triggered specifically to allow the transmission of the happy bit.

RRC configures MAC with the duration Happy_Bit_Delay_Condition, over which to evaluate the current grant relative to the TEBS after application of the E-TFC selection procedure described in [TS 25.321] subclause 11.8.1.4.

For every E-DCH transmission, the Happy Bit shall be set to "unhappy" if the three following criteria are met:

1) UE is transmitting as much scheduled data as allowed by the current Serving_Grant in E-TFC selection; and
2) UE has enough power available to transmit at higher data rate; and
3) Based on the same power offset as the one selected in E-TFC selection to transmit data in the same TTI as the Happy Bit, TEBS would require more than Happy_Bit_Delay_Condition ms to be transmitted with the current Serving_Grant × the ratio of active processes to the total number of processes.

The first criteria is always true for a deactivated process and the ratio of the third criteria is always 1 for 10ms TTI.

Reference(s)

TS 25.321 clause 9.2.5.3.1, 11.8.1.5

7.1.6.2.2.3 Test purpose

The purpose of this test case is to verify that the UE sets the happy bit correctly.

7.1.6.2.2.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4c using condition A12 as specified in clause 9.1 of TS 34.108.

The following parameters are specific for this test case:

Parameter	Value
Periodicity for Scheduling Info	No periodic SI transmission
Happy bit delay condition	20 ms
E-DCH MAC-d flow maximum number of retransmissions	15
HARQ RV Configuration	rv0

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Test procedure

In this test procedure the UE is configured with one logical channel with Id 7 (LCH1).

a) The SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

b) The SS issues an absolute grant corresponding to 2 RLC PDUs of size 41 octets per TTI (signalling value 5)

c) The SS waits until all data is received in uplink and checks the happy bit

d) The SS removes the scheduling grant for the UE

e) The SS transmits 8 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

f) The SS issues an absolute grant corresponding to 2 RLC SDUs of size 40 octets per TTI (signalling value 5)

g) SS waits until data is receive in uplink and checks the happy bit

h) The SS waits until all data is received in uplink

i) The SS is configured to always send a NACK on every HARQ process, when data is received in uplink, and to pass the received data to the higher layers.

j) The SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

k) The SS waits until data is received in uplink. The SS stores the HARQ process ID[x] of the HARQ process used for this transmission and checks the happy bit

l) The SS is reconfigured to normal ACK/NACK operation mode on all HARQ processes, except HARQ process ID[x]

m) The SS transmits 10 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

n) The SS waits for the data to be received in uplink and checks the happy bit every time data is re-transmitted on HARQ process ID[x]

Expected sequence

Step	Direction UE	Direction SS	Message	Comments
1	←		2 RLC PDUs on LCH 1	
2	←		Absolute grant allowing the UE to transmit 2 RLC PDUs per TTI	Signalling value 5
3	→		Data and happy bit	Happy bit should be set to happy
4	←		Removal of absolute grant	Signalling value 1
5	←		8 RLC PDUs on LCH 1	
6	←		Absolute grant allowing the UE to transmit 2 RLC PDUs per TTI	Signalling value 5
7	→		Data and happy bit	Happy bit should be set to unhappy
8	SS			The SS always NACK the received data on all HARQ processes
9	←		2 RLC PDUs on LCH 1	
10	→		Data and happy bit	Happy bit should be set to happy for the data received by the SS on HARQ process ID[x]
11	SS			The SS is set to normal ACK/NACK operation mode on all HARQ processes, except HARQ process ID[x]
12	←		10 RLC PDUs on LCH 1	
12a	←		10 RLC PDUs on LCH1	
13	→		Data and happy bit	Happy bit for the retransmissions of the MAC es PDU received on HARQ process ID[x] should change from happy to unhappy, and become happy again when buffered data has been processed by the other HARQ processes.

Specific Message Contents

None

7.1.6.2.2.5 Test requirements

1. In step 3 the SS shall receive data and the happy bit shall be set to happy in the first TTI containing data
2. In step 7 the SS shall receive data and the happy bit shall be set to unhappy in the first TTI containing data
3. In step 10 the SS shall receive data and the happy bit shall be set to happy in the first TTI containing data
4. In step 13 the SS shall receive data and the happy bit, on the same HARQ process as in step 10, shall change status from happy to unhappy, and later change status from unhappy to happy.

7.1.6.2.3 MAC-es/e non-scheduled transmissions

7.1.6.2.3.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.2.3.2 Conformance requirement

Extract From 25.321 clause 11.8.1.4:

[…]

RRC can allocate non-scheduled transmission grants to individual MAC-d flows in order to reduce the transmission delays. When a 2ms TTI is configured each non-scheduled grant is applicable to the specific set of HARQ processes indicated by RRC. The applicability of scheduled grants can be also restricted to a specific set of HARQ processes when a 2ms TTI is configured. HARQ process restriction and reservation is under the control of the serving cell Node B and indicated to the UE by RRC.

[…]

For all logical channels, if the logical channel belongs to a non-scheduled MAC-d flow, its data shall be considered as available up to the corresponding non-scheduled grant, if the logical channel does not belong to a non-scheduled MAC-d flow, its data shall be considered as available up to the Serving Grant;

[…]

The amount of data from MAC-d flows for which non-scheduled grants were configured shall not exceed the value of the non-scheduled grant;

[…]

Extract From 25.321 clause11.9.1.4:

In TDD, rules for E-TFC selection shall be applied as provided below.

UEs shall apply E-TFC selection when invoked by the HARQ entity (see subclause 11.9.1.1.1).

For each MAC-d flow, RRC configures MAC-e with a HARQ profile and multiplexing list. Additionally, RRC configures MAC with a power offset in case the Scheduling Information needs to be transmitted without any higher-layer data. The HARQ profile includes the power offset and maximum number of HARQ transmissions to use for this MAC-d flow. For 1.28 Mcps TDD, the HARQ profile also includes a retransmission timer attribute. The multiplexing list identifies for each MAC-d flow(s), the other MAC-d flows for which data can be multiplexed in a transmission that uses the power offset included in its HARQ profile.

RRC can control the scheduling of uplink data by giving each logical channel a priority between 1 and 8, where 1 is the highest priority and 8 the lowest. E-TFC selection in the UE shall be done in accordance with the priorities indicated by RRC. Logical channels have absolute priority, i.e. the UE shall maximise the transmission of higher priority data.

RRC can allocate non-scheduled transmission grants to individual MAC-d flows in order to reduce the transmission delays.

The UE shall determine whether to take scheduled or non-scheduled grants into account in the upcoming transmission. If neither are supposed to be taken into account (i.e. the TTI is not available for non-scheduled transmission and no Grant for scheduled transmission has been received) then no grant shall be assumed to exist. If a grant exists then the transmission format and data allocation shall follow the requirements below.

For each configured MAC-d flow, a given E-TFC can be in any of the following states:

- Supported state;

- Blocked state.

The E-TFC states are derived according to the following:

- If the transmission is a retransmission then only the E-TFC with the same block size as the original transmission may be in the supported state.

- For 1.28Mcps TDD, only E-TFCs from the E-TFCS (the table of TB sizes) which are consistent with the UE's E-DCH capability category shall be considered for the transmission;

- Only E-TFCs from the E-TFCS (the table of TB sizes) which can be supported by (exactly) the number of slots assigned by the grant shall be considered for the transmission;

- Only E-TFCs which result (for the granted timeslot and code physical resources) in a code rate lying between the maximum and minimum (inclusive) allowable code rates set by RRC [7] shall be considered for the transmission {note: the definition of the term "coderate" as used here is the same as that provided by [18]}. This shall be evaluated for both QPSK and 16-QAM modulation;

- P_{HARQ}, the HARQ profile power offset is selected (the HARQ profile for the transmission shall be selected among the HARQ profiles of MAC-d flows on which the highest priority logical channels with available data are mapped; Scheduling Information power offset shall be used when Scheduling Information is transmitted without any higher-layer data.)

- Only E-TFCs whose calculated transmission power requirement P_{E-PUCH} (see [18]) is less than or equal to the available or granted power shall be considered for the transmission (note: this requirement does not apply in the case of a retransmission on non-scheduled resources).

For 3.84Mcps/7.68Mcps TDD, from those E-TFCs in the supported state the UE determines the largest block size that it is permitted to transmit within the given constraints.

For 1.28Mcps TDD, from those E-TFCs in the supported state, UE determines a candidate set with up to 64 E-TFCs, including the largest 63 E-TFCs, in addition to the E-TFC dedicated for SI. If the number of E-TFCs in the supported state is not greater than 63, all the E-TFCs in the supported state shall be included in the candidate set. The E-TFCs in the candidate set shall then be re-indexed in an ascending order and numbered from 0 to (Nmax -1), where Nmax is the number of E-TFC in the candidate set. From the candidate set the UE determines the largest block size that is permitted to transmit within the given constraints.

The UE shall select the modulation type associated with the determined E-TFC (note: if an E-TFC is supported by both QPSK and 16-QAM then 16-QAM modulation shall be used if its power requirement (P_{E-PUCH}) is lower than the power requirement for QPSK, otherwise QPSK modulation shall be used).

Data allocation shall then be performed in accordance with the following:

- For all logical channels, if the logical channel belongs to a non-scheduled MAC-d flow, its data shall be considered as available up to the largest block size determined for the corresponding non-scheduled grant. If the logical channel does not belong to a non-scheduled MAC-d flow, its data shall be considered as available up to the largest block size determined for the Serving Grant;
- The data allocation shall maximise the transmission of higher priority data;
- The UE shall select the E-TFC, SF and modulation which minimises the power used (3.84/7.68 Mcps TDD only);
- The UE shall select the E-TFC and modulation which minimises the power used (1.28 Mcps TDD only);

Once an appropriate E-TFC and data allocation are found according to the rules above, the "Multiplexing and TSN Setting" entity shall generate the corresponding MAC-e PDU.

In 1.28Mcps TDD, when Scheduling Information is triggered by timer per subclause 11.9.1.5, the E-TFC selection and data-allocation process shall assume that Scheduling Information has a priority higher than any other logical channel.

The E-TFC selection function shall provide this MAC-e PDU and transmission HARQ profile to the HARQ entity. The selected E-TFC is also provided (Note: for 1.28Mcps TDD, the signalled transport block size index, i.e. E-TFCI, is the index of the selected E-TFC in the candidate set.). The maximum number of HARQ transmissions and the power offset in this profile shall be set respectively to the maximum of both the Max Number of HARQ Transmissions and of the power offset of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission. For 1.28 Mcps TDD, the retransmission timer shall be set to the maximum of the retransmission timer value of the HARQ profiles that are permitted to be multiplexed into the transmission. Each HARQ process which is associated with a buffer holding a MAC-e PDU for potential retransmission shall maintain the HARQ profile and the number of re-transmissions that have occurred. For 1.28 Mcps TDD, the HARQ process shall also maintain the value of RTX_TIMER.

Further information on E-TFC selection is provided in Annex CA.

Reference(s)

TS 25.321 clause 11.8.1.4, 11.9.1.4

7.1.6.2.3.3 Test purpose

To verify that the UE when RRC is configured for non-scheduled transmissions sends data without scheduling grant. To verify that no SI is sent for non-scheduled transmissions.

7.1.6.2.3.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4c(FDD) /6.11.5.4.7.6(1.28Mcps TDD) using condition A12(FDD) /A11(1.28Mcps TDD) as specified in clause 9.1 of TS 34.108. The following parameters are specific for this test case:

Parameter	Value
Periodicity for scheduling info	No periodic scheduling info
E-TFCI table	Table 0 for 10 ms TTI(FDD)
E-TFCI table	5ms TTI E-DCH Transport Block Size Table 0(1.28Mcps TDD)

The UE is placed into UE test loop mode 1 with the UL SDU size set to (10*41)-2 octets.

Test procedure

LCH 1 is mapped to MAC-d flow 2 which is configured for non-scheduled transmission allowing one SDU/TTI to be sent.

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1

c) The SS waits until data is received and checks that only 1 PDU/TTI is transmitted

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		1 RLC PDU on LCH 1	
2	→		MAC-es PDU containing 1 RLC PDU	This step is repeated 10 times until the complete SDU is transmitted

Specific Message Contents

None

7.1.6.2.3.5 Test requirements

1. After step 1, the SS shall not receive any SI.

2. In step 2, the SS shall receive 1 MAC-es PDU containing 1 RLC PDU in each TTI until the complete SDU has been received.

7.1.6.2.4 MAC-es/e correct handling of scheduled transmissions when absolute grant varies

7.1.6.2.4.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.2.4.2 Conformance requirement

Extract from 25.321 clause 9.2.5.2.2:

The absolute grant message is sent on downlink, on the configured E-AGCH, from the serving E-DCH cell and allows the Node B scheduler to directly adjust the granted rate of UEs under its control.

[…]

Absolute Grant Value:
This field indicates the maximum E-DCH traffic to pilot ratio (E-DPDCH/DPCCH) that the UE is allowed to use in the next transmission. The length of the Absolute Grant Value field is 5 bits

[…]

Extract From 25.321 clause 9.2.6.2.1:

The Absolute Grant is sent on downlink on a set of configured E-AGCHs from the serving E-DCH cell and allows the Node B scheduler to directly adjust the granted rate and assigned physical resources for UEs under its control. The physical resource assignment indicates to the UE the maximum amount of uplink resources that it may use for a scheduled transmission.

The E-AGCH is a shared channel that uses an E-RNTI specific CRC in order to address messages to specific UEs (see [19]). For TDD, the RRC shall configure the MAC with a primary E-RNTI only.

A UE is required to monitor a set of E-AGCHs. The RRC signals to the UE details of the set of E-AGCHs that are to be monitored. The UE decodes an Absolute Grant intended for it on the basis of the E-RNTI sent to it by the Node B via the SRNC and by RRC. The following information will be conveyed in an absolute grant message:

Absolute Grant Value – maximum power granted per resource unit (per slot)

The physical resources to be used for transmission

- Channelisation Code
- Timeslots
- Resource Duration (optional)

The absolute grant message itself includes multiple fields that are multiplexed together into between 14 and 28 bits for 3.84/7.68 Mcps TDD and between 23 and 26 bits for 1.28 Mcps TDD (depending on the system configuration) inside the MAC-e of the Node B and then submitted to the physical layer for transmission on the E-AGCH. These fields are:

- Absolute Grant Value:
  For TDD, this field indicates the maximum E-DCH traffic to reference power ratio (E-PUCH/$P_{e\text{-}base}$) per TDD resource unit that the UE is allowed to use on the E-DCH resources associated with the Absolute Grant. A TDD resource unit is defined as one sixteenth of the OVSF code space in one timeslot. The length of the Absolute Grant Value field for TDD is 5 bits.

- Channelisation Code:
  This field describes the code component of the physical resource grant. For 1.28/3.84 Mcps TDD it comprises an enumerated value of length 5 bits indicating which node on the OVSF code tree has been allocated. For 7.68 Mcps TDD it comprises an enumerated value of length 6 bits indicating which node on the OVSF tree has been allocated. The mapping between the allocated OVSF and the enumerated node 0…30 for 1.28/3.84 Mcps and 0…62 for 7.68 Mcps is as given in [19].

- Timeslot Resource Related Information:
  This field describes the timeslot component of the physical resource grant and comprises a bitmap of length n_{TRRI} indicating which of the timeslots configured for E-DCH use by RRC have been allocated with the LSB corresponding to the lowest numbered E-DCH timeslot and the MSB corresponding to the highest numbered timeslot. The length of the TRRI field (n_{TRRI}) is 5 bits for 1.28 Mcps TDD and is configurable by RRC on a per-cell basis between 1 and 12 bits for 3.84/7.68 Mcps TDD.

- Resource Duration Indicator:
  Optionally, RRC may configure, on a per-cell basis the presence of a resource duration indicator field on E-AGCH for TDD. If configured as present in a cell, 3 bits are used to indicate the number of TTI's allocated and the spacing between the allocated TTIs via a single grant according to table 9.2.6.2.1-2. If the field is configured as not present on E-AGCH in the cell, a value of 0 is implicitly assumed by the UE corresponding to 1 TTI.

Table 9.2.6.2.1-2 – Resource Duration Indicator (RDI) interpretation

Resource Duration Indicator (3 bits)	TTIs allocated	TTI spacing
0	1	1
1	2	1
2	2	2
3	2	4
4	4	1
5	4	2
6	4	4
7	8	1

- E-AGCH Cyclic Sequence Number (ECSN):
  The ECSN is a 3-bit field used to assist the UE with outer-loop power control of E-AGCH (cf. HCSN for HS-SCCH).

- E-HICH Indicator(EI) (1.28 Mcps TDD only)
  The E-HICH indicator (EI) consists of 2 bits and is used to indicate which E-HICH will convey the acknowledgement indicator for the scheduled UEs.

- E-UCCH Number Indicator (ENI) (1.28 Mcps TDD only)
  The E-UCCH Number Indicator (ENI) is a 3-bit field used to indicate the detailed number of E-UCCH.

[…]

UEs in CELL_DCH state, configured with an E-DCH transport channel shall maintain a Serving Grant and the list of active HARQ processes based on the absolute and relative grant commands decoded on the configured E-AGCH and E-RGCH(s).

[…]

For all logical channels, if the logical channel belongs to a non-scheduled MAC-d flow, its data shall be considered as available up to the corresponding non-scheduled grant, if the logical channel does not belong to a non-scheduled MAC-d flow, its data shall be considered as available up to the Serving Grant;

Reference(s)

TS 25.321 clauses 9.2.5.2.2, 9.2.6.2.1, 11.8.1.3

7.1.6.2.4.3 Test purpose

To verify that the UE transmits different amount of data when the absolute grant varies.

7.1.6.2.4.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4c(FDD) /6.11.5.4.7.6(1.28Mcps TDD) using condition A12(FDD) /A11(1.28Mcps TDD) as specified in clause 9.1 of TS 34.108. The following parameters are specific for this test case:

Parameter	Value
Periodicity for scheduling info	No periodic scheduling info
E-TFCI table	Table 0 for 10 ms TTI (FDD)
E-TFCI table	5ms TTI E-DCH Transport Block Size Table 0(1.28Mcps TDD)

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Test procedure

Logical Channel with Id 7 (LCH 1) is mapped to MAC-d flow 2 with priority 1.

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS transmits 4 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1

c) SS waits until an SI is received

d) The SS issues an absolute grant that allows the UE to transmit 1 SDU/TTI (absolute grant signalling value 4)

e) The SS waits until data is received and checks that only 1 SDU/TTI is transmitted

f) The SS waits until all 4 SDUs have been received

g) The SS removes the scheduling grant for E-DCH for the UE

h) The SS transmits 8 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1

i) SS waits until an SI is received

j) The SS issues an absolute grant that allows the UE to transmit 4 SDUs/TTI (absolute grant signalling value 7)

k) The SS waits until data is received and checks that only 4 SDUs/TTI is transmitted

l) The SS waits until all 8 SDUs have been received

m) The SS removes the scheduling grant for E-DCH for the UE

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	4 RLC PDUs on LCH 1	
1a	→	SI indicating data on LCH 1	
2	←	Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 4
3	→	MAC es PDU containing 1 RLC PDU, 4 TTIs in a row	
4	←	Removal of absolute grant	Signalling value 1
5	←	8 RLC PDUs on LCH 1	
5a	→	SI indicating data on LCH 1	
6	←	Absolute grant allowing the UE to transmit 4 RLC PDUs per TTI	Signalling value 7
7	→	MAC es PDU containing 4 RLC PDUs, 2 TTIs in a row	
8	←	Removal of absolute grant	Signalling value 1

Specific Message Contents

None

7.1.6.2.4.5 Test requirements

1. In step 3, the SS shall receive 1 MAC-es PDU containing 1 RLC PDU. This shall happen 4 TTIs in a row.

2. In step 7, the SS shall receive 1 MAC-es PDU containing 4 RLC PDUs. This shall happen 2 TTIs in a row.

7.1.6.2.5 MAC-es/e de-activation and re-activation of HARQ processes

7.1.6.2.5.1 Definition and applicability

All UEs which support E-DCH and support 2 ms TTI.

7.1.6.2.5.2 Conformance requirement

The Serving Grant Update procedure shall be applied at every TTI boundary and shall take into account the Absolute Grant message, Serving Relative Grant and non-serving Relative Grants that apply to the TTI.

The UE shall:

1> set reference_ETPR to the E-DPDCH to DPCCH power ratio as defined in subclause 3.1.2;

1> if an Absolute Grant was received for this TTI:

2> if the Identity type is “Primary”, and the Absolute Grant value is set to "INACTIVE":

3> if Absolute Grant Scope indicates "Per HARQ process" and a 2ms TTI is configured:

4> de-activate the process given by the value of CURRENT_HARQ_PROCESS.

3> if Absolute Grant Scope indicates "All HARQ processes" and a secondary E-RNTI was configured by higher layers:

4> activate all HARQ processes;

4> set Serving_Grant = Stored_Secondary_Grant;

4> set Primary_Grant_Available to "False".

3> if Absolute Grant Scope indicates "All HARQ processes", a 2ms TTI is configured and a secondary E-RNTI was not configured by higher layers:

4> deactivate all HARQ processes (if a process was inactive it remains inactive, if a process was active it becomes inactive).

2> else if the Absolute Grant Value is different from "INACTIVE":

3> if the Identity Type is "Secondary":

4> set Stored_Secondary_Grant = Absolute Grant Value.

3> if the Identity Type is "Primary" or Primary_Grant_Available is set to "False":

4> set Serving_Grant = Absolute Grant Value.

4> if the Identity Type is "Primary":

5> set Primary_Grant_Available to "True";

5> if Absolute Grant Scope indicates "Per HARQ process":

6> activate the process given by the value of CURRENT_HARQ_PROCESS.

5> if Absolute Grant Scope indicates "All HARQ processes":

6> activate all HARQ processes;

5> if AG_Timer is not active, it shall be started, otherwise it shall be restarted.

Reference(s)

TS 25.321 clause 11.8.1.3.1

7.1.6.2.5.3 Test purpose

The purpose of this test case is to verify the selective de-activation and re-activation of a HARQ process

7.1.6.2.5.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4c using condition A12 as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25

The following parameters are specific for this test case:

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99)
E-DCH TTI	2 ms

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to (10*41)-2 octets.

Test procedure

In this test procedure The UE is configured with one logical channels, with an UL SDU size of 39 octets.

a) SS has not issued any scheduling grant for E-DCH to the UE

b) SS transmits 5 SDU’s of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

c) SS waits until an SI is received.

d) SS issues an absolute grant that allows the UE to send 1 RLC PDU per TTI (signalling value 4)

e) SS starts receiving loop backed RLC PDU’s. SS checks all 8 Harq processes are used.

f) SS transmits an absolute grant, with Absolute Grant Value set to "INACTIVE" and Absolute Grant Scope indicating "Per HARQ process" corresponding to HARQ process 0 & 4.

g) SS transmits 5 SDU’s of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

h) SS starts receiving loop backed RLC PDU’s. SS checks Harq processes 0 and 4 are not used.

i) SS transmits an absolute grant, with Absolute Grant Value that allows UE to send 1 RLC PDU per TTI (signalling value 4) and Absolute Grant Scope indicating " All HARQ processes ".

j) SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

k) SS starts receiving loop backed RLC PDU’s. SS checks all 8 Harq processes are used.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	5 RLC PDUs on LCH 1	
2	→	SI indicating data on LCH 1	
3	←	Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 4
4	→	MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated until all 5 RLC SDU's are received
5	←	Absolute grant de-activating HARQ Process 0	
6	←	Absolute grant de-activating HARQ Process 4	
7	←	5 RLC PDUs on LCH 1	
8	→	MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated until all 5 RLC SDU's are received.
9	←	Absolute grant activating All HARQ Process 0	Signalling value 4
10	←	5 RLC PDUs on LCH 1	
11	→	MAC es PDU's containing 1 RLC PDU from LCH 1	This step is repeated until all 5 RLC SDU's are received

Specific Message Contents

None

7.1.6.2.5.5 Test requirements

1. In step 4 all 8 HARQ processes shall be used to transmit RLC PDU's
2. In step 8 HARQ processes 0 and 4 shall not be used to transmit RLC PDU's
3. In step 11 all 8 HARQ processes shall be used to transmit RLC PDU's

7.1.6.2.6 MAC-es/e correct handling of relative grants

7.1.6.2.6.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.2.6.2 Conformance requirement

The Serving Grant Update procedure shall be applied at every TTI boundary and shall take into account the Absolute Grant message, Serving Relative Grant and non-serving Relative Grants that apply to the TTI.

The UE shall:

1> set reference_ETPR2 to reference_ETPR as defined in subclause 3.1.2;

1> set reference_ETPR to the E-DPDCH to DPCCH power ratio as defined in subclause 3.1.2;

1> if an Absolute Grant was received for this TTI:

…..

1> else (no Absolute Grant received):

2> if the HARQ process given by the value of CURRENT_HARQ_PROCESS is active; and

2> if Primary_Grant_Available is equal to "True"; and

2> if Serving_Grant <> "Zero_Grant" ; and

2> if AG_Timer has expired; and2> if there was a scheduled transmission (see Note) in the previous TTI of the HARQ process given by the value of CURRENT_HARQ_PROCESS:

3> if the Serving Relative Grant indicates "UP":

4> determine the Serving_Grant in accordance with subclause 9.2.5.2.1.

3> else, if the Serving Relative Grant indicates "DOWN":

4> determine the Serving_Grant in accordance with subclause 9.2.5.2.1.

1> if any Non-Serving Relative Grants indicate "DOWN" for this TTI and Serving_Grant <> "Zero_Grant":

2> Serving_Grant = MIN(Serving_Grant, Serving_Grant determined in accordance with subclause 9.2.5.2.1);

2> Maximum_Serving_Grant = Serving_Grant.

2> if Non_Serving_RG_Timer is not active it shall be started, otherwise it shall be restarted;

1> else if no Non-Serving Relative Grants indicate "DOWN" for this TTI:

2> if Non_Serving_RG_Timer has not expired:

3> Serving_Grant = MIN(Maximum_Serving_Grant, Serving_Grant).NOTE: Scheduling Information sent alone is not considered as a scheduled transmission.

Reference(s)

TS 25.321 clause 11.8.1.3.1

7.1.6.2.6.3 Test purpose

The purpose of this test case is

1. To verify that the UE acts on serving and non-serving relative grants when the UE is using the Primary E-RNTI.
2. To verify that the UE only acts on non-serving relative grants when the UE is using the Secondary E-RNTI
3. To verify that the UE does not use a Serving_Grant value greater than Maximum_Serving_Grant when the Non_Serving_RG_Timer has not expired.

7.1.6.2.6.4Method of test

Initial conditions

System Simulator:

2 cells, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4c using condition A12 as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25

Cell 1 is the serving E-DCH cell.

The following parameters are specific for this test case:

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99)
E-DCH TTI	10 ms
New Secondary E-RNTI	'1010 1111 1010 1111'
3-Index-Step Threshold	20
2-Index-Step Threshold	37

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to (10*41)-2 octets.

Test procedure

In this test procedure the UE is configured with one logical channel.

0) SS waits for the Measurement report from the UE with event set to "1a" and then adds the Radio link on the second cell by sending an Active Set Update message.

a) SS has not issued any scheduling grant for E-DCH to the UE

b) SS transmits 10 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

c) SS waits until an SI is received.

d) SS issues a primary absolute grant that allows the UE to send 1 RLC PDU per TTI (signalling value 4)

e) SS starts receiving loop backed RLC PDU's.

f) After receiving data once on all HARQ processes in a HARQ-RTT, SS transmits a relative grant in cell 1(serving cell) as 'UP'.

g) SS continues receiving loop back PDU's and checks that UE has started using the serving grant corresponding to more than one RLC PDU's transmitted per TTI.

h) SS transmits 10 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

i) SS starts receiving loop backed RLC PDU's.

j) After receiving data once on all HARQ processes in a HARQ-RTT, SS transmits a relative grant in cell 2(non serving) as 'Down'.

k) SS continues receiving loop back PDU's and checks that the UE has reduced the serving grant corresponding to one RLC PDU transmitted per TTI.

l) SS transmits a primary absolute grant, with Absolute Grant Value set to "INACTIVE" and Absolute Grant Scope indicating "All HARQ process" . The UE starts using the Secondary Grant.

m) SS transmits 10 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

n) SS waits until an SI is received.

o) SS issues a secondary absolute grant corresponding to 1 RLC PDU of size 41 octets per TTI (signalling value 4)

p) After receiving data once on all HARQ processes in a HARQ-RTT, SS transmits a relative grant in cell 1(serving cell) as 'UP'.

q) SS continues receiving loop back PDU's and checks that the UE has ignored the previous relative grant.

r) SS issues a secondary absolute grant corresponding to 2 RLC PDU's of size 41 octets per TTI (signalling value 5)

s) SS transmits 10 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

t) SS starts receiving loop backed RLC PDU's. SS checks that the UE is using a serving grant corresponding to 2 RLC PDU's transmitted per TTI.

u) After receiving data on all HARQ processes for two HARQ-RTTs, SS transmits a relative grant in cell 2 (non serving) as 'Down'. (*Note)

v) SS continues receiving loop back PDU's and checks that UE has reduced the serving grant corresponding to 1 RLC PDU's transmitted per TTI.

w) SS issues a secondary absolute grant corresponding to 2 RLC PDU's of size 41 octets per TTI (signalling value 5) wa) SS transmits 10 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

wb) SS starts receiving loop backed RLC PDU's. SS checks that the UE is using a serving grant corresponding to 2 RLC PDU's transmitted per TTI.

x) After receiving data on all HARQ processes for two HARQ-RTTs, SS transmits a relative grant in cell 2 (non serving) as 'Down'.

y) In the following TTI, SS transmits a secondary absolute grant that allows the UE to send 2 RLC PDU's of size 41 octets per TTI (signalling value 5).

za) Void

aa) SS continues receiving loop back PDU's and checks that UE has reduced the serving grant corresponding to 1 RLC PDU's transmitted per TTI.

Expected sequence

Step	Direction UE SS	Message	Comments
0a	→	Measurement Report	See specific message contents for this message
0b	←	ACTIVE SET UPDATE	The SS instructs the UE to add cell 2 in the active set
0c	→	ACTIVE SET UPDATE COMPLETE	
1	←	10 RLC PDUs on LCH 1	
2	→	SI indicating data on LCH 1	
3	←	Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 4
4	→	MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated for one HARQ RTT
5	←	Relative Grant in cell 1 with 'UP'	
6	→	MAC es PDU containing more than one RLC PDU from LCH 1	This step is repeated until all RLC SDU's are received.
7	←	10 RLC PDUs on LCH 1	
8	→	MAC es PDU containing more than one RLC PDU from LCH 1	This step is repeated for one HARQ RTT
9	←	Relative Grant in cell 2 with 'DOWN'	
10	→	MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated until all RLC SDU's are received.
11	←	Primary Absolute grant set to 'INACTIVE' and scope 'All HARQ Processes'	UE serving grant to Stored_Secondary_Grant which is initialised to 'Zero_grant'.
12	←	10 RLC PDUs on LCH 1	
13	→	SI indicating data on LCH 1	
14	←	Secondary Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 4
15	→	MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated for one HARQ RTT
16	←	Relative Grant in cell 1 with 'UP'	
17	→	MAC es PDU containing one RLC PDU from LCH 1	This step is repeated until all RLC SDU's are received.
18	←	Secondary Absolute grant allowing the UE to transmit 2 RLC PDU per TTI	Signalling value 5
19	←	10 RLC PDUs on LCH 1	
20	→	MAC es PDU containing 2 RLC PDU from LCH 1	This step is repeated for two HARQ RTTs
21	←	Relative Grant in cell 2 with 'DOWN'	
22	→	MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated until all RLC SDU's are received.
23	←	Secondary Absolute grant allowing the UE to transmit 2 RLC PDUs per TTI	Signalling value 5 SG_{LUPR} corresponding to 19/15
23a	←	10 RLC PDUs on LCH 1	
23b	→	MAC es PDU containing 2 RLC PDU from LCH 1	This step is repeated for two HARQ RTTs
24	←	Relative Grant in cell 2 with 'DOWN'	SG_{LUPR} corresponding to 17/15 sufficient for 1 RLC PDU per TTI
25	←	1 TTI after step 24, Absolute grant allowing the UE to transmit 2 RLC PDUs per TTI	Signalling value 5
26	←	Void	
27	→	MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated until all RLC SDU's are received.

Specific Message Contents

MEASUREMENT REPORT (Step 0a)

Use the same message as specified in 34.108 except for the following:

Information Element	Value/remark
Message Type	
Integrity check info	
- Message authentication code	This IE is checked to see if it is present. The value is compared against the XMAC-I value computed by SS. The first/ leftmost bit of the bit string contains the most significant bit of the MAC-I.
- RRC Message sequence number	This IE is checked to see if it is present. The value is used by SS to compute the XMAC-I value.
Measurement identity	1
Measured Results	
- Intra-frequency measured results	Check to see if measurement results for 2 cells are included (the order in which the different cells are reported is not important)
- Cell measured results	
- Cell Identity	Checked that this IE is absent
- Cell synchronisation information	Checked that this IE is present and includes IE COUNT-C-SFN frame difference
- Primary CPICH info	
- Primary scrambling code	Refer to clause titled "Default settings for cell No.2 (FDD)" in clause 6.1 of TS 34.108
- CPICH Ec/N0	Checked that this IE is absent
- CPICH RSCP	Checked that this IE is present
- Pathloss	Checked that this IE is absent
- Cell measured results	
- Cell Identity	Checked that this IE is absent
- Cell synchronisation information	Checked that this IE is absent
- Primary CPICH info	
- Primary scrambling code	Refer to clause titled "Default settings for cell No.1 (FDD)" in clause 6.1 of TS 34.108
- CPICH Ec/N0	Checked that this IE is absent
- CPICH RSCP	Checked that this IE is present
- Pathloss	Checked that this IE is absent
Measured results on RACH	Checked that this IE is absent
Additional measured results	Checked that this IE is absent
Event results	
- Intra-frequency measurement event results	
- Intra-frequency event identity	1a
- Cell measurement event results	
- Primary CPICH info	
- Primary scrambling code	Refer to clause titled "Default settings for cell No.2 (FDD)" in clause 6.1 of TS 34.108

ACTIVE SET UPDATE (Step 0b)

The message to be used in this test is defined in TS 34.108, clause 9, with the following exceptions:

Information Element	Value/remark
Activation time	Not Present
Radio link addition information	
- Primary CPICH Info	
- Primary Scrambling Code	Refer to clause titled "Default settings for cell No.2 (FDD)" in clause 6.1 of TS 34.108
- Downlink DPCH info for each RL	
- CHOICE mode	FDD
- Primary CPICH usage for channel estimation	P-CPICH can be used.
- DPCH frame offset	Calculated value from Cell synchronisation information
- Secondary CPICH info	Not Present
- DL channelisation code	This IE is repeated for all existing downlink DPCHs allocated to the UE
- Secondary scrambling code	1
- Spreading factor	Refer to TS 34.108 clause 6.10.2.4 "Typical radio parameter sets"
- Code Number	For each DPCH, assign the same code number in the current code given in cell 1.
- Scrambling code change	Not Present
- TPC Combination Index	1
- Close loop timing adjustment mode	Not Present
- TFCI Combining Indicator	FALSE
- E-HICH Information	
- Channelisation code	4
- Signature sequence	1
- CHOICE E-RGCH Information	
- E-RGCH Information	
- Signature Sequence	0
- RG combination index	1

7.1.6.2.6.5 Test requirements

1. After step 5 UE will start sending 2 RLC PDU’s per TTI.
2. After step 9, UE will reduce number of RLC PDU’s per TTI to 1.
3. After step 16, UE will not change its rate of RLC PDU’s per TTI.
4. After step 21, UE will reduce number of RLC PDU’s per TTI to 1.

4a After Step 23,UE will start sending 2 RLC PDU’s per TTI

4b. After step 24, UE will reduce number of RLC PDU’s per TTI to 1

5. After step 25, UE will not change its SG_{LUPR} and hence in step 27 will loop back PDU’s at the rate of 1 RLC PDU per TTI.

7.1.6.2.7 MAC-es/e correct handling of absolute grants on Primary and Secondary E-RNTI

7.1.6.2.7.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.2.7.2 Conformance requirement

The Serving Grant Update procedure shall be applied at every TTI boundary and shall take into account the Absolute Grant message, Serving Relative Grant and non-serving Relative Grants that apply to the TTI.

The UE shall:

1> set reference_ETPR to the E-DPDCH to DPCCH power ratio as defined in subclause 3.1.2;

1> if an Absolute Grant was received for this TTI:

2> if the Identity type is "Primary", and the Absolute Grant value is set to "INACTIVE":

3> if Absolute Grant Scope indicates "Per HARQ process" and a 2ms TTI is configured:

4> de-activate the process given by the value of CURRENT_HARQ_PROCESS.

3> if Absolute Grant Scope indicates "All HARQ processes" and a secondary E-RNTI was configured by higher layers:

4> activate all HARQ processes;

4> set Serving_Grant = Stored_Secondary_Grant;

4> set Primary_Grant_Available to "False".

3> if Absolute Grant Scope indicates "All HARQ processes", a 2ms TTI is configured and a secondary E-RNTI was not configured by higher layers:

4> deactivate all HARQ processes (if a process was inactive it remains inactive, if a process was active it becomes inactive).

2> else if the Absolute Grant Value is different from "INACTIVE":

3> if the Identity Type is "Secondary":

4> set Stored_Secondary_Grant = Absolute Grant Value.

3> if the Identity Type is "Primary" or Primary_Grant_Available is set to "False":

4> set Serving_Grant = Absolute Grant Value.

4> if the Identity Type is "Primary":

5> set Primary_Grant_Available to "True";

5> if Absolute Grant Scope indicates "Per HARQ process":

6> activate the process given by the value of CURRENT_HARQ_PROCESS.

5> if Absolute Grant Scope indicates "All HARQ processes":

6> activate all HARQ processes;

5> if AG_Timer is not active, it shall be started, otherwise it shall be restarted.
Reference(s)

TS 25.321 clause 11.8.1.3.1

7.1.6.2.7.3 Test purpose

The purpose of this test case is to verify that the UE acting on absolute grants given on the Primary and Secondary E-RNTI and switching between the 2 cases.

7.1.6.2.7.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4c using condition A12 as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25

The following parameters are specific for this test case:

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99)
New Secondary E-RNTI	'1010 1111 1010 1111'

The UE is placed into UE test loop mode 1 with the UL SDU size set to (4*41)-2 octets.

Test procedure

In this test procedure The UE is configured with one logical channel.

a) SS has not issued any scheduling grant for E-DCH to the UE

b) SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

c) SS waits until an SI is received.

d) The SS issues primary absolute grant corresponding to 4 RLC PDUs of size 41 octets per TTI (signalling value 7)

e) SS starts receiving loop backed RLC PDU's.

f) SS transmits primary absolute grant, with Absolute Grant Value set to "INACTIVE" and Absolute Grant Scope indicating "All HARQ process" . UE starts using Secondary Grant.

g) SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

h) SS waits until an SI is received.

i) The SS issues secondary absolute grant corresponding to 1 RLC PDU of size 41 octets per TTI (signalling value 4)

j) SS starts receiving loop backed RLC PDU's.

k) SS issues secondary absolute grant of 'ZERO_GRANT'.

l) SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

m) SS waits until an SI is received.

n) The SS issues primary absolute grant corresponding to 4 RLC PDUs of size 41 octets per TTI (signalling value 7), with Absolute Grant Scope set as "All HARQ processes". UE starts using primary grant.

o) SS starts receiving loop backed RLC PDU's.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		1 RLC PDUs on LCH 1	
2	→		SI indicating data on LCH 1	
3	←		Primary Absolute grant allowing the UE to transmit 4 RLC PDU per TTI	Signalling value 7
4	→		MAC es PDU containing 4 RLC PDU's from LCH 1	
5	←		Primary Absolute grant set to 'INACTIVE' and scope 'All HARQ Processes'	UE serving grant to Stored_Secondary_Grant which is initialised to 'Zero_grant'.
6	←		1 RLC PDUs on LCH 1	
7	→		SI indicating data on LCH 1	
8	←		Secondary Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 4
9	→		MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated until the whole RLC SDU is transmitted
10	←		Secondary Absolute grant set to 'Zero_Grant'	
11	←		1 RLC PDUs on LCH 1	
12	→		SI indicating data on LCH 1	
13	←		Primary Absolute grant allowing the UE to transmit 4 RLC PDU per TTI	Signalling value 7
14	→		MAC es PDU containing 4 RLC PDU's from LCH 1	

Specific Message Contents

None

7.1.6.2.7.5 Test requirements

1. In step 4, the SS shall receive 1 MAC-es PDU containing 4 RLC PDU's

1a. In step 7 UE shall transmit SI, as an indication that it has stopped using previous absolute grant.

2. After step 8, UE shall start sending loop backed PDU, with one RLC PDU per TTI.

3. In step 12 UE shall transmit SI.

4. After step 13, UE shall loop back all 4 RLC PDU's in one TTI.

7.1.6.2.8 MAC-es/e combined non-scheduled and scheduled transmissions

7.1.6.2.8.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.2.8.2 Conformance requirement

From 25.321 clause 11.8.1.4:

The transmission format and data allocation shall follow the requirements below:

[…]

- For all logical channels, if the logical channel belongs to a non-scheduled MAC-d flow, its data shall be considered as available up to the corresponding non-scheduled grant, if the logical channel does not belong to a non-scheduled MAC-d flow, its data shall be considered as available up to the Serving Grant;

[…]

- The amount of data from MAC-d flows for which non-scheduled grants were configured shall not exceed the value of the non-scheduled grant;

[…]

- When not in a power limited condition the maximum amount of data from MAC-d flows for which no non-scheduled grants were configured shall be quantized to the next smaller supported E-TFC based on the Serving Grant (after adjustment for compressed frames), the power offset from the selected HARQ profile, the non-scheduled grants (if any) and Scheduling Information (if any); In the case a 2ms TTI is configured and the HARQ process is inactive, the UE shall not include any such data in the transmission;

From 25.321 clause 11.9.1.4:

In TDD, rules for E-TFC selection shall be applied as provided below.

UEs shall apply E-TFC selection when invoked by the HARQ entity (see subclause 11.9.1.1.1).

For each MAC-d flow, RRC configures MAC-e with a HARQ profile and multiplexing list. Additionally, RRC configures MAC with a power offset in case the Scheduling Information needs to be transmitted without any higher-layer data. For 1.28 Mcps TDD, RRC also configures MAC with a retransmission timer and the maximum number of HARQ transmissions in case the Scheduling Information needs to be transmitted without any higher-layer data. The HARQ profile includes the power offset and maximum number of HARQ transmissions to use for this MAC-d flow. For 1.28 Mcps TDD, the HARQ profile also includes a retransmission timer attribute. The multiplexing list identifies for each MAC-d flow(s), the other MAC-d flows for which data can be multiplexed in a transmission that uses the power offset included in its HARQ profile.

RRC can control the scheduling of uplink data by giving each logical channel a priority between 1 and 8, where 1 is the highest priority and 8 the lowest. E-TFC selection in the UE shall be done in accordance with the priorities indicated by RRC. Logical channels have absolute priority, i.e. the UE shall maximise the transmission of higher priority data.

RRC can allocate non-scheduled transmission grants to individual MAC-d flows in order to reduce the transmission delays.

The UE shall determine whether to take scheduled or non-scheduled grants into account in the upcoming transmission. If neither are supposed to be taken into account (i.e. the TTI is not available for non-scheduled transmission and no Grant for scheduled transmission has been received) then no grant shall be assumed to exist. If a grant exists then the transmission format and data allocation shall follow the requirements below.

For each configured MAC-d flow, a given E-TFC can be in any of the following states:

- Supported state;

- Blocked state.

The E-TFC states are derived according to the following:

- If the transmission is a retransmission then only the E-TFC with the same block size as the original transmission may be in the supported state.

- For 1.28Mcps TDD, only E-TFCs from the E-TFCS (the table of TB sizes) which are consistent with the UE's E-DCH capability category shall be considered for the transmission;

- Only E-TFCs from the E-TFCS (the table of TB sizes) which can be supported by (exactly) the number of slots assigned by the grant shall be considered for the transmission;

- Only E-TFCs which result (for the granted timeslot and code physical resources) in a coderate lying between the maximum and minimum (inclusive) allowable code rates set by RRC [7] shall be considered for the transmission {note: the definition of the term "coderate" as used here is the same as that provided by [18]}. This shall be evaluated for both QPSK and 16-QAM modulation;

- P_{HARQ}, the HARQ profile power offset is selected (for 3.84/7.68Mcps TDD the HARQ profile for the transmission shall be selected among the HARQ profiles of MAC-d flows on which the highest priority logical channels with available data are mapped, for 1.28Mcps TDD the HARQ power offset shall be set to the maximum of HARQ power offset of all the MAC-d flows mapped to the same type of resource (scheduled or non-scheduled resource); Scheduling Information power offset shall be used when Scheduling Information is transmitted without any higher-layer data.)

- Only E-TFCs whose calculated transmission power requirement $P_{E\text{-}PUCH}$ (see [18]) is less than or equal to both the available and the granted power shall be considered for the transmission (note: this requirement does not apply in the case of a retransmission on non-scheduled resources). For TDD, the smallest E-TFC is considered always in the supported state. The granted power is defined as the calculated E-PUCH transmission power of [18] with β_e = (Absolute Grant Value + α_e). The available power is the maximum UE transmission power.

From those E-TFCs in the supported state the UE determines the largest block size that it is permitted to transmit within the given constraints.

The UE shall select the modulation type associated with the determined E-TFC (note: if an E-TFC is supported by both QPSK and 16-QAM then 16-QAM modulation shall be used if its power requirement (P_{E-PUCH}) is lower than the power requirement for QPSK, otherwise QPSK modulation shall be used).

Data allocation shall then be performed in accordance with the following:

- For all logical channels, if the logical channel belongs to a non-scheduled MAC-d flow, its data shall be considered as available up to the largest block size determined for the corresponding non-scheduled grant. If the logical channel does not belong to a non-scheduled MAC-d flow, its data shall be considered as available up to the largest block size determined for the Serving Grant;
- The data allocation shall maximise the transmission of higher priority data;
- The UE shall select the E-TFC, SF and modulation which minimises the power used (3.84/7.68 Mcps TDD only);
- The UE shall select the E-TFC and modulation which minimises the power used (1.28 Mcps TDD only);

Once an appropriate E-TFC and data allocation are found according to the rules above, the "Multiplexing and TSN Setting" entity shall generate the corresponding MAC-e PDU.

In 1.28Mcps TDD, when Scheduling Information is triggered by timer per subclause 11.9.1.5, the E-TFC selection and data-allocation process shall assume that Scheduling Information has a priority higher than any other logical channel.

The E-TFC selection function shall provide this MAC-e PDU and transmission HARQ profile to the HARQ entity. For 3.84Mcps TDD and 7.68Mcps TDD the selected E-TFC is also provided (Note: for 1.28Mcps TDD, the signalled transport block size index, i.e. E-TFCI, is the index of the selected E-TFC in the candidate set.). The maximum number of HARQ transmissions and the power offset in this profile shall be set respectively to the maximum of both the Max Number of HARQ Transmissions and of the power offset of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission. For 1.28 Mcps TDD, the maximum number of HARQ transmissions shall be set to the maximum of the Max Number of HARQ Transmissions of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission, the HARQ power offset shall be set to the maximum of HARQ power offset of all the MAC-d flows mapped to the same type of resource (scheduled or non-scheduled resource), and the retransmission timer shall be set to the maximum of the retransmission timer value of the HARQ profiles that are permitted to be multiplexed into the transmission. For 1.28Mcps TDD, when the Scheduling Information needs to be transmitted without any higher-layer data, the specific HARQ profile should be applied. Each HARQ process which is associated with a buffer holding a MAC-e PDU for potential retransmission shall maintain the HARQ profile and the number of re-transmissions that have occurred. For 1.28 Mcps TDD, the HARQ process shall also maintain the value of RTX_TIMER.

Further information on E-TFC selection is provided in Annex CA.

From 25.331 clause 8.6.5.18:

1> if the IE "E-DCH MAC-d flow multiplexing list" is included:

2> only multiplex MAC-d PDU's from the E-DCH MAC-d flow indicated in the IE "E-DCH MAC-d flow identity" with MAC-d PDU's from E-DCH MAC-d flows with which multiplexing in the same MAC-e PDU is allowed in accordance to the IE "E-DCH MAC-d flow multiplexing list".

[…]

1> for FDD:

2> if the IE "Non-scheduled transmission grant info" is included:

3> if the TTI configured on the E-DCH equals 2ms, and the IE "2ms non-scheduled transmission grant HARQ process allocation" is configured for this MAC-d flow:

4> MAC-d PDU's for logical channels belonging to this MAC-d flow shall only be included in a MAC-e PDU transmitted by HARQ processes allowed by the IE "2ms non-scheduled transmission grant HARQ process allocation", with a total contribution from this MAC-d flow not exceeding the size as signalled by the IE "Max MAC-e PDU contents size".

3> else:

4> MAC-d PDU's for logical channels belonging to this MAC-d flow shall be included in a MAC-e PDU transmitted by any HARQ process, with a total contribution from this MAC-d flow not exceeding the size as signalled by the IE "Max MAC-e PDU contents size".

1> for TDD:

2> if the IE "Non-scheduled transmission grant info" is included:

3> MAC-d PDU's for logical channels belonging to this MAC-d flow shall only be included in a MAC-e PDU transmitted by HARQ processes designated as non scheduled (Ids 4 – 7) in the TTIs indicated (as determined from the IEs "Activation Time", "Resource Duration" and "Resource Periodicity").

2> if the IE "Scheduled transmission grant info" is included:

3> transmission of MAC-d PDUs for logical channels belonging to this MAC-d flow shall be in accordance with the received scheduled grant on E-AGCH (see [15]).

Reference(s)

TS 25.321 clause 11.8.1.4, 11.9.1.4, TS 25.331 clause 8.6.5.18

7.1.6.2.8.3 Test purpose

To verify that the UE is able to handle combined non-scheduled and scheduled transmissions.

7.1.6.2.8.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4d (FDD) /6.11.5.4.7.7(1.28Mcps TDD) using condition A15 (FDD) /A14 (1.28Mcps TDD) as specified in clause 9.1 of TS 34.108. The following parameters are specific for this test case with the logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the test case			

The following parameters are specific for this test case:

Parameter	Value
E-DCH MAC-d flow multiplexing list	11111111 (See 25.331 10.3.5.1b) Note 1
E-TFCI table	Table 0 for 10 ms TTI (FDD)
E-TFCI table	5ms TTI E-DCH Transport Block Size Table 0(1.28Mcps TDD)
Note 1: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The UE is placed into UE test loop mode 1 with the UL SDU size for LCH 1 set to (25*41)-2 octets and LCH 2 size set to 39 octets.

Test procedure

The UE is configured with a non-scheduled grant on MAC-d flow 2, and the value of the “Max MAC-e PDU contents size” is 500 bits. The UE is not given any grant to transmit on MAC-d flow 3 (LCH 2).

a) The SS has not issued any grant for E-DCH on MAC-d flow 3 (LCH 2)

b) The SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH 2

c) The SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1

d) The SS waits until data is received and checks that the first TTI contains only data on LCH 1

e) The SS issues an absolute grant that allows the UE to send with a high rate on LCH 2 (well above 1 SDU/TTI) immediately after the previous step (i.e. not more than one TTI after the first data on LCH 1 has been looped back).

f) The SS receives data from the two logical channels LCH 1 and LCH 2 in one TTI.

g) The SS removes the scheduling grant for E-DCH for the UE

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		1 RLC PDU on LCH 2	SDU size is 40 bytes
2	←		1 RLC PDU on LCH 1	SDU size is 40 bytes
2a	→		SI indicating data on LCH 2	Step 2a and 3 can happen in any order
3	→		MAC es PDU containing 1 RLC PDU on LCH 1	
4	←		Absolute grant allowing the UE to transmit with high data rate on LCH 2	Signalling value 31
5	→		MAC es PDU containing 1 RLC PDU on LCH 1 and 1 RLC PDU on LCH 2	Before and after this step, SS continues to receive 1 RLC PDU on LCH 1 per TTI, until complete SDU consisting of 25 PDU’s is received.
6	←		Removal of absolute grant	Signalling value 1

Specific Message Contents

None

7.1.6.2.8.5 Test requirements

1. In step 3, the SS shall receive 1 MAC-es PDU containing 1 RLC PDU on LCH 1.

2. In step 5, the SS shall receive 1 MAC-es PDU containing 1 RLC PDU on LCH 1 and 1 RLC PDU on LCH 2 within the same TTI.

7.1.6.2.9 MAC-es/e Correct handling of HARQ profile power offsets

7.1.6.2.9.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.2.9.2 Conformance requirement

In FDD mode, the rules for E-TFC selection provided below shall apply to UEs in CELL_DCH state with an E-DCH transport channel configured. These UEs shall apply the E-TFC selection procedure when invoked by the HARQ entity (see subclause 11.8.1.1.1). In the case where a 2ms TTI is configured, E-TFC selection shall not be performed for TTIs that overlap with an uplink compressed mode gap. The E-TFC restriction procedure described in [12] shall always be applied before the E-TFC selection process below. Furthermore, for UEs that are also configured with a DCH transport channel on uplink, the TFC selection procedure shall be applied before either of these.

For each MAC-d flow, RRC configures MAC with a HARQ profile and a multiplexing list. Additionally, RRC configures MAC with a power offset for "Control-only" transmissions. This power offset and a maximum number of

HARQ transmissions of 8 will be used to define a HARQ profile for "Control-only" transmissions which will be used, in case the Scheduling Information needs to be transmitted without any higher-layer data. The HARQ profile includes the power offset and maximum number of HARQ transmissions to use for this MAC-d flow. The multiplexing list identifies for each MAC-d flow(s), the other MAC-d flows from which data can be multiplexed in a transmission that uses the power offset included in its HARQ profile.

RRC can control the scheduling of uplink data by giving each logical channel a priority between 1 and 8, where 1 is the highest priority and 8 the lowest. E-TFC selection in the UE shall be done in accordance with the priorities indicated by RRC. Logical channels have absolute priority, i.e. the UE shall maximise the transmission of higher priority data.

RRC can allocate non-scheduled transmission grants to individual MAC-d flows in order to reduce the transmission delays. When a 2ms TTI is configured each non-scheduled grant is applicable to the specific set of HARQ processes indicated by RRC. The applicability of scheduled grants can be also restricted to a specific set of HARQ processes when a 2ms TTI is configured. HARQ process restriction and reservation is under the control of the serving cell Node B and indicated to the UE by RRC.

For each configured MAC-d flow, a given E-TFC can be in any of the following states:

- Supported state;
- Blocked state.

At each TTI boundary, UEs in CELL_DCH state with an E-DCH transport channel configured shall determine the state of each E-TFC for every MAC-d flow configured based on its required transmit power versus the maximum UE transmit power (see [7] and [12]). If no DCH transport channel is configured or if a DCH transport channel is configured and the selected TFC is "empty" (see [3]), the UE shall consider that E-TFCs included in the minimum set of E-TFCs are always in supported state (see [7]).

At every TTI boundary for which a new transmission is requested by the HARQ entity (see subclause 11.8.1.1.1), the UE shall perform the operations described below. UEs configured both with DCH and E-DCH transport channels shall perform TFC selection before performing E-TFC selection.

The Serving Grant Update function provides the E-TFC selection function with the maximum E-DPDCH to DPCCH power ratio that the UE is allowed to allocate for the upcoming transmission for scheduled data (held in the Serving Grant state variable – see subclause 11.8.1.3).

The HARQ process ID for the upcoming transmission is determined using the following formulae:

- For 2ms TTI: CURRENT_HARQ_PROCESS_ID = [5*CFN + subframe number] **mod** HARQ_RTT
- For 10ms TTI: CURRENT_HARQ_PROCESS_ID = [CFN] **mod** HARQ_RTT

Based on this current HARQ process ID and the RRC configuration, the UE shall determine whether to take the scheduled and non-scheduled grants into account in the upcoming transmission. If they are not supposed to be taken into account, then the corresponding grant shall be assumed to not exist. If the variable Serving_Grant has the value "Zero_Grant" after the Serving Grant Update, then the Serving Grant shall not be taken into account in the upcoming transmission.

When Scheduling Information is triggered per subclause 11.8.1.6, the E-TFC selection and data-allocation process shall assume that a non-scheduled grant is available for its transmission and that Scheduling Information has a priority higher then any other logical channel. Furthermore the HARQ process used for the upcoming transmission shall be assumed to be active and not L3 restricted for the transmission of the Scheduling Information, i.e. transmission of Scheduling Information can take place on this process.

The transmission format and data allocation shall follow the requirements below:

- Only E-TFCs from the configured E-TFCS shall be considered for the transmission;
- For all logical channels, if the logical channel belongs to a non-scheduled MAC-d flow, its data shall be considered as available up to the corresponding non-scheduled grant, if the logical channel does not belong to a non-scheduled MAC-d flow, its data shall be considered as available up to the Serving Grant;
- The power offset for the transmission is the one from the HARQ profile of the MAC-d flow that allows highest-priority data to be transmitted. If more than one MAC-d flow allows data of the same highest priority to be transmitted, it is left to implementation to select which MAC-d flow to prefer);

- In case the variable Serving_Grant has the value "Zero_Grant" after the Serving Grant Update function and there is no data available for MAC-d flows for which non-scheduled grants were configured and the transmission of Scheduling Information has been triggered, the "Control-only" HARQ profile configured by the higher layers shall be used.
- The Nominal Power Offset shall be set to the power offset included in the transmission HARQ profile;
- The data allocation shall maximize the transmission of higher priority data;
- The amount of data from MAC-d flows for which non-scheduled grants were configured shall not exceed the value of the non-scheduled grant;
- If a 10ms TTI is configured and the TTI for the upcoming transmission overlaps with a compressed mode gap, the Serving_Grant provided by the Serving Grant Update function shall be scaled back as follows:

  $$SG' = SG * (\frac{N_C}{15})$$

  where SG' represents the modified serving grant considered by the E-TFC selection algorithm and N_C represents the number of non DTX slots in the compressed TTI;
- When not in a power limited condition the maximum amount of data from MAC-d flows for which no non-scheduled grants were configured shall be quantized to the next smaller supported E-TFC based on the Serving Grant (after adjustment for compressed frames), the power offset from the selected HARQ profile, the non-scheduled grants (if any) and Scheduling Information (if any); In the case a 2ms TTI is configured and the HARQ process is inactive, the UE shall not include any such data in the transmission;
- The Scheduling Information is always sent when triggered;
- Only E-TFCs in supported state shall be considered;
- The E-TFC resulting in the smallest amount of padding for the selected MAC-es PDUs and corresponding MAC-e/es headers, shall be selected including the case when the Scheduling Information needs to be transmitted.

Once an appropriate E-TFC and data allocation are found according to the rules above, the "Multiplexing and TSN Setting" entity shall generate the corresponding MAC-e PDU.

The E-TFC selection function shall provide this MAC-e PDU and transmission HARQ profile to the HARQ entity. The maximum number of HARQ transmissions and the power offset in this profile, shall be set respectively to the maximum of the Max Number of HARQ Transmissions of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission and to the Nominal Power Offset. The HARQ entity shall also be informed of whether the transmission includes Scheduling Information and whether this information is sent by itself or with higher-layer data.

Reference(s)

TS 25.321 clause 11.8.1.4

7.1.6.2.9.3 Test purpose

The purpose of this test case is to verify that the UE applies different HARQ profiles from different MAC-d flows to E-DCH transmissions accordingly and in case data from two MAC-d flows is transmitted in the same E-DCH transmission, the UE selects the correct power offset.

7.1.6.2.9.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4d using condition A15 as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the testcase			

The following parameters are specific for this test case:

Parameter	Value
E-DCH MAC-d flow multiplexing list for MAC-d flow 2	11111111 (See 25.331 10.3.5.1b) Note 1
E-DCH MAC-d flow multiplexing list for MAC-d flow 3	11111111 (See 25.331 10.3.5.1b) Note 1
Power offset for MAC-d flow 2	3dB (see 25.331 subclause 10.3.5.1b)
Power offset for MAC-d flow 3	0dB (see 25.331 subclause 10.3.5.1b)
Note 1: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB 25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3.

a) SS has not issued any scheduling grant for E-DCH to the UE.

b) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

c) SS waits until an SI is received.

d) The SS issues primary absolute grant corresponding to 1 RLC PDU of size 41 octets per TTI when the Mac-d flow power offset is 3dB (signalling value 5), with Absolute Grant Scope set as "All HARQ processes".

e) SS starts receiving loop backed RLC PDU's.

f) The SS issues primary absolute grant corresponding to "ZERO GRANT", with Absolute Grant Scope set as "All HARQ processes".

g) SS transmits 4 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH2.

h) SS waits until an SI is received.

i) The SS issues primary absolute grant corresponding to 2 RLC PDUs of size 41 octets per TTI when the Mac-d flow power offset is 0dB (signalling value 5), with Absolute Grant Scope set as "All HARQ processes".

j) SS starts receiving loop backed RLC PDU's.

k) The SS issues primary absolute grant corresponding to "ZERO GRANT", with Absolute Grant Scope set as "All HARQ processes".

l) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH2.

m) SS waits until an SI is received.

n) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

o) SS waits until an SI is received.

p) The SS issues primary absolute grant corresponding to 3 RLC PDUs of size 41 octets per TTI when the Mac-d flow power offset is 3dB (signalling value 9), with Absolute Grant Scope set as "All HARQ processes".

q) SS starts receiving loop backed RLC PDU's.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		2 RLC PDUs on LCH 1	
2	→		SI indicating data on LCH 1	
3	←		Primary Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 5
4	→		MAC es PDU containing 1 RLC SDU from LCH 1	This step is repeated until all the RLC SDUs are transmitted
5	←		Primary Absolute grant set to 'ZERO GRANT' and scope 'All HARQ Processes'	
6	←		4 RLC PDUs on LCH 2	
7	→		SI indicating data on LCH 2	
8	←		Primary Absolute grant allowing the UE to transmit 2 RLC PDU per TTI	Signalling value 5
9	→		MAC es PDU containing 2 RLC SDU from LCH 2	This step is repeated until all the RLC SDUs are transmitted
10	←		Primary Absolute grant set to 'ZERO GRANT' and scope 'All HARQ Processes'	
11	←		2 RLC PDUs on LCH 2	
12	→		SI indicating data on LCH 2	
13	←		2 RLC PDUs on LCH 1	
14	→		SI indicating data on LCH 1	
15	←		Primary Absolute grant allowing the UE to transmit 3 RLC PDUs per TTI	Signalling value 9
16	→		MAC es PDU containing 2 RLC PDU's from LCH 1 and MAC es PDU containing 1 RLC PDU from LCH 2	
17	→		MAC es PDU containing 1 RLC PDU from LCH 2	

Specific Message Contents

None

7.1.6.2.9.5 Test requirements

1. In step 4, UE shall loop back PDUs for two TTIs, with one RLC PDU per TTI.
2. In step 9, UE shall loop back PDUs for two TTIs, with two RLC PDUs per TTI.
3. In step 16, UE shall loop back PDUs for one TTI, with three RLC PDU per TTI (2 RLC PDU's from LCH1 and 1 RLC PDU from LCH 2).
4. In step 17, UE shall loop back PDU for one TTI, with one RLC PDU per TTI (1 RLC PDU from LCH 2).

7.1.6.2.9a MAC-es/e Correct handling of HARQ profile (1.28Mcps TDD)

7.1.6.2.9a.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.2.9a.2 Conformance requirement

In TDD, rules for E-TFC selection shall be applied as provided below.

UEs shall apply E-TFC selection when invoked by the HARQ entity (see subclause 11.9.1.1.1).

For each MAC-d flow, RRC configures MAC-e with a HARQ profile and multiplexing list. Additionally, RRC configures MAC with a power offset in case the Scheduling Information needs to be transmitted without any higher-layer data. For 1.28 Mcps TDD, RRC also configures MAC with a retransmission timer and the maximum number of HARQ transmissions in case the Scheduling Information needs to be transmitted without any higher-layer data. The HARQ profile includes the power offset and maximum number of HARQ transmissions to use for this MAC-d flow.

For 1.28 Mcps TDD, the HARQ profile also includes a retransmission timer attribute. The multiplexing list identifies for each MAC-d flow(s), the other MAC-d flows for which data can be multiplexed in a transmission that uses the power offset included in its HARQ profile.

RRC can control the scheduling of uplink data by giving each logical channel a priority between 1 and 8, where 1 is the highest priority and 8 the lowest. E-TFC selection in the UE shall be done in accordance with the priorities indicated by RRC. Logical channels have absolute priority, i.e. the UE shall maximise the transmission of higher priority data.

RRC can allocate non-scheduled transmission grants to individual MAC-d flows in order to reduce the transmission delays.

The UE shall determine whether to take scheduled or non-scheduled grants into account in the upcoming transmission. If neither are supposed to be taken into account (i.e. the TTI is not available for non-scheduled transmission and no Grant for scheduled transmission has been received) then no grant shall be assumed to exist. If a grant exists then the transmission format and data allocation shall follow the requirements below.

For each configured MAC-d flow, a given E-TFC can be in any of the following states:

- Supported state;
- Blocked state.

The E-TFC states are derived according to the following:

- If the transmission is a retransmission then only the E-TFC with the same block size as the original transmission may be in the supported state.
- For 1.28Mcps TDD, only E-TFCs from the E-TFCS (the table of TB sizes) which are consistent with the UE's E-DCH capability category shall be considered for the transmission;
- Only E-TFCs from the E-TFCS (the table of TB sizes) which can be supported by (exactly) the number of slots assigned by the grant shall be considered for the transmission;
- Only E-TFCs which result (for the granted timeslot and code physical resources) in a coderate lying between the maximum and minimum (inclusive) allowable code rates set by RRC [7] shall be considered for the transmission {note: the definition of the term "coderate" as used here is the same as that provided by [18]}. This shall be evaluated for both QPSK and 16-QAM modulation;
- P_{HARQ}, the HARQ profile power offset is selected (for 3.84/7.68Mcps TDD the HARQ profile for the transmission shall be selected among the HARQ profiles of MAC-d flows on which the highest priority logical channels with available data are mapped, for 1.28Mcps TDD the HARQ power offset shall be set to the maximum of HARQ power offset of all the MAC-d flows mapped to the same type of resource (scheduled or non-scheduled resource); Scheduling Information power offset shall be used when Scheduling Information is transmitted without any higher-layer data.)
- Only E-TFCs whose calculated transmission power requirement $P_{E\text{-}PUCH}$ (see [18]) is less than or equal to both the available and the granted power shall be considered for the transmission (note: this requirement does not apply in the case of a retransmission on non-scheduled resources). For TDD, the smallest E-TFC is considered always in the supported state. The granted power is defined as the calculated E-PUCH transmission power of [18] with β_e = (Absolute Grant Value + α_e). The available power is the maximum UE transmission power.

From those E-TFCs in the supported state the UE determines the largest block size that it is permitted to transmit within the given constraints.

The UE shall select the modulation type associated with the determined E-TFC (note: if an E-TFC is supported by both QPSK and 16-QAM then 16-QAM modulation shall be used if its power requirement ($P_{E\text{-}PUCH}$) is lower than the power requirement for QPSK, otherwise QPSK modulation shall be used).

Data allocation shall then be performed in accordance with the following:

- For all logical channels, if the logical channel belongs to a non-scheduled MAC-d flow, its data shall be considered as available up to the largest block size determined for the corresponding non-scheduled grant. If the logical channel does not belong to a non-scheduled MAC-d flow, its data shall be considered as available up to the largest block size determined for the Serving Grant;
- The data allocation shall maximise the transmission of higher priority data;

- The UE shall select the E-TFC, SF and modulation which minimises the power used (3.84/7.68 Mcps TDD only);
- The UE shall select the E-TFC and modulation which minimises the power used (1.28 Mcps TDD only);

Once an appropriate E-TFC and data allocation are found according to the rules above, the "Multiplexing and TSN Setting" entity shall generate the corresponding MAC-e PDU.

In 1.28Mcps TDD, when Scheduling Information is triggered by timer per subclause 11.9.1.5, the E-TFC selection and data-allocation process shall assume that Scheduling Information has a priority higher than any other logical channel.

The E-TFC selection function shall provide this MAC-e PDU and transmission HARQ profile to the HARQ entity. For 3.84Mcps TDD and 7.68Mcps TDD the selected E-TFC is also provided

NOTE: For 1.28Mcps TDD, the signalled transport block size index, i.e. E-TFCI, is the index of the selected E-TFC in the candidate set.

The maximum number of HARQ transmissions and the power offset in this profile shall be set respectively to the maximum of both the Max Number of HARQ Transmissions and of the power offset of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission. For 1.28 Mcps TDD, the maximum number of HARQ transmissions shall be set to the maximum of the Max Number of HARQ Transmissions of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission, the HARQ power offset shall be set to the maximum of HARQ power offset of all the MAC-d flows mapped to the same type of resource (scheduled or non-scheduled resource), and the retransmission timer shall be set to the maximum of the retransmission timer value of the HARQ profiles that are permitted to be multiplexed into the transmission. For 1.28Mcps TDD, when the Scheduling Information needs to be transmitted without any higher-layer data, the specific HARQ profile should be applied. Each HARQ process which is associated with a buffer holding a MAC-e PDU for potential retransmission shall maintain the HARQ profile and the number of re-transmissions that have occurred. For 1.28 Mcps TDD, the HARQ process shall also maintain the value of RTX_TIMER.

Further information on E-TFC selection is provided in Annex CA.

Reference(s)

TS 25.321 clause 11.9.1.4

7.1.6.2.9a.3 Test purpose

The purpose of this test case is to verify that the UE applies different HARQ profiles from different MAC-d flows to E-DCH transmissions.

7.1.6.2.9a.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.5.4.7.7 using condition A14 as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the testcase			

The following parameters are specific for this test case:

Parameter	Value
E-DCH MAC-d flow multiplexing list for MAC-d flow 2	11111111 (See 25.331 10.3.5.1b) Note 1
E-DCH MAC-d flow multiplexing list for MAC-d flow 3	11111111 (See 25.331 10.3.5.1b) Note 1
Power offset for MAC-d flow 2	3dB (see 25.331 subclause 10.3.5.1b)
Power offset for MAC-d flow 3	0dB (see 25.331 subclause 10.3.5.1b)
Note 1: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB 25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3.

a) SS has not issued any scheduling grant for E-DCH to the UE.

b) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

c) SS waits until an SI is received.

d) The SS issues primary absolute grant corresponding to 1 RLC PDU of size 41 octets per TTI.

e) SS starts receiving loop backed RLC PDU's.

f) SS transmits 4 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH2.

g) SS waits until an SI is received.

h) The SS issues primary absolute grant corresponding to 2 RLC PDUs of size 41 octets per TTI.

i) SS starts receiving loop backed RLC PDU's.

j) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH2.

k) SS waits until an SI is received.

l) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

m) SS waits until an SI is received.

n) The SS issues primary absolute grant corresponding to 3 RLC PDUs of size 41 octets per TTI.

o) SS starts receiving loop backed RLC PDU's.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		2 RLC PDUs on LCH 1	
2	→		SI indicating data on LCH 1	
3	←		Primary Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	
4	→		MAC es PDU containing 1 RLC SDU from LCH 1	This step is repeated until all the RLC SDUs are transmitted
5	←		4 RLC PDUs on LCH 2	
6	→		SI indicating data on LCH 2	
7	←		Primary Absolute grant allowing the UE to transmit 2 RLC PDU per TTI	
8	→		MAC es PDU containing 2 RLC SDU from LCH 2	This step is repeated until all the RLC SDUs are transmitted
9	←		2 RLC PDUs on LCH 2	
10	→		SI indicating data on LCH 2	
11	←		2 RLC PDUs on LCH 1	
12	→		SI indicating data on LCH 1	
13	←		Primary Absolute grant allowing the UE to transmit 3 RLC PDUs per TTI	
14	→		MAC es PDU containing 2 RLC PDU's from LCH 1 and MAC es PDU containing 1 RLC PDU from LCH 2	
15	→		MAC es PDU containing 1 RLC PDU from LCH 2	

Specific Message Contents

None

7.1.6.2.9a.5 Test requirements

1. In step 4, UE shall loop back PDUs for two TTIs, with one RLC PDU per TTI.
2. In step 9, UE shall loop back PDUs for two TTIs, with two RLC PDUs per TTI.
3. In step 16, UE shall loop back PDUs for one TTI, with three RLC PDU per TTI (2 RLC PDU's from LCH1 and 1 RLC PDU from LCH 2).
4. In step 17, UE shall loop back PDU for one TTI, with one RLC PDU per TTI (1 RLC PDU from LCH 2).

7.1.6.2.10 MAC-es/e Correct handling of minimum set of E-TFCI

7.1.6.2.10.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.2.10.2 Conformance requirement

In FDD mode, the rules for E-TFC selection provided below shall apply to UEs in CELL_DCH state with an E-DCH transport channel configured. These UEs shall apply the E-TFC selection procedure when invoked by the HARQ entity (see subclause 11.8.1.1.1). In the case where a 2ms TTI is configured, E-TFC selection shall not be performed for TTIs that overlap with an uplink compressed mode gap. The E-TFC restriction procedure described in [12] shall always be applied before the E-TFC selection process below. Furthermore, for UEs that are also configured with a DCH transport channel on uplink, the TFC selection procedure shall be applied before either of these.

For each MAC-d flow, RRC configures MAC with a HARQ profile and a multiplexing list. Additionally, RRC configures MAC with a power offset for "Control-only" transmissions. This power offset and a maximum number of HARQ transmissions of 8 will be used to define a HARQ profile for "Control-only" transmissions which will be used, in case the Scheduling Information needs to be transmitted without any higher-layer data. The HARQ profile includes the power offset and maximum number of HARQ transmissions to use for this MAC-d flow. The multiplexing list identifies for each MAC-d flow(s), the other MAC-d flows from which data can be multiplexed in a transmission that uses the power offset included in its HARQ profile.

RRC can control the scheduling of uplink data by giving each logical channel a priority between 1 and 8, where 1 is the highest priority and 8 the lowest. E-TFC selection in the UE shall be done in accordance with the priorities indicated by RRC. Logical channels have absolute priority, i.e. the UE shall maximise the transmission of higher priority data.

RRC can allocate non-scheduled transmission grants to individual MAC-d flows in order to reduce the transmission delays. When a 2ms TTI is configured each non-scheduled grant is applicable to the specific set of HARQ processes indicated by RRC. The applicability of scheduled grants can be also restricted to a specific set of HARQ processes when a 2ms TTI is configured. HARQ process restriction and reservation is under the control of the serving cell Node B and indicated to the UE by RRC.

For each configured MAC-d flow, a given E-TFC can be in any of the following states:

- Supported state;
- Blocked state.

At each TTI boundary, UEs in CELL_DCH state with an E-DCH transport channel configured shall determine the state of each E-TFC for every MAC-d flow configured based on its required transmit power versus the maximum UE transmit power (see [7] and [12]). If no DCH transport channel is configured or if a DCH transport channel is configured and the selected TFC is "empty" (see [3]), the UE shall consider that E-TFCs included in the minimum set of E-TFCs are always in supported state (see [7]).

At every TTI boundary for which a new transmission is requested by the HARQ entity (see subclause 11.8.1.1.1), the UE shall perform the operations described below. UEs configured both with DCH and E-DCH transport channels shall perform TFC selection before performing E-TFC selection.

The Serving Grant Update function provides the E-TFC selection function with the maximum E-DPDCH to DPCCH power ratio that the UE is allowed to allocate for the upcoming transmission for scheduled data (held in the Serving Grant state variable – see subclause 11.8.1.3).

The HARQ process ID for the upcoming transmission is determined using the following formulae:

- For 2ms TTI: CURRENT_HARQ_PROCESS_ID = [5*CFN + subframe number] **mod** HARQ_RTT
- For 10ms TTI: CURRENT_HARQ_PROCESS_ID = [CFN] **mod** HARQ_RTT

Based on this current HARQ process ID and the RRC configuration, the UE shall determine whether to take the scheduled and non-scheduled grants into account in the upcoming transmission. If they are not supposed to be taken into account, then the corresponding grant shall be assumed to not exist. If the variable Serving_Grant has the value "Zero_Grant" after the Serving Grant Update, then the Serving Grant shall not be taken into account in the upcoming transmission.

When Scheduling Information is triggered per subclause 11.8.1.6, the E-TFC selection and data-allocation process shall assume that a non-scheduled grant is available for its transmission and that Scheduling Information has a priority higher then any other logical channel. Furthermore the HARQ process used for the upcoming transmission shall be assumed to be active and not L3 restricted for the transmission of the Scheduling Information, i.e. transmission of Scheduling Information can take place on this process.

The transmission format and data allocation shall follow the requirements below:

- Only E-TFCs from the configured E-TFCS shall be considered for the transmission;
- For all logical channels, if the logical channel belongs to a non-scheduled MAC-d flow, its data shall be considered as available up to the corresponding non-scheduled grant, if the logical channel does not belong to a non-scheduled MAC-d flow, its data shall be considered as available up to the Serving Grant;
- The power offset for the transmission is the one from the HARQ profile of the MAC-d flow that allows highest-priority data to be transmitted. If more than one MAC-d flow allows data of the same highest priority to be transmitted, it is left to implementation to select which MAC-d flow to prefer);
- In case the variable Serving_Grant has the value "Zero_Grant" after the Serving Grant Update function and there is no data available for MAC-d flows for which non-scheduled grants were configured and the transmission of Scheduling Information has been triggered, the "Control-only" HARQ profile configured by the higher layers shall be used.
- The Nominal Power Offset shall be set to the power offset included in the transmission HARQ profile;

- The data allocation shall maximize the transmission of higher priority data;
- The amount of data from MAC-d flows for which non-scheduled grants were configured shall not exceed the value of the non-scheduled grant;
- If a 10ms TTI is configured and the TTI for the upcoming transmission overlaps with a compressed mode gap, the Serving_Grant provided by the Serving Grant Update function shall be scaled back as follows:

  $$SG' = SG * (\frac{N_C}{15})$$

  where SG' represents the modified serving grant considered by the E-TFC selection algorithm and N_C represents the number of non DTX slots in the compressed TTI;
- When not in a power limited condition the maximum amount of data from MAC-d flows for which no non-scheduled grants were configured shall be quantized to the next smaller supported E-TFC based on the Serving Grant (after adjustment for compressed frames), the power offset from the selected HARQ profile, the non-scheduled grants (if any) and Scheduling Information (if any); In the case a 2ms TTI is configured and the HARQ process is inactive, the UE shall not include any such data in the transmission;
- The Scheduling Information is always sent when triggered;
- Only E-TFCs in supported state shall be considered;
- The E-TFC resulting in the smallest amount of padding for the selected MAC-es PDUs and corresponding MAC-e/es headers, shall be selected including the case when the Scheduling Information needs to be transmitted.

Once an appropriate E-TFC and data allocation are found according to the rules above, the "Multiplexing and TSN Setting" entity shall generate the corresponding MAC-e PDU.

The E-TFC selection function shall provide this MAC-e PDU and transmission HARQ profile to the HARQ entity. The maximum number of HARQ transmissions and the power offset in this profile, shall be set respectively to the maximum of the Max Number of HARQ Transmissions of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission and to the Nominal Power Offset. The HARQ entity shall also be informed of whether the transmission includes Scheduling Information and whether this information is sent by itself or with higher-layer data.

Reference(s)

TS 25.321 clause 11.8.1.4

7.1.6.2.10.3 Test purpose

The purpose of this test case is to verify that the UE considers the minimum set of E-TFCI as always supported.

7.1.6.2.10.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4c using condition A12 as specified in clause 9.1 of TS 34.108. The following parameters are specific for this test case:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25

The following Radio Bearer Setup parameters are specific for this test case:

Parameter	Value
Maximum allowed UL TX power	0dBm
Uplink DPCH power control info	
Power Control Algorithm	Algorithm 2
- E-DPDCH info	
- E-TFCI table index	0
- E-DCH minimum set E-TFCI	31
- Reference E-TFCIs	2 E-TFCIs
- Reference E-TFCI	11
- Reference E-TFCI PO	8
- Reference E-TFCI	83
- Reference E-TFCI PO	21
Scheduling Information Configuration	
- Periodicity for Scheduling Info – no grant	10ms
ACK/NACK	5
CQI Reporting Cycle	2

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Test procedure

In this test procedure The UE is configured with one logical channel, with Id 7 (LCH 1). The Scheduling Information configuration for the E-DCH indicates to the UE that it shall periodically report Scheduling Information, which contains UPH measurement every E-DCH TTI.

a) SS has not issued any scheduling grant for E-DCH to the UE.

b) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

c) SS waits until an SI is received.

d) The SS issues primary absolute grant corresponding to 2 RLC PDUs of size 41 octets per TTI (signalling value 5), with Absolute Grant Scope set as "All HARQ process".

e) SS starts receiving loop backed RLC PDU’s.

f) The SS issues primary absolute grant corresponding to “ZERO GRANT”, with Absolute Grant Scope set as "All HARQ processes".

g) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

h) SS waits until the next periodic SI is received.

i) The SS sends power control bits to give one TPC_cmd +1 to the UE.

j) SS waits 100ms and checks the UPH measurement from the UE for 150ms. If UPH measurement does not indicate UE_POWER_HEADROOM_5 within the 150ms then go back to step g) otherwise proceed to next step.

   NOTE: When the UPH target range is reached then power control bits to give TPC_cmd =0 should be sent by SS to maintain the target power headroom. Failure to reach the target UPH range results in INCONCLUSIVE verdict and the test case should be re-run.

k) The SS issues primary absolute grant corresponding to 2 RLC PDUs of size 41 octets per TTI (signalling value 5), with Absolute Grant Scope set as "All HARQ process".

l) SS starts receiving loop backed RLC PDU’s.

NOTE: Due to the configured “Minimum set of E-TFCI” of 31, the UE should send a single PDU/TTI anyway.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	2 RLC PDUs on LCH 1	
2	→	SI indicating data on LCH 1	
3	←	Primary Absolute grant allowing the UE to transmit 2 RLC PDU per TTI	Signalling value 8
4	→	MAC es PDU containing 2 RLC PDU's from LCH 1	
5	←	Primary Absolute grant set to 'ZERO GRANT' and scope 'All HARQ Processes'	
6	←	2 RLC PDUs on LCH 1	
7	→	SI indicating data on LCH 1	Next periodic SI sent from UE
8	←		The SS sends power control bits to give one TPC_cmd +1 to the UE.
9		Wait 100ms	
10	→	Periodic SIs indicating UPH measurement	SS checks UPH measurement for 150ms. If UE_POWER_HEADROOM_5 then next step, otherwise step 6
11	←	Primary Absolute grant allowing the UE to transmit 2 RLC PDU per TTI	Signalling value 8
12	→	MAC es PDU containing 1 RLC PDUs from LCH 1	This step is repeated until the all RLC SDUs are transmitted

Specific Message Contents

None

7.1.6.2.10.5 Test requirements

1. In step 4, UE shall start sending loop backed PDU, with two RLC PDUs per TTI.
2. In step 12, UE shall start sending loop backed PDU, with one RLC PDU per TTI.

7.1.6.2.10a Smallest E-TFC (1.28Mcps TDD)

7.1.6.2.10a.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.2.10a.2 Conformance requirement

In TDD, rules for E-TFC selection shall be applied as provided below.

UEs shall apply E-TFC selection when invoked by the HARQ entity (see subclause 11.9.1.1.1).

For each MAC-d flow, RRC configures MAC-e with a HARQ profile and multiplexing list. Additionally, RRC configures MAC with a power offset in case the Scheduling Information needs to be transmitted without any higher-layer data. For 1.28 Mcps TDD, RRC also configures MAC with a retransmission timer and the maximum number of HARQ transmissions in case the Scheduling Information needs to be transmitted without any higher-layer data. The HARQ profile includes the power offset and maximum number of HARQ transmissions to use for this MAC-d flow. For 1.28 Mcps TDD, the HARQ profile also includes a retransmission timer attribute. The multiplexing list identifies for each MAC-d flow(s), the other MAC-d flows for which data can be multiplexed in a transmission that uses the power offset included in its HARQ profile.

RRC can control the scheduling of uplink data by giving each logical channel a priority between 1 and 8, where 1 is the highest priority and 8 the lowest. E-TFC selection in the UE shall be done in accordance with the priorities indicated by RRC. Logical channels have absolute priority, i.e. the UE shall maximise the transmission of higher priority data.

RRC can allocate non-scheduled transmission grants to individual MAC-d flows in order to reduce the transmission delays.

The UE shall determine whether to take scheduled or non-scheduled grants into account in the upcoming transmission. If neither are supposed to be taken into account (i.e. the TTI is not available for non-scheduled transmission and no Grant for scheduled transmission has been received) then no grant shall be assumed to exist. If a grant exists then the transmission format and data allocation shall follow the requirements below.

For each configured MAC-d flow, a given E-TFC can be in any of the following states:

- Supported state;
- Blocked state.

The E-TFC states are derived according to the following:

- If the transmission is a retransmission then only the E-TFC with the same block size as the original transmission may be in the supported state.
- For 1.28Mcps TDD, only E-TFCs from the E-TFCS (the table of TB sizes) which are consistent with the UE's E-DCH capability category shall be considered for the transmission;
- Only E-TFCs from the E-TFCS (the table of TB sizes) which can be supported by (exactly) the number of slots assigned by the grant shall be considered for the transmission;
- Only E-TFCs which result (for the granted timeslot and code physical resources) in a coderate lying between the maximum and minimum (inclusive) allowable code rates set by RRC [7] shall be considered for the transmission {note: the definition of the term "coderate" as used here is the same as that provided by [18]}. This shall be evaluated for both QPSK and 16-QAM modulation;
- P_{HARQ}, the HARQ profile power offset is selected (for 3.84/7.68Mcps TDD the HARQ profile for the transmission shall be selected among the HARQ profiles of MAC-d flows on which the highest priority logical channels with available data are mapped, for 1.28Mcps TDD the HARQ power offset shall be set to the maximum of HARQ power offset of all the MAC-d flows mapped to the same type of resource (scheduled or non-scheduled resource); Scheduling Information power offset shall be used when Scheduling Information is transmitted without any higher-layer data.)
- Only E-TFCs whose calculated transmission power requirement $P_{E\text{-}PUCH}$ (see [18]) is less than or equal to both the available and the granted power shall be considered for the transmission (note: this requirement does not apply in the case of a retransmission on non-scheduled resources). For TDD, the smallest E-TFC is considered always in the supported state. The granted power is defined as the calculated E-PUCH transmission power of [18] with β_e = (Absolute Grant Value + α_e). The available power is the maximum UE transmission power.

From those E-TFCs in the supported state the UE determines the largest block size that it is permitted to transmit within the given constraints.

The UE shall select the modulation type associated with the determined E-TFC (note: if an E-TFC is supported by both QPSK and 16-QAM then 16-QAM modulation shall be used if its power requirement ($P_{E\text{-}PUCH}$) is lower than the power requirement for QPSK, otherwise QPSK modulation shall be used).

Data allocation shall then be performed in accordance with the following:

- For all logical channels, if the logical channel belongs to a non-scheduled MAC-d flow, its data shall be considered as available up to the largest block size determined for the corresponding non-scheduled grant. If the logical channel does not belong to a non-scheduled MAC-d flow, its data shall be considered as available up to the largest block size determined for the Serving Grant;
- The data allocation shall maximise the transmission of higher priority data;
- The UE shall select the E-TFC, SF and modulation which minimises the power used (3.84/7.68 Mcps TDD only);
- The UE shall select the E-TFC and modulation which minimises the power used (1.28 Mcps TDD only);

Once an appropriate E-TFC and data allocation are found according to the rules above, the "Multiplexing and TSN Setting" entity shall generate the corresponding MAC-e PDU.

In 1.28Mcps TDD, when Scheduling Information is triggered by timer per subclause 11.9.1.5, the E-TFC selection and data-allocation process shall assume that Scheduling Information has a priority higher than any other logical channel.

The E-TFC selection function shall provide this MAC-e PDU and transmission HARQ profile to the HARQ entity. For 3.84Mcps TDD and 7.68Mcps TDD the selected E-TFC is also provided.

NOTE: For 1.28Mcps TDD, the signalled transport block size index, i.e. E-TFCI, is the index of the selected E-TFC in the candidate set.

The maximum number of HARQ transmissions and the power offset in this profile shall be set respectively to the maximum of both the Max Number of HARQ Transmissions and of the power offset of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission. For 1.28 Mcps TDD, the maximum number of HARQ transmissions shall be set to the maximum of the Max Number of HARQ Transmissions of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission, the HARQ power offset shall be set to the maximum of HARQ power offset of all the MAC-d flows mapped to the same type of resource (scheduled or non-scheduled resource), and the retransmission timer shall be set to the maximum of the retransmission timer value of the HARQ profiles that are permitted to be multiplexed into the transmission. For 1.28Mcps TDD, when the Scheduling Information needs to be transmitted without any higher-layer data, the specific HARQ profile should be applied. Each HARQ process which is associated with a buffer holding a MAC-e PDU for potential retransmission shall maintain the HARQ profile and the number of re-transmissions that have occurred. For 1.28 Mcps TDD, the HARQ process shall also maintain the value of RTX_TIMER.

Further information on E-TFC selection is provided in Annex CA.

Reference(s)

TS 25.321 clause 11.9.1.4

7.1.6.2.10a.3 Test purpose

The purpose of this test case is to verify that the UE considers the smallest E-TFC as always supported.

7.1.6.2.10a.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.5.4.7.6 using condition A11 as specified in clause 9.1 of TS 34.108. The following parameters are specific for this test case:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25

The following parameters are specific for this test case:

Parameter	Value
Maximum allowed UL TX power	33dBm

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Test procedure

In this test procedure The UE is configured with one logical channel, with Id 7 (LCH 1).

a) SS has not issued any scheduling grant for E-DCH to the UE.

b) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

c) SS waits until an SI is received.

d) The SS issues primary absolute grant corresponding to 2 RLC PDUs of size 41 octets per TTI.

e) SS starts receiving loop backed RLC PDU's.

f) The SS performs a physical channel reconfiguration setting the “Maximum allowed UL TX power” to a small enough value that not even a single PDU is supported due to insufficient available power.

g) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

h) SS waits until an SI is received.

i) The SS issues primary absolute grant corresponding to 2 RLC PDUs of size 41 octets per TTI (.

j) SS starts receiving loop backed MAC es PDU only including an SI.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		2 RLC PDUs on LCH 1	
2	→		SI indicating data on LCH 1	
3	←		Primary Absolute grant allowing the UE to transmit 2 RLC PDU per TTI	
4	→		MAC es PDU containing 2 RLC PDU's from LCH 1	
5	←		SS performs a physical channel reconfiguration	The “Maximum allowed UL TX power” is reduced such that any E-TFC is not supported anymore
6	←		2 RLC PDUs on LCH 1	
7	→		SI indicating data on LCH 1	
8	←		Primary Absolute grant allowing the UE to transmit 2 RLC PDU per TTI	
9	→		MAC es PDU containing an SI only	

Specific Message Contents

None

7.1.6.2.10a.5 Test requirements

1. In step 4, UE shall start sending loop backed PDU, with two RLC PDUs per TTI.

2. In step 9, UE shall start sending loop backed PDU, including an SI only.

7.1.6.2.11 MAC-es/e correct handling of absolute and relative grants in discontinuous downlink reception operation

7.1.6.2.11.1 Definition and applicability

All UEs which support DPCCH Discontinuous Transmission and Discontinuous Downlink Reception operation.

7.1.6.2.11.2 Conformance requirement

From TS 25.321 clause 11.8.1.3.1

The Serving Grant Update procedure shall be applied at every TTI boundary and shall take into account the Absolute Grant message, Serving Relative Grant and non-serving Relative Grants that apply to the TTI.

The UE shall:

1> set reference_ETPR2 to reference_ETPR as defined in subclause 3.1.2;

1> set reference_ETPR to the E-DPDCH to DPCCH power ratio as defined in subclause 3.1.2;

1> if an Absolute Grant was received for this TTI:

  2> if the Identity type is "Primary", and the Absolute Grant value is set to "INACTIVE":

    3> if Absolute Grant Scope indicates "Per HARQ process" and a 2ms TTI is configured:

      4> de-activate the process given by the value of CURRENT_HARQ_PROCESS.

3> if Absolute Grant Scope indicates "All HARQ processes" and a secondary E-RNTI was configured by higher layers:

4> activate all HARQ processes;

4> set Serving_Grant = Stored_Secondary_Grant;

4> set Primary_Grant_Available to "False".

3> if Absolute Grant Scope indicates "All HARQ processes", a 2ms TTI is configured and a secondary E-RNTI was not configured by higher layers:

4> deactivate all HARQ processes (if a process was inactive it remains inactive, if a process was active it becomes inactive).

2> else if the Absolute Grant Value is different from "INACTIVE":

3> if the Identity Type is "Secondary":

4> set Stored_Secondary_Grant = Absolute Grant Value.

3> if the Identity Type is "Primary" or Primary_Grant_Available is set to "False":

4> set Serving_Grant = Absolute Grant Value.

4> if the Identity Type is "Primary":

5> set Primary_Grant_Available to "True";

5> if Absolute Grant Scope indicates "Per HARQ process":

6> activate the process given by the value of CURRENT_HARQ_PROCESS.

5> if Absolute Grant Scope indicates "All HARQ processes":

6> activate all HARQ processes.

5> if AG_Timer is not active, it shall be started, otherwise it shall be restarted.

1> else (no Absolute Grant received):

2> if the HARQ process given by the value of CURRENT_HARQ_PROCESS is active; and

2> if Primary_Grant_Available is equal to "True"; and

2> if Serving_Grant <> "Zero_Grant" ; and

2> if AG_Timer has expired; and

2> if there was a scheduled transmission (see NOTE) in the previous TTI of the HARQ process given by the value of CURRENT_HARQ_PROCESS:

3> if the Serving Relative Grant indicates "UP":

4> determine the Serving_Grant in accordance with subclause 9.2.5.2.1.

3> else, if the Serving Relative Grant indicates "DOWN":

4> determine the Serving_Grant in accordance with subclause 9.2.5.2.1.

3> else:

4> the Serving_Grant is unchanged (i.e. kept from previous TTI).

1> if any Non-Serving Relative Grants indicate "DOWN" for this TTI and Serving_Grant <> "Zero_Grant":

2> Serving_Grant = MIN(Serving_Grant, Maximum_Serving_Grant, Serving_Grant determined in accordance with subclause 9.2.5.2.1);

2> Maximum_Serving_Grant = Serving_Grant.

2> if Non_Serving_RG_Timer is not active it shall be started, otherwise it shall be restarted;

1> else if no Non-Serving Relative Grants indicate "DOWN" for this TTI:

2> if Non_Serving_RG_Timer has not expired:

3> Serving_Grant = MIN(Maximum_Serving_Grant, Serving_Grant).

1> if Non_Serving_RG_Timer expires:

2> set the Maximum_Serving_Grant to the highest possible value (i.e. index 37 in table 9.2.5.2.1.1 or 9.2.5.2.1.2 as configured by higher layers).

NOTE 1: MIN("Zero_Grant", any numerical value) = "Zero_Grant".

NOTE 2: Scheduling Information sent alone is not considered as a scheduled transmission.

From TS 25.321 clause 11.8.1.8

When the DRX feature is enabled by higher layers, and in addition to the conditions defined in subclause 6C.3 of [5] the downlink monitoring of E-AGCH and E-RGCH sets is required in the following conditions:

- At least one MAC-d flow is configured with a scheduled transmission and TEBS > 0 or;
- a scheduled E-DCH transmission has been performed in any of the *Inactivity Threshold for UE Grant Monitoring* previous TTIs or;
- the start of E-AGCH and E-RGCH commands overlap with an E-HICH corresponding to a scheduled E-DCH transmission.

From TS 25.214 clause 6C.3

When DL_DRX_Active is TRUE (see section 6C), the UE shall continue to receive F-DPCH as described in sub-clause 5.1 and the UE need not receive physical downlink channels other than the F-DPCH except for the following cases:

1. …
2. …
3. …
4. …
5. The UE shall monitor the full E-AGCH transmission from the serving E-DCH cell in the following cases:
   - If UE_DRX_Grant_Monitoring is TRUE and the start of the E-AGCH transmission overlaps with an HS-SCCH reception subframe as defined in the HS-SCCH reception pattern,
   - When conditions defined in subclause 11.8.1.8 of [6] are fulfilled.
6. The UE shall monitor the full E-RGCH transmissions from cells in the serving E-DCH radio link set in the following cases:
   - If UE_DRX_Grant_Monitoring is TRUE and the start of the E-RGCH transmission overlaps with an HS-SCCH reception subframe as defined in the HS-SCCH reception pattern,
   - When conditions defined in subclause 11.8.1.8 of [6] are fulfilled.
7. The UE shall monitor the full E-RGCH(s) from all the other cells in the E-DCH active set, except from the cells in the serving E-DCH radio link set as determined in subclause 11.8.1.8 of [6].

Reference(s)

TS 25.321 clauses 11.8.1.3.1 and 11.8.1.8

TS 25.214 clause 6C.3

7.1.6.2.11.3 Test purpose

The purpose of this test case is to verify that when in discontinuous downlink reception operation, the UE monitors the E-AGCH and E-RGCH at the times specified in the core specifications.

7.1.6.2.11.4 Method of test

Initial conditions

System Simulator:

2 cells, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration Streaming or interactive or background / UL: [max bit rate depending on UE category and TTI] DL: [max bit rate depending on UE category] / UM PS RAB + UL: [max bit rate depending on UE category and TTI] DL: [max bit rate depending on UE category] SRBs for DCCH on E-DCH and HS-DSCH as specified in TS 34.108, clause 6.11.4i.1. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25

Both cells 1 and 2 are in E-DCH active set. Cell 1 is the serving E-DCH cell. Cell 2 belongs to non serving Radio link set.

The following parameters are specific for this test case:

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99)
E-DCH TTI	10 ms
Inactivity Threshold for UE Grant Monitoring	0

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to (10*41)-2 octets.

Test procedure

In this test procedure the UE is configured with one logical channel.

0) SS waits for the Measurement report from the UE with event set to "1a" and then adds the Radio link on the second cell by sending an Active Set Update message.

a) SS has not issued any scheduling grant for E-DCH to the UE, TEBS at the UE is 0 and there is no pending E-HICH corresponding to a previous scheduled E-DCH transmission.

b) SS has waited long enough for both SS and UE to go autonomously into DTX/DRX mode.

c) SS issues a primary absolute grant that allows the UE to send 2 RLC PDU's per TTI (signalling value 5), in a transmission that overlaps with an HS-SCCH reception subframe as defined in the HS-SCCH reception pattern.

d) SS transmits 10 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

e) SS starts receiving looped back PDU's and checks that UE has started using the serving grant corresponding to 2 RLC PDU's transmitted per TTI.

f) Void.

g) Within 1 HARQ-RTT of the TTI with the last scheduled E-DCH transmission, and in a transmission that overlaps with an HS-SCCH reception subframe as defined in the HS-SCCH reception pattern, SS sends a relative grant in cell 2 (non-serving) as 'Down'. (*Note)

h) SS transmits 10 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

i) SS starts receiving looped back PDU's and checks that UE has started using the serving grant corresponding to 1 RLC PDU transmitted per TTI, i.e. that it has acted on the 'Down' command from cell 2.

j) In a transmission overlapping with the E-HICH for the last transmitted PDU, but not overlapping with an HS-SCCH reception subframe as defined in the HS-SCCH reception pattern , SS issues a issues a primary absolute grant that allows the UE to send 2 RLC PDU's per TTI (signalling value 5).

k) SS transmits 10 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

l) SS starts receiving looped back PDU's and checks that UE has started using the serving grant corresponding to 2 RLC PDU's transmitted per TTI.

m) Void.

n) In a transmission overlapping with the E-HICH for the last transmitted PDU, but not overlapping with an HS-SCCH reception subframe as defined in the HS-SCCH reception pattern, SS issues a relative grant in cell 2 (non-serving) as 'Down'. (*Note)

o) SS transmits 10 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

p) SS starts receiving looped back PDU's and checks that UE has started using the serving grant corresponding to 1 RLC PDU transmitted per TTI.

q) SS waits until all data has been received.

r) SS removes the scheduling grant from the UE.

s) SS sends a Physical Channel Reconfiguration Message to the UE to change the value of 'Inactivity Threshold for UE Grant Monitoring' from 0 to 8 subframes.

t) UE sends a Physical Channel Reconfiguration Complete Message.

u) SS issues a primary absolute grant that allows the UE to send 1 RLC PDU per TTI (signalling value 4), in a transmission that overlaps with an HS-SCCH reception subframe as defined in the HS-SCCH reception pattern.

v) SS transmits 10 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

w) SS starts receiving looped back PDU's and checks that UE has started using the serving grant corresponding to 1 RLC PDU transmitted per TTI.

x) In up to 8 subframes of the TTI with the last scheduled E-DCH transmission, in a transmission that does not overlap with an HS-SCCH reception subframe as defined in the HS-SCCH reception pattern, SS issues a primary absolute grant that allows the UE to send 2 RLC PDU's per TTI (signalling value 5)

y) SS transmits 10 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

z) SS starts receiving looped back PDU's and checks that UE has started using the serving grant corresponding to 2 RLC PDU's transmitted per TTI.

aa) In up to 8 subframes of the TTI with the last scheduled E-DCH transmission, in a transmission that does not overlap with an HS-SCCH reception subframe as defined in the HS-SCCH reception pattern, SS issues relative grant in cell 2 (non-serving) as 'Down'. (*Note)

ab) SS transmits 10 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

ac) SS starts receiving looped back PDU's and checks that UE has started using the serving grant corresponding to 1 RLC PDU transmitted per TTI, i.e. that it has acted on the first primary grant followed by the 'Down' command from cell 2.

ad) SS waits for at least 8 subframes after the TTI of the last scheduled E-DCH transmission, then removes the scheduling grant from the UE.

ae) SS transmits 10 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

af) SS waits until an SI is received.

ag) SS issues a primary absolute grant that allows the UE to send 2 RLC PDU's per TTI (signalling value 5), in a transmission that does not overlap with an HS-SCCH reception subframe as defined in the HS-SCCH reception pattern.

ah) SS starts receiving looped back PDU's and checks that UE has started using the serving grant corresponding to 2 RLC PDU's transmitted per TTI.

*NOTE: The absolute grants issued in steps c, j and x with signalling value 5 result in SG_{LUPR} corresponding to 19/15. One transmission of a 'Down' command will result in SG_{LUPR} corresponding to 17/15, which is sufficient for 1 RLC PDU transmission only.

Expected sequence

Step	Direction UE SS	Message	Comments
0A	→	Measurement Report	See specific message contents for this message
0B	←	ACTIVE SET UPDATE	The SS instructs the UE to add cell 2 in the active set
0C	→	ACTIVE SET UPDATE COMPLETE	
1	←	Absolute grant allowing the UE to transmit 2 RLC PDUs per TTI	Signalling value 5 Overlapping with an HS-SCCH reception subframe
2	←	10 RLC PDUs on LCH 1	
3	→	MAC es PDU containing more than one RLC PDU from LCH 1	This step is repeated until all RLC SDU's are received.
4	←	Void	
5	←	Within 1 HARQ-RTT of the last scheduled E-DCH transmission in Step 3, Relative Grant in cell 2 with 'DOWN'	Overlapping with an HS-SCCH reception subframe
6	←	10 RLC PDUs on LCH 1	
7	→	MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated until all RLC SDU's are received.
8	←	Absolute grant allowing the UE to transmit 2 RLC PDUs per TTI	Signalling value 5 Overlapping with E-HICH transmission for the last PDU sent in Step 6 Not overlapping with an HS-SCCH reception subframe
9	←	10 RLC PDUs on LCH 1	
10	→	MAC es PDU containing more than one RLC PDU from LCH 1	This step is repeated until all RLC SDU's are received.
11	←	Void	
12	←	Relative Grant in cell 2 with 'DOWN'	Overlapping with E-HICH transmission for the last PDU sent in Step 10 Not overlapping with an HS-SCCH reception subframe
13	←	10 RLC PDUs on LCH 1	
14	→	MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated until all RLC SDU's are received.
15		Removal of scheduling grant for the UE	
16	←	Physical Channel Reconfiguration	' Inactivity Threshold for UE Grant Monitoring' set to 8 frames
17	→	Physical Channel Reconfiguration Complete	
18	←	Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 4 Overlapping with an HS-SCCH reception subframe
19	←	10 RLC PDUs on LCH 1	
20	→	MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated until all RLC SDU's are received.
21		In up to 8 subframes of the last scheduled E-DCH transmission in Step 20, absolute grant allowing the UE to transmit 2 RLC PDUs per TTI	Signalling value 5 Not overlapping with an HS-SCCH reception subframe
22	←	10 RLC PDUs on LCH 1	
23	→	MAC es PDU containing more than one RLC PDU from LCH 1	This step is repeated until all RLC SDU's are received.
24		Void	
25		In up to 8 subframes of the last scheduled E-DCH transmission in Step 23, Relative Grant in cell 2 with 'DOWN'	Not overlapping with an HS-SCCH reception subframe
26	←	10 RLC PDUs on LCH 1	
27	→	MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated until all RLC SDU's are received.
28	←	At least 8 subframes after the last scheduled E-DCH transmission in Step 27, removal of	

		scheduling grant for the UE	
29	←	10 RLC PDUs on LCH 1	
30	→	SI indicating data on LCH 1	
31	←	Absolute grant allowing the UE to transmit 2 RLC PDUs per TTI	Signalling value 5 Not overlapping with an HS-SCCH reception subframe
32	→	MAC es PDU containing more than one RLC PDU from LCH 1	This step is repeated until all RLC SDU's are received.

Specific Message Contents

MEASUREMENT REPORT (Step 0a)

Use the same message as specified in 34.108 except for the following:

Information Element	Value/remark
Message Type	
Integrity check info	
- Message authentication code	This IE is checked to see if it is present. The value is compared against the XMAC-I value computed by SS. The first/ leftmost bit of the bit string contains the most significant bit of the MAC-I.
- RRC Message sequence number	This IE is checked to see if it is present. The value is used by SS to compute the XMAC-I value.
Measurement identity	1
Measured Results	
- Intra-frequency measured results	Check to see if measurement results for 2 cells are included (the order in which the different cells are reported is not important)
- Cell measured results	
- Cell Identity	Checked that this IE is absent
- Cell synchronisation information	Checked that this IE is present and includes IE COUNT-C-SFN frame difference
- Primary CPICH info	
- Primary scrambling code	Refer to clause titled "Default settings for cell No.2 (FDD)" in clause 6.1 of TS 34.108
- CPICH Ec/N0	Checked that this IE is absent
- CPICH RSCP	Checked that this IE is present
- Pathloss	Checked that this IE is absent
- Cell measured results	
- Cell Identity	Checked that this IE is absent
- Cell synchronisation information	Checked that this IE is absent
- Primary CPICH info	
- Primary scrambling code	Refer to clause titled "Default settings for cell No.1 (FDD)" in clause 6.1 of TS 34.108
- CPICH Ec/N0	Checked that this IE is absent
- CPICH RSCP	Checked that this IE is present
- Pathloss	Checked that this IE is absent
Measured results on RACH	Checked that this IE is absent
Additional measured results	Checked that this IE is absent
Event results	
- Intra-frequency measurement event results	
- Intra-frequency event identity	1a
- Cell measurement event results	
- Primary CPICH info	
- Primary scrambling code	Refer to clause titled "Default settings for cell No.2 (FDD)" in clause 6.1 of TS 34.108

ACTIVE SET UPDATE (Step 0b)

The message to be used in this test is defined in TS 34.108, clause 9, with the following exceptions:

Information Element	Value/remark
Activation time	Not Present
DTX-DRX timing information	
CHOICE *timing*	Continue

DTX-DRX Information	Not Present
Radio link addition information	
- Primary CPICH Info	
- Primary scrambling code	Primary scrambling code of Cell 2
- Downlink F-DPCH info for each RL	
- Primary CPICH usage for channel estimation	Primary CPICH may be used
- F-DPCH frame offset	Calculated value from Cell synchronisation information
- F-DPCH slot format	3 if UE supports enhanced F-DPCH, otherwise Not Present
- Secondary CPICH info	Not Present
- Secondary scrambling code	Not Present
- Code number	12
- TPC combination index	1
- CHOICE E-HICH Information	
- E-HICH Information	
- Channelisation code	4
- Signature sequence	1
- CHOICE E-RGCH Information	
- E-RGCH Information	
- Signature Sequence	0
- RG combination index	2

7.1.6.2.11.5 Test requirements

1. After step 2, UE will start sending 2 RLC PDU's per TTI.
2. After step 6, UE will start sending 1 RLC PDU per TTI.
3. After step 9, UE will start sending 2 RLC PDU's per TTI.
4. After step 13, UE will start sending 1 RLC PDU per TTI.
5. After step 19, UE will start sending 1 RLC PDU per TTI.
6. After step 22, UE will start sending 2 RLC PDU's per TTI.
7. After step 26, UE will start sending 1 RLC PDU per TTI.
8. After Step 31, UE will start sending 2 RLC PDU's per TTI.

7.1.6.2.12 MAC-es/e correct handling scheduling information transmission (for different UpPCH shifting setting, for 1.28Mcps TDD only)

7.1.6.2.12.1 Definition and applicability

All UEs which support 1.28Mcps TDD and HS-PDSCH and E-DCH.

7.1.6.2.12.2 Conformance requirement

[TS 25.224, clause 5.2.2]

Open loop uplink synchronisation control is used for UpPCH.

The UE may estimate the propagation delay Δt_p based upon the path loss using the received P-CCPCH and/or DwPCH power.

The UpPCH is sent to the Node B advanced in time according to the timing of the received DwPCH. The time of the beginning of the UpPCH $T_{TX\text{-}UpPCH}$ is given by:

$T_{TX\text{-}UpPCH} = T_{RX\text{-}DwPCH} - 2\Delta t_p + 12*16\ T_C + n_{UpPCHShift}*16Tc$

$n_{UpPCHShift} = 0..127$, $n_{UpPCHShift}$ is indicated by higher layers

in multiple of 1/8 chips, where

$T_{TX\text{-}UpPCH}$ is the beginning time of UpPCH transmission with the UE's timing,

$T_{RX-DwPCH}$ is the received beginning time of DwPCH with the UE's timing,

$2\Delta t_p$ is the timing advance of the UpPCH default value is 48Tc.

[TS 25.224, clause 5.6.3]

Requests for the transmission of an E-RUCCH are controlled by higher layers [18].

The available eight SYNC_UL signatures in a cell is divided into two subsets, one for the access of RACH information and the other for the access of E-RUCCH information.

When a Node B detects a SYNC_UL signature and acknowledges it on the related FPACH, it should do some recordings, including the FPACH channel number, the sub-frame on which the acknowledgement is sent and the SYNC_UL signature number. When a PRACH or E-RUCCH comes from a UE, the Node B should derive the related FPACH and the sub-frame on which the acknowledgement was sent for the UE and find the right record. The signature number in the record can help the Node B know the access type.

Random access procedure for enhanced uplink is basically same as random access procedure in subclause 5.6.3, only adding some new definitions.

L_{iE} is the Length of E-RUCCH information transport blocks associated to FPACHi in sub-frames.

N_{RACHi} is the number of PRACHs associated to the ith FPACH.

$N_{E-RUCCHi}$ is the number of E-RUCCHs associated to the ith FPACH and $N_{E-RUCCHi}$ equals to $\min\{N_{RACHi}, L_{iE}\}$.

When SF of PRACH code equals to 16, L_{iE} will be 2, otherwise L_{iE} will be 1

When SF of PRACH code equals to 4, SF of E-RUCCH will be 8, otherwise E-RUCCHs has the same SF with PRACH.

When $n_{E-RUCCHi}$ equals to n_{RACHi}, E-RUCCH will share the same code resource with PRACH. And when SF of PRACH code equals to 4, the code resource assigned to PRACH including two codes (code i and code i+1) of SF 8, E-RUCCH can use the ith code of SF 8.

If $FPACH_i$ sent an acknowledgement for E-RUCCH information, the sub-frames on which an acknowledgement is sent on FPACHi is fulfilling the following relation:

(SFN' mod L_{iE})=$n_{E-RUCCHi}$; $n_{E-RUCCHi}$=0,…, $N_{E-RUCCHi}$-1,

Where, SFN' is the sub-frame number of the acknowledgement on FPACH

Accordingly, the code resource assigned to PRACH may be used by PRACH or E-RUCCH, we should make two prescript avoiding the collision between PRACH and E-RUCCH.

When Node B sent a $FPACH_i$ for $PRACH_{nRACHi}$ in sub frame K, Node B could not send a $FPACH_i$ for $E-RUCCH_{n_{E-RUCCHi}}$ before sub frame K+L_i.

When Node B sent a $FPACH_i$ for $E-RUCCH_{n_{E-RUCCHi}}$ in sub frame K, Node B could not send a FPACHi for $PRACH_{nRACHi}$ before sub frame K+L_{iE}.

The interval between the acknowledgement on FPACH and transmission of E-RUCCH is fixed for a UE. The UE will send at the sub-frame coming 2 sub-frames after the one carrying the signature acknowledgement. In case L_{iE} is bigger than one and the sub-frame number of the acknowledgement is odd the UE will wait one more sub-frame.

The transmission power and the transmission timing are set according to subclause 5.1.1.7 and 5.2.7 respectively.

[TS 25.224, clause 5.2.7]

The Node B shall measure the received SYNC-UL timing deviation $UpPCH_{POS}$. $UpPCH_{POS}$ is sent in the FPACH and is represented as an 13 bit number (0-8191) being the multiple of 1/8 chips which is nearest to received position of the UpPCH.

Time of the beginning of the E-RUCCH $T_{TX-E-RUCCH}$ is given by:

$T_{TX-E-RUCCH} = T_{RX-E-RUCCH} -(UpPCH_{ADV} + UpPCH_{POS} - 8*16\ T_C)$

in multiple of 1/8 chips, where

$T_{TX-E-RUCCH}$ is the beginning time of E-RUCCH transmission with the UE's timing,

$T_{RX-E-RUCCH}$ is the beginning time of E-RUCCH reception with the UE's timing if the E-RUCCH was a DL channel,

$UpPCH_{ADV}$ is the timing advance of the UpPCH.

[TS 25.321, clause 11.9.1.5]

A "Grant Request" type Scheduling Information can be triggered if any of the following events occur:

- The TEBS becomes larger than zero;
- An E-DCH serving cell change occurs and the TEBS is larger than zero;

An optional Extended Estimation Window (defined by RRC in TTIs) may be used to prevent the UE from triggering unnecessary E-RUCCH transmission in case the UE potentially has an available Grant a short time in the future. The UE may perform a persistent check through the Extended Estimation Window to evaluate whether there is a Grant available for new data transmission when the UE can not take the decision just according to the related HARQ information, e.g., HARQ timing, HARQ retransmission numbers and so on.

If a UE has no Grant (including scheduled grant or non-scheduled grant) available for a new MAC-e or MAC-i PDU transmission in current TTI or in the Extended Estimation Window (if configured by RRC), as the "Grant Request" type Scheduling Information is triggered, the transmission of Scheduling Information shall be triggered via E-RUCCH.

Else if the UE has a Grant (including scheduled grant or non-scheduled grant) available for a new MAC-e or MAC-i PDU transmission in current TTI or in Extended Estimation Window (if configured by RRC), as the "Grant Request" type Scheduling Information is triggered, the scheduling information should be included in a MAC-e or MAC-i PDU via the Grant. If the HARQ process fails to deliver the MAC-e or MAC-i PDU containing the triggered the "Grant Request" type Scheduling Information, another "Grant Request" type Scheduling Information shall be triggered.

When assembling a MAC-e or MAC-i PDU, if the scheduling information needs to be included in the MAC-e or MAC-i PDU according to subclause 9.2.4.2 and it shall be transmitted regardless of TEBS status.

Additional periodic timer T-SI is used to avoid long pause duration of scheduling information reporting (defined by RRC). Once the grant is designated, T-SI shall be started .When the scheduling information is included in MAC-e or MAC-i PDU and sent, the timer shall be restarted immediately. When the timer expires, if there is a grant to send a new MAC-e or MAC-i PDU, it should include scheduling information, otherwise the UE shall wait for a grant to send scheduling information in a new MAC-e or MAC-i PDU.

Additionally if data with higher priority than the data already in the transmission buffer arrives, the Scheduling Information shall be triggered and included in next available MAC-e or MAC-i PDU, i.e. higher priority data arrival event shall not trigger a E-RUCCH procedure.

RRC can configure MAC with a delay timer to be used when the UE transits from having a Grant to not having a Grant and the TEBS is still larger than zero. The delay timer T_WAIT shall be started once the Grant expires and shall be stopped and reset when a Grant is received. When T_WAIT expires, the transmission of a Scheduling Information shall be triggered via E-RUCCH (T_WAIT shall be stopped and reset).

Even if multiple events are triggered by the time a new Scheduling Information reporting can take place, only single scheduling information with newly updated content shall be sent via E-RUCCH or included in a MAC-e or MAC-i PDU.

[TS 25.331, clause 8.6.6.43]

If the IE "Second Frequency info" is included, the UE shall:

1> act as specified in section 8.6.6.1.

If the IE "FPACH Frequency info" is included, the UE shall:

1> store the FPACH frequency indicated in the IE "FPACH Frequency info".

If the IE "UpPCH Position Info" is included:

1> store and use the UpPCH position indicated by the IE "UpPCH Position Info ". The calculation of the uplink

access position is described in [33].

If the IE "UpPCH Position Info" is not included:

1> use the UpPTS as the default UpPCH position.

Reference

3GPP TS 25.224 clause 5.2.2, 5.2.7, 5.6.3a, TS25.321 clause 11.9.1.5, TS 25.331 clause 8.6.6.43.

7.1.6.2.12.3 Test purpose

To confirm that UE can transmit SI correctly for different UpPCH shifting setting.

7.1.6.2.12.4 Method of test

Initial conditions

System Simulator:

1 cell, 3 frequency (one is primary frequency, others are secondary frequency).

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.5.4.7.6 using condition A11 as specified in clause 9.1 of TS 34.108 at the secondary frequency. The following parameters are specific for this test case:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Test procedure

In this test procedure The UE is configured with one logical channel, with Id 7 (LCH 1).

a) SS has not issued any scheduling grant for E-DCH to the UE.

b) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

c) Wait 40ms until the timer T-WAIT expires.

d) UE sends SI on E-RUCCH.

e) The SS issues primary absolute grant corresponding to 2 RLC PDUs of size 41 octets per TTI.

f) SS starts receiving loop backed RLC PDU's.

g) SS sends the PHYSICAL CHANNEL RECONFIGURATION message to UE for changing the UpPCH shifting value from 0(default value) to 63.

h) UE sends PHYSICAL CHANNEL RECONFIGURATION COMPLETE message to SS.

i) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

j) Wait 40ms until the timer T-WAIT expires.

k) UE sends SI on E-RUCCH.

l) The SS issues primary absolute grant corresponding to 2 RLC PDUs of size 41 octets per TTI.

m) SS starts receiving loop backed RLC PDU's.

n) SS sends the PHYSICAL CHANNEL RECONFIGURATION message to UE for modifying the UpPCH shifting value from 63(default value) to 127.

o) UE sends PHYSICAL CHANNEL RECONFIGURATION COMPLETE message to SS.

p) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1.

q) UE sends SI on E-RUCCH.

Expected sequence

Step	Direction UE	Direction SS	Message	Comments
1	←		2 RLC PDUs on LCH 1	
2			Wait 40ms until timer T-WAIT expires	
3	→		SI via E-RUCCH	SS checks SI received on E-RUCCH.
4	←		Absolute grant allowing the UE to transmit 2 RLC PDU per TTI	
5	→		MAC es PDU containing 2 RLC PDU's from LCH 1	
6	←		PHYSICAL CHANNEL RECONFIGURATION	UpPCH shifting value=63
7	→		PHYSICAL CHANNEL RECONFIGURATION COMPLETE	
8	←		2 RLC PDUs on LCH 1	
9			Wait 40ms until timer T-WAIT expires	
10	→		SI via E-RUCCH	SS checks SI received on E-RUCCH.
11	←		Absolute grant allowing the UE to transmit 2 RLC PDU per TTI	
12	→		MAC es PDU containing 2 RLC PDU's from LCH 1	
13	←		PHYSICAL CHANNEL RECONFIGURATION	UpPCH shifting value=127
14	→		PHYSICAL CHANNEL RECONFIGURATION COMPLETE	
15	←		2 RLC PDUs on LCH 1	
16			Wait 40ms until timer T-WAIT expires	
17	→		SI via E-RUCCH	SS checks SI received on E-RUCCH.

Specific Message Contents

PHYSICAL CHANNEL RECONFIGURATION (Step 6) (1.28 Mcps TDD)

Use the same message as specified for "Packet to CELL_DCH from CELL_DCH in PS" in 34.108 except for the following:

Information Element	Value/remark	Version
New H-RNTI	'0101 0101 0101 0101'	
Frequency info		
- UARFCN (Nt)	Same as primary frequency of the cell	
Multi-frequency Info		
- Second Frequency Info	Same as secondary frequency of the cell	
- FPACH Frequency Info	Same as secondary frequency of the cell	
- UpPCH Position Info	63	

PHYSICAL CHANNEL RECONFIGURATION (Step 13) (1.28 Mcps TDD)

Use the same message as specified for "Packet to CELL_DCH from CELL_DCH in PS" in 34.108 except for the following:

Information Element	Value/remark	Version
New H-RNTI	'0101 0101 0101 0101'	
Frequency info		
- UARFCN (Nt)	Same as primary frequency of the cell	
Multi-frequency Info		
- Second Frequency Info	Same as secondary frequency of the cell	
- FPACH Frequency Info	Same as secondary frequency of the cell	
- UpPCH Position Info	127	

7.1.6.2.12.5 Test requirements

1. After step 3 the SS shall receive an SI indicating that data is available on LCH 1.
2. After step 10 the SS shall receive an SI indicating that data is available on LCH 1.
3. After step 17 the SS shall receive an SI indicating that data is available on LCH 1.

7.1.6.3 MAC-es/e- E-TFC selection

7.1.6.3.1 MAC-es/e E-TFC priority

7.1.6.3.1.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.3.1.2 Conformance requirement

Extract from TS 25.321 clause 11.8.1.4

[…]

RRC can control the scheduling of uplink data by giving each logical channel a priority between 1 and 8, where 1 is the highest priority and 8 the lowest. E-TFC selection in the UE shall be done in accordance with the priorities indicated by RRC. Logical channels have absolute priority, i.e. the UE shall maximise the transmission of higher priority data.

[…]

Extract from TS 25.321 clause 11.9.1.4

[…]

RRC can control the scheduling of uplink data by giving each logical channel a priority between 1 and 8, where 1 is the highest priority and 8 the lowest. E-TFC selection in the UE shall be done in accordance with the priorities indicated by RRC. Logical channels have absolute priority, i.e. the UE shall maximise the transmission of higher priority data.

[…]

Reference(s)

TS 25.321 clause 11.8.1.4, 11.9.1.4

7.1.6.3.1.3 Test purpose

To verify that the UE transmits data in order of priority

7.1.6.3.1.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4d(FDD) /6.11.5.4.7.7(1.28Mcps TDD) using condition A15(FDD) /A14(1.28Mcps TDD) as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
NOTE: The RAB combination also include SRBs on E-DCH on MAC-d flow 1 which are not used in the test case			

The following parameters are specific for this test case:

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99) (FDD)
T-WAIT	200 ms (see 25.331 10.3.6.103)(1.28Mcps TDD)
E-DCH MAC-d flow multiplexing list	11111111 (See 25.331 10.3.5.1b) Note 1
Note 1: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The UE is placed into UE test loop mode 1 with the UL SDU size set to (10*41)-2 octets for RB25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3.

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

c) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

d) The SS waits for an SI to be received that indicates that data is available on both logical channels (can be identified from the content of the SI)

e) The SS issues an absolute grant that allows the UE to send 1 RLC PDU per TTI (signalling value 4)

f) The SS verifies that the first TTIs only contains data from LCH1 which have a higher priority

g) The SS verifies that data on LCH2 is only transmitted after all the data on LCH1 has been looped back

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	1 RLC PDU on LCH 2	
2	←	1 RLC PDU on LCH 1	
3	→	Potential SI indicating data on LCH 2	This SI is ignored by the SS
4	→	SI indicating that data is available for LCH 1 and LCH 2	
5	←	Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 4
6	→	MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated until the whole RLC SDU is transmitted
7	→	MAC es PDU containing 1 RLC PDU from LCH 2	This step is repeated until the whole RLC SDU is transmitted

Specific Message Contents

None

7.1.6.3.1.5 Test requirements

1. In step 6, the SS shall receive 1 MAC-es PDU containing 1 RLC PDU from LCH 1 in each TTI until the whole RLC SDU has been received.
2. In step 6, the SS verifies that no data is received on LCH 2 until all data on LCH 1 has been received
3. In step 7, the SS shall receive 1 MAC-es PDU containing 1 RLC PDU from LCH 2 in each TTI until the whole RLC SDU has been received

7.1.6.3.2 MAC-es/e transport block size selection/ UL QPSK

7.1.6.3.2.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.3.2.2 Conformance requirement

Extract from TS 25.321 clause 11.8.1.4

For Rel-6:

[…]

The transmission format and data allocation shall follow the requirements below:

- Only E-TFCs from the configured E-TFCS shall be considered for the transmission;

  […]

- The UE may avoid using the following E-TFCIs;
  - If the UE is configured with E-TFCI table 0 (see [7]) and 2ms TTI, it may avoid using E-TFCI 120 in the mapping defined in Annex B.1
  - If the UE is configured with E-TFCI table 1 (see [7]) and 2ms TTI, it may avoid using E-TFCI 115 in the mapping defined in Annex B.2

  […]

[…]

For Rel-7 and later releases:

[…]

The transmission format and data allocation shall follow the requirements below:

  […]

- The UE shall not use the following E-TFCIs;
  - If the UE is configured with E-TFCI table 0 (see [7]) and 2ms TTI, it shall not use E-TFCI 120 in the mapping defined in Annex B.1
  - If the UE is configured with E-TFCI table 1 (see [7]) and 2ms TTI, it shall not use E-TFCI 115 in the mapping defined in Annex B.2
  - If the UE is configured with E-TFCI table 2 (see [7]) and 2ms TTI, it shall not use E-TFCI 121 in the mapping defined in Annex B.2a
  - If the UE is configured with E-TFCI table 3 (see [7]) and 2ms TTI, it shall not use E-TFCIs 101 and 102 in the mapping defined in Annex B.2b

[…]

[…]

Extract from TS 25.321 clause 9.2.5.4

[…]

RRC can configure the MAC-e to use one of two Transport block size sets for each TTI duration. The normative description of the mapping between the E-TFC index and the corresponding transport block size is provided in Annex B:

- If the UE is configured with E-TFCI table 0 (see 3GPP TS 25.331) and 2ms TTI, it shall use the mapping defined in 3GPP TS 25.321 Annex B.1
- If the UE is configured with E-TFCI table 1 (see 3GPP TS 25.331) and 2ms TTI, it shall use the mapping defined in 3GPP TS 25.321 Annex B.2
- If the UE is configured with E-TFCI table 0 (see 3GPP TS 25.331) and 10ms TTI, it shall use the mapping defined in 3GPP TS 25.321 Annex B.3
- If the UE is configured with E-TFCI table 1 (see 3GPP TS 25.331) and 10ms TTI, it shall use the mapping defined in 3GPP TS 25.321 Annex B.4

[…]

Reference(s)

TS 25.321 clause 9.2.5.4

7.1.6.3.2.3 Test purpose

To verify that the UE is able to transmit all possible transport block sizes in accordance with configured MAC-d PDU size and within the UE capability.

7.1.6.3.2.4 Method of test

NOTE: The reference to E-DCH Category refers to the UE capability as signalled in the Rel-6 IE "E-DCH physical layer category". All UEs supporting E-DCH should signal a category between 1 and 6 for this IE even if the UE physical capability category is above 6.

NOTE: The reference to HS-DSCH Categories refers to the UE capability as signalled in the Rel-5 IE "HS-DSCH physical layer category" (1 to 12). All UEs supporting HS-DSCH should signal a category between 1 and 12 for this IE even if the UE physical capability category is above 12. This IE corresponds to the HS-DSCH category supported by the UE when MAC-ehs is not configured.

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

NOTE: At the SS RLC transmit entity and UE UL RLC entity for data RB 'Last transmission PDU poll and Last retransmission PDU poll' should be set to 'FALSE' and 'Poll SDU' to 'Not Present'.

User Equipment:

UE in idle mode

The following parameters are specific for this test case:

Common for all UE HS-DSCH categories:

Parameter	Value
MAC-d PDU size	336 bits
MAC-hs receiver window size	16
Number of HARQ processes	1
Number of reordering queues	1

Common for all UE E-DCH categories:

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99)
RLC Poll Timer	1000ms
RLC Reset Timer	1000ms

Specific depending on E-DCH category:

Parameter	E-DCH Category	Value
RLC Transmission window size	1	512
	2 to 3	1024
	4 to 6	1536
E-TFCI table	1 to 6	See table 7.1.6.3.2.5

Specific depending on HS-DSCH category:

Parameter	HS-DSCH Category	Value
RLC Receiving window size	1 to 6	512
	7 and 8	1536
	9 and 10	2047
	11 and 12	1024

Definition of test variables:

N_{PDUs}	Number of MAC-d PDUs

The mapping between the chosen E-TFC index and the corresponding E-DCH transport block size is given in the following tables:

Table 7.1.6.3.2.1: Test points for 2ms TTI E-DCH Transport Block Size Table 0

TB Index	TB Size (bits)	TB Index	TB Size (bits)	TB Index	TB Size (bits)	TB Index	TB Size (bits)	TB Index	TB Size (bits)
0	18	30	342	60	1015	90	3008	120	8913 Note
1	120	31	355	61	1053	91	3119	121	9241
2	124	32	368	62	1091	92	3234	122	9582
3	129	33	382	63	1132	93	3353	123	9935
4	133	34	396	64	1173	94	3477	124	10302
5	138	35	410	65	1217	95	3605	125	10681
6	143	36	426	66	1262	96	3738	126	11075
7	149	37	441	67	1308	97	3876	127	11484
8	154	38	458	68	1356	98	4019		
9	160	39	474	69	1406	99	4167		
10	166	40	492	70	1458	100	4321		
11	172	41	510	71	1512	101	4480		
12	178	42	529	72	1568	102	4645		

13	185	43	548	73	1626	103	4816		
14	192	44	569	74	1685	104	4994		
15	199	45	590	75	1748	105	5178		
16	206	46	611	76	1812	106	5369		
17	214	47	634	77	1879	107	5567		
18	222	48	657	78	1948	108	5772		
19	230	49	682	79	2020	109	5985		
20	238	50	707	80	2094	110	6206		
21	247	51	733	81	2172	111	6435		
22	256	52	760	82	2252	112	6672		
23	266	53	788	83	2335	113	6918		
24	275	54	817	84	2421	114	7173		
25	286	55	847	85	2510	115	7437		
26	296	56	878	86	2603	116	7711		
27	307	57	911	87	2699	117	7996		
28	318	58	944	88	2798	118	8290		
29	330	59	979	89	2901	119	8596		

NOTE: E-TFCI value 120 shall not be used by a Rel-7 or later release UE and may not be used by a Rel-6 UE. The reason for including the test point for the E-TFCI value 120 is to verify that a Rel-7 UE uses the next possible larger E-TFCI value instead. This test point is not applicable for Rel-6 UEs.

Table 7.1.6.3.2.2: Test points for 2ms TTI E-DCH Transport Block Size Table 1

TB Index	TB Size (bits)	TB Index	TB Size (bits)	TB Index	TB Size (bits)
0	18	43	2724	86	7252
1	186	44	2742	87	7288
2	204	45	3042	88	7428
3	354	46	3060	89	7464
4	372	47	3078	90	7764
5	522	48	3298	91	7800
6	540	49	3316	92	7908
7	674	50	3334	93	7944
8	690	51	3378	94	8100
9	708	52	3396	95	8136
10	726	53	3414	96	8436
11	858	54	3732	97	8472
12	876	55	3750	98	8564
13	1026	56	3972	99	8600
14	1044	57	3990	100	8772
15	1062	58	4068	101	8808
16	1194	59	4086	102	9108
17	1212	60	4404	103	9144
18	1330	61	4422	104	9220
19	1348	62	4628	105	9256
20	1362	63	4646	106	9444
21	1380	64	4740	107	9480
22	1398	65	4758	108	9780
23	1530	66	5076	109	9816
24	1548	67	5094	110	9876
25	1698	68	5284	111	9912
26	1716	69	5302	112	10116
27	1734	70	5412	113	10152
28	1866	71	5430	114	10452
29	1884	72	5748	115	10488 Note
30	1986	73	5766	116	10532
31	2004	74	5940	117	10568
32	2022	75	5958	118	10788
33	2034	76	6084	119	10824
34	2052	77	6102	120	11124
35	2070	78	6420	121	11178
36	2370	79	6438	122	11188
37	2388	80	6596	123	11242
38	2406	81	6614	124	11460
39	2642	82	6756	125	11478
40	2660	83	6774		
41	2678	84	7092		
42	2706	85	7110		

NOTE: E-TFCI value 115 shall not be used by a Rel-7 or later release UE and may not be used by a Rel-6 UE. The reason for including the test point for the E-TFCI value 115 is to verify that a Rel-7 UE uses the next possible larger E-TFCI value instead. This test point is not applicable for Rel-6 UEs.

Table 7.1.6.3.2.3: Test points for 10ms TTI E-DCH Transport Block Size Table 0

TB Index	TB Size (bits)	TB Index	TB Size (bits)	TB Index	TB Size (bits)	TB Index	TB Size (bits)	TB Index	TB Size (bits)
0	18	30	389	60	1316	90	4452	120	15051
1	120	31	405	61	1371	91	4636	121	15675
2	124	32	422	62	1428	92	4828	122	16325
3	130	33	440	63	1487	93	5029	123	17001
4	135	34	458	64	1549	94	5237	124	17706
5	141	35	477	65	1613	95	5454	125	18440
6	147	36	497	66	1680	96	5680	126	19204
7	153	37	517	67	1749	97	5915	127	20000
8	159	38	539	68	1822	98	6161		
9	166	39	561	69	1897	99	6416		
10	172	40	584	70	1976	100	6682		
11	180	41	608	71	2058	101	6959		
12	187	42	634	72	2143	102	7247		
13	195	43	660	73	2232	103	7547		
14	203	44	687	74	2325	104	7860		
15	211	45	716	75	2421	105	8186		
16	220	46	745	76	2521	106	8525		
17	229	47	776	77	2626	107	8878		
18	239	48	809	78	2735	108	9246		
19	249	49	842	79	2848	109	9629		
20	259	50	877	80	2966	110	10028		
21	270	51	913	81	3089	111	10444		
22	281	52	951	82	3217	112	10877		
23	293	53	991	83	3350	113	11328		
24	305	54	1032	84	3489	114	11797		
25	317	55	1074	85	3634	115	12286		
26	331	56	1119	86	3784	116	12795		
27	344	57	1165	87	3941	117	13325		
28	359	58	1214	88	4105	118	13877		
29	374	59	1264	89	4275	119	14453		

Table 7.1.6.3.2.4: Test points for 10ms TTI E-DCH Transport Block Size Table 1

TB Index	TB Size (bits)	TB Index	TB Size (bits)	TB Index	TB Size (bits)
0	18	41	5076	82	11850
1	186	42	5094	83	12132
2	204	43	5412	84	12186
3	354	44	5430	85	12468
4	372	45	5748	86	12522
5	522	46	5766	87	12804
6	540	47	6084	88	12858
7	690	48	6102	89	13140
8	708	49	6420	90	13194
9	858	50	6438	91	13476
10	876	51	6756	92	13530
11	1026	52	6774	93	13812
12	1044	53	7092	94	13866
13	1194	54	7110	95	14148
14	1212	55	7428	96	14202
15	1362	56	7464	97	14484
16	1380	57	7764	98	14556
17	1530	58	7800	99	14820
18	1548	59	8100	100	14892
19	1698	60	8136	101	15156
20	1716	61	8436	102	15228
21	1866	62	8472	103	15492
22	1884	63	8772	104	15564
23	2034	64	8808	105	15828
24	2052	65	9108	106	15900
25	2370	66	9144	107	16164
26	2388	67	9444	108	16236
27	2706	68	9480	109	16500
28	2724	69	9780	110	16572
29	3042	70	9816	111	17172
30	3060	71	10116	112	17244
31	3378	72	10152	113	17844
32	3396	73	10452	114	17916
33	3732	74	10488	115	18516
34	3750	75	10788	116	18606
35	4068	76	10824	117	19188
36	4086	77	11124	118	19278
37	4404	78	11178	119	19860
38	4422	79	11460	120	19950
39	4740	80	11514		
40	4758	81	11796		

Table 7.1.6.3.2.5: Applicable E-TFS indexes for sub-tests 1 to 4 and UE E-DCH categories 1 to 6.

			Applicable E-TFS indexes					
Sub-test	E-DCH TTI	E-DCH Transport Block Size Table	Category 1	Category 2	Category 3	Category 4	Category 5	Category 6
1	10ms	10ms TTI Table 0, Table 7.1.6.3.2.3	1..101	1..119	1..119	1..127	1..127	1..127
2	10ms	10ms TTI Table 1, Table 7.1.6.3.2.4	1..54	1..97	1..97	1..120	1..120	1..120
3	2ms	2ms TTI Table 0, Table 7.1.6.3.2.1	N/A	1..88	N/A	1..108	N/A	1..127
4	2ms	2ms TTI Table 1, Table 7.1.6.3.2.2	N/A	1..44	N/A	1..73	N/A	1..125
NOTE 1: Applicable indexes depends on the UE capability of "Maximum number of bits of an E-DCH transport block transmitted within a 10 ms E-DCH TTI" and "Maximum number of bits of an E-DCH transport block transmitted within a 2 ms E-DCH TTI" as specified in TS 25.306 clause 5 and Table 5.1g. E-TFCI index=0 not tested as TB size for this E-TFCI value is 18 bits, which would only fit the MAC-e/es header used by the SS in the test procedure 1. NOTE 2: For E-DCH categories beyond 6, E-TFS indices for category 6 are applicable.								

Table 7.1.6.3.2.6: E-TFCI values causing degradation due to turbo coder irregularities

E-DCH Transport Block Size Tables	E-TFCI	Reference
2 ms TTI, Table 0	120	[6], Annex B.1
2 ms TTI, Table 1	115	[6], Annex B.2

Test procedure

a) The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.10.2.4.6.2 using condition A13 as specified in clause 9.1 of TS 34.108.. See Note 1.

b) The SS closes the test loop using UE test loop mode 1 and configuring the UL RLC SDU size to be equal to the received DL SDU size (i.e. not setting the UL RLC SDU size parameter).

c) SS sets RLC SDU size = 312 bits which corresponds to maximum AM payload size for 1 MAC-d PDU of size 336 bits.

d) The SS removes the scheduling grant for E-DCH for the UE.

e) If N_{PDUs} is less than 36 the SS transmits one RLC SDU with size (($NPDUs$ – 1) * 320 + 312) else the SS transmits two SDUs with size ((N_{PDUs} – 2) * 320 + 2 * 312) / 2. See note 2.

f) The SS waits for an SI to be received that indicates that there is data available for transmission (can be identified from the content of the SI). See Note 3. The SS checks that TEBS has the correct value.

g) The SS issues an absolute grant that allows the UE to send at maximum bit rate (signalling value 31)

h) The SS waits until data is received and verifies that the looped back SDU data has the correct content and is sent in the same TTI.

i) The SS verifies that the received E-TFC used by the UE is correct. For Rel-7 and later release UE the SS checks that the UE has not used the transport block sizes correspondent to the E-TFCI values as listed in table 7.1.6.3.2.6, but instead used the transport block size correspondent to the next possible larger E-TFCI value.

j) The SS increments the RLC SDU payload size by 320 bits. For the case of 2 SDUs transmitted by the SS, each of the payload sizes are incremented by 320 bits. The SS calculates the new E-TFC transport block size from the relevant Transport Block Size Table. If this transport block size is supported by the UE under test, according to Table 7.1.6.3.2.5, then continue with step d else continue with step k.

k) The SS opens the UE test loop.

l) The SS release the radio bearer.

m) The SS may optionally deactivate the radio bearer test mode.

NOTE 1: The SS configures the physical channel parameters according to the actual UE category under test.

NOTE 2: Calculation of Downlink (DL) RLC SDU size:

DL SDU size = N_{PDUs} * 336 bits RLC PDU – headers associated with MAC and RLC.

RLC PDU = RLC 16 bits Sequence Number + 8 bits for the Optional Length Indicators + RLC pay load size. The Optional Length Indicator is present only in the delivery of the last RLC PDU.

The Optional Length Indicators consists of a 7 bits Length Indicator + 1 bit Extension Field of binary value = "0". The 7 bit length indicator indicates the number of octets between the end of the RLC header up to and including the last octet of the (DL) RLC SDU ending within the PDU.

Therefore, the RLC payload has two different sizes of 320 bits (336 – 16 bits Sequence Number) and 312 bits (336 – 16 bits sequence Number - (7 bits Length Indicator + 1 bit extension field)).

N_{PDUs} = FLOOR ((TBS size – MAC-e header size – MAC-es header size) / MAC-d PDU size) = FLOOR ((TBS size -18) / 336).

For N_{PDUs} = 1

DL RLC SDU payload has size 312 bits

For $1 < N_{PDUs} < 36$

There are (N_{PDUs} – 1) RLC payloads of size 320 bits with the last RLC payload size 312 bits

DL RLC SDU payload size = (N_{PDUs} -1) * 320 + 312

For $N_{PDUs} \geq 36$

The test data for transport channels on HS-DSCH and E-DCH is divided into 2 RLC SDUs so that the SDU size does not exceed 1500 octets (limit of SDU size in SM)

The payload data of the MAC-d PDUs contains 2 RLC SDUs of size

((N_{PDUs} – 2) * 320 + 2 * 312) / 2

$N_{PDU} = N_{PDUs} + 2$

Calculation of E-TFC TB Size:

Select the E-TFC Index/TB Size = Number of MAC-d PDU * 336 bits RLC PDU + 18 bits MAC-es and MAC-e headers (6 bits N + 6 bits TSN + 6 bits DDI) according to the E-DCH Transport Block Size Tables for FDD per 25.321 Annex B, .

As an example TBS value of 716 bits is used by the UE in the 10mS Index 0 subtest to deliver UL RLC SDU size o f 84 bytes = 672bit + 18 bits MAC headers = 690 bits

NOTE 3: Calculation of TEBS value:

Using the E-TFC TB size determined in Note 2 above, select the TEBS index according to 25.321 Table 9.2.5.3.2-1.

Expected sequence

Step	Direction UE / SS	Message	Comments
1	<--	SYSTEM INFORMATION (BCCH)	Broadcast
2	<--	PAGING TYPE 1 (PCCH)	Paging (PS domain, P-TMSI)
3	-->	RRC CONNECTION REQUEST (CCCH)	RRC
4	<--	RRC CONNECTION SETUP (CCCH)	RRC
5	-->	RRC CONNECTION SETUP COMPLETE (DCCH)	RRC
6	-->	SERVICE REQUEST (DCCH)	GMM
7	<--	SECURITY MODE COMMAND	RRC see note 1
8	-->	SECURITY MODE COMPLETE	RRC see note 1
9	<--	ACTIVATE RB TEST MODE (DCCH)	TC
10	-->	ACTIVATE RB TEST MODE COMPLETE (DCCH)	TC
11	<--	RADIO BEARER SETUP (DCCH)	RRC. For the PS radio bearer the 'pdcp info' IE shall be omitted.
12	-->	RADIO BEARER SETUP COMPLETE (DCCH)	RRC
13	<--	CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 with no "LB Setup RB IE#k" parameter set (UE shall return an UL RLC SDU with the same size as the received RLC SDU in downlink)
14	-->	CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
15	SS		The SS initially creates one RLC SDU with payload size 312bits
16	←	Removal of absolute grant	Signalling value 1
17	<--	DOWNLINK RLC SDU(s)	Send test data. The data contains 1 RLC SDU or 2 SDUs (refer to Note 2) in test procedure above
18	→	SI indicating data for transmission	This can be verified from the indicated Total E-DCH Buffer Status (TEBS)
19	<--	Absolute grant allowing the UE to transmit at maximum bit rate.	Signalling value 31
20	-->	UPLINK RLC SDU(s)	The SS checks E-TFC from the UE and checks that the content of the received UL RLC SDU is correct and sent in the same TTI. For Rel-7 and later release UE the SS checks that the UE has not used the transport block sizes correspondent to the E-TFCI values as listed in table 7.1.6.3.2.6, but instead used the transport block size correspondent to the next possible larger E-TFCI value.
21	SS		The SS increases the SDU size(s) by 320 bits (refer to Note 2) and calculates the E-TFC transport block size required to send this data on E-DCH from the relevant Transport Block Size Table. If E-TFC TB size is supported by the E-DCH category then repeat steps 16 to 19
22	<--	OPEN UE TEST LOOP (DCCH)	TC
23	-->	OPEN UE TEST LOOP COMPLETE (DCCH)	TC
24		RB RELEASE	RRC
25	<--	DEACTIVATE RB TEST MODE	TC Optional step
26	-->	DEACTIVATE RB TEST MODE COMPLETE	TC Optional step
Note 1: In addition to activate integrity protection Step 7 and Step 8 are inserted in order to stop T3317 timer in the UE, which starts after transmitting SERVICE REQUEST message.			

7.1.6.3.2.5 Test requirements

1. In step 20, the SS verifies that the received E-TFC has the correct size .For Rel-7 and later release UE the SS checks that the UE has not used the transport block sizes correspondent to the E-TFCI values as listed in table 7.1.6.3.2.6, but instead used the transport block size correspondent to the next possible larger E-TFCI value.
2. In step 20, the SS shall receive the RLC SDUs in the same TTI and with the same content as sent in downlink.

7.1.6.3.2a MAC-es/e transport block size selection/UL 16QAM

7.1.6.3.2a.1 Definition and applicability

All UEs which support E-DCH and UL 16QAM.

7.1.6.3.2a.2 Conformance requirement

Extract from TS 25.321 clause 9.2.5.4

Extract from TS 25.321 clause 11.8.1.4

For Rel-6:

[…]

The transmission format and data allocation shall follow the requirements below:

- Only E-TFCs from the configured E-TFCS shall be considered for the transmission;

  […]

- The UE may avoid using the following E-TFCIs;
  - If the UE is configured with E-TFCI table 0 (see [7]) and 2ms TTI, it may avoid using E-TFCI 120 in the mapping defined in Annex B.1
  - If the UE is configured with E-TFCI table 1 (see [7]) and 2ms TTI, it may avoid using E-TFCI 115 in the mapping defined in Annex B.2

  […]

[…]

For Rel-7 and later releases:

[…]

The transmission format and data allocation shall follow the requirements below:

  […]

- The UE shall not use the following E-TFCIs;
  - If the UE is configured with E-TFCI table 0 (see [7]) and 2ms TTI, it shall not use E-TFCI 120 in the mapping defined in Annex B.1
  - If the UE is configured with E-TFCI table 1 (see [7]) and 2ms TTI, it shall not use E-TFCI 115 in the mapping defined in Annex B.2
  - If the UE is configured with E-TFCI table 2 (see [7]) and 2ms TTI, it shall not use E-TFCI 121 in the mapping defined in Annex B.2a
  - If the UE is configured with E-TFCI table 3 (see [7]) and 2ms TTI, it shall not use E-TFCIs 101 and 102 in the mapping defined in Annex B.2b

  […]

[…]

RRC can configure the MAC-e to use one of two Transport block size sets for each TTI duration. The normative description of the mapping between the E-TFC index and the corresponding transport block size is provided in Annex B:

- If the UE is configured with E-TFCI table 0 (see 3GPP TS 25.331) and 2ms TTI, it shall use the mapping defined in 3GPP TS 25.321 Annex B.1
- If the UE is configured with E-TFCI table 1 (see 3GPP TS 25.331) and 2ms TTI, it shall use the mapping defined in 3GPP TS 25.321 Annex B.2
- If the UE is configured with E-TFCI table 2 (see 3GPP TS 25.331) and 2ms TTI, it shall use the mapping defined in 3GPP TS 25.321 Annex B.2a
- If the UE is configured with E-TFCI table 3 (see 3GPP TS 25.331) and 2ms TTI, it shall use the mapping defined in 3GPP TS 25.321 Annex B.2b
- If the UE is configured with E-TFCI table 0 (see 3GPP TS 25.331) and 10ms TTI, it shall use the mapping defined in 3GPP TS 25.321 Annex B.3
- If the UE is configured with E-TFCI table 1 (see 3GPP TS 25.331) and 10ms TTI, it shall use the mapping defined in 3GPP TS 25.321 Annex B.4

[…]

Reference(s)

TS 25.321 clause 9.2.5.4

7.1.6.3.2a.3 Test purpose

To verify that the UE is able to transmit all possible transport block sizes in accordance with configured MAC-d PDU size and within the UE capability.

7.1.6.3.2a.4 Method of test

NOTE: The reference to E-DCH Category refers to the UE capability as signalled in the Rel-7 IE "E-DCH physical layer category extension".

NOTE: The reference to HS-DSCH Categories refers to the UE capability as signalled in the Rel-5 IE "HS-DSCH physical layer category" (1 to 12). All UEs supporting HS-DSCH should signal a category between 1 and 12 for this IE even if the UE physical capability category is above 12. This IE corresponds to the HS-DSCH category supported by the UE when MAC-ehs is not configured.

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

NOTE: At the SS RLC transmit entity for data RB 'Last transmission PDU poll and Last retransmission PDU poll' should be set to 'FALSE' and 'Poll SDU' to 'Not Present'.

User Equipment:

UE in idle mode

The following parameters are specific for this test case:

Common for all UE HS-DSCH categories:

Parameter	Value
MAC-d PDU size	336 bits
MAC-hs receiver window size	16
Number of HARQ processes	1
Number of reordering queues	1

Common for all UE E-DCH categories:

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99)
RLC Poll Timer	1000ms
RLC Reset Timer	1000ms

Specific depending on E-DCH category:

Parameter	E-DCH Category	Value
RLC Transmission window size	**7**	**1536**
E-TFCI table	**7**	**See table 7.1.6.3.2a.3**

Specific depending on HS-DSCH category:

Parameter	HS-DSCH Category	Value
RLC Receiving window size	1 to 6	512
	7 and 8	1536
	9 and 10	2047
	11 and 12	1024

Definition of test variables:

N_{PDUs}	Number of MAC-d PDUs

The mapping between the chosen E-TFC index and the corresponding E-DCH transport block size is given in the following tables:

Table 7.1.6.3.2a.1 Test points for 2ms TTI E-DCH Transport Block Size Table 2

E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)
0	18	30	402	60	1405	90	4913	120	17173
1	120	31	419	61	1465	91	5122	121	17904 Note
2	125	32	437	62	1528	92	5341	122	18667
3	130	33	455	63	1593	93	5568	123	19462
4	135	34	475	64	1661	94	5805	124	20291
5	141	35	495	65	1731	95	6053	125	21155
6	147	36	516	66	1805	96	6310	126	22056
7	154	37	538	67	1882	97	6579	127	22995
8	160	38	561	68	1962	98	6859		
9	167	39	585	69	2046	99	7152		
10	174	40	610	70	2133	100	7456		
11	182	41	636	71	2224	101	7774		
12	189	42	663	72	2319	102	8105		
13	197	43	691	73	2417	103	8450		
14	206	44	721	74	2520	104	8810		
15	215	45	752	75	2628	105	9185		
16	224	46	784	76	2740	106	9577		
17	233	47	817	77	2856	107	9985		
18	243	48	852	78	2978	108	10410		
19	254	49	888	79	3105	109	10853		
20	265	50	926	80	3237	110	11316		
21	276	51	965	81	3375	111	11798		
22	288	52	1007	82	3519	112	12300		
23	300	53	1049	83	3669	113	12824		
24	313	54	1094	84	3825	114	13370		
25	326	55	1141	85	3988	115	13940		
26	340	56	1189	86	4158	116	14534		
27	354	57	1240	87	4335	117	15153		
28	370	58	1293	88	4520	118	15798		
29	385	59	1348	89	4712	119	16471		

NOTE: E-TFCI value 121 shall not be used by a Rel-7 or later release UE and may not be used by a Rel-6 UE. The reason for including the test point for the E-TFCI value 121 is to verify that a Rel-7 UE uses the next possible larger E-TFCI value instead.

Table 7.1.6.3.2a.2: Test points for 2ms TTI E-DCH Transport Block Size Table 3

E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)
0	18	30	1902	60	6614	90	14184	120	21966
1	186	31	1986	61	6774	91	14538	121	22302
2	204	32	2004	62	7110	92	14874	122	22430
3	354	33	2034	63	7270	93	15210	123	22638
4	372	34	2052	64	7446	94	15546	124	22996
5	522	35	2370	65	7782	95	15882		
6	540	36	2388	66	7926	96	16218		
7	558	37	2642	67	8118	97	16554		
8	674	38	2660	68	8454	98	16890		
9	692	39	2706	69	8582	99	17226		
10	708	40	2724	70	8790	100	17562		
11	858	41	3042	71	9126	101	17802 Note		
12	876	42	3060	72	9238	102	17898 Note		
13	894	43	3298	73	9462	103	18252		
14	1026	44	3316	74	9798	104	18476		
15	1044	45	3378	75	9894	105	18588		
16	1194	46	3396	76	10134	106	18924		
17	1212	47	3750	77	10470	107	19132		
18	1230	48	3990	78	10550	108	19260		
19	1330	49	4086	79	10806	109	19596		
20	1348	50	4422	80	11160	110	19788		
21	1362	51	4646	81	11224	111	19932		
22	1380	52	4758	82	11496	112	20268		
23	1530	53	5094	83	11880	113	20444		
24	1548	54	5302	84	12168	114	20604		
25	1566	55	5430	85	12536	115	20940		
26	1698	56	5766	86	12840	116	21100		
27	1716	57	5958	87	13192	117	21276		
28	1866	58	6102	88	13512	118	21612		
29	1884	59	6438	89	13848	119	21774		

NOTE: E-TFCI values 101 and 102 shall not be used by a Rel-7 or later release UE and may not be used by a Rel-6 UE. The reason for including the test point for the E-TFCI values 101 and 102 is to verify that a Rel-7 UE uses the next possible larger E-TFCI values instead.

Table 7.1.6.3.2a.3 Applicable E-TFS indexes for sub-tests 1 to 2 and UE E-DCH category 7.

			Applicable E-TFS indexes
Sub-test	**E-DCH TTI**	**E-DCH Transport Block Size Table**	**Category 7**
1	2ms	2ms TTI Table 2, Table 7.1.6.3.2.2a.1	1..127
2	2ms	2ms TTI Table 3, Table 7.1.6.3.2.2a.2	1..124
NOTE 1: Applicable indexes depends on “Maximum number of bits of an E-DCH transport block transmitted within a 2 ms E-DCH TTI” as specified in TS 25.306 clause 5.1. E-TFCI index=0 not tested as TB size for this E-TFCI value is 18 bits, which would only fit the MAC-e/es header used by the SS in the test procedure.			

Table 7.1.6.3.2a.6 lists E-TFCI values that a Rel-7 or later release UE shall not use due to the associated coding rates cause turbo coder irregularities (ref. [6], Annex B).

Table 7.1.6.3.2a.6: E-TFCI values causing degradation due to turbo coder irregularities

E-DCH Transport Block Size Tables	E-TFCI	Reference
2 ms TTI, Table 2	121	[6], Annex B.2a
2 ms TTI, Table 3	101	[6], Annex B.2b
2 ms TTI, Table 3	102	[6], Annex B.2b

Test procedure

a) The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.10.2.4.6.2 using condition " Packet to CELL_DCH / E-DCH[UL : 16QAM] / HS-DSCH using one multiplexing option (1/1) and SRBs mapped on E-DCH/DCH condition A19a" as specified in clause 9.1 of TS 34.108. See note 1.

b) The SS closes the test loop using UE test loop mode 1 and configuring the UL RLC SDU size to be equal to the received DL SDU size (i.e. not setting the UL RLC SDU size parameter).

c) SS sets RLC SDU size = 312 bits which corresponds to maximum AM payload size for 1 MAC-d PDU of size 336 bits.

d) The SS removes the scheduling grant for E-DCH for the UE.

e) If N_{PDUs} is less than 36 the SS transmits one RLC SDU with size (($NPDUs$ – 1) * 320 + 312) else the SS transmits two SDUs with size ((N_{PDUs} – 2) * 320 + 2 * 312) / 2. See note 2.

f) The SS waits for an SI to be received that indicates that there is data available for transmission (can be identified from the content of the SI). See Note 3. The SS checks that TEBS has the correct value.

g) The SS issues an absolute grant that allows the UE to send at maximum bit rate (signalling value 31)

h) The SS waits until data is received and verifies that the looped back SDU data has the correct content and is sent in the same TTI.

i) The SS verifies that the received E-TFC used by the UE is correct. For Rel-7 and later release UE the SS checks that the UE has not used the transport block sizes correspondent to the E-TFCI values as listed in table 7.1.6.3.2a.6, but instead used the transport format correspondent to the next possible larger E-TFCI value.

j) The SS increments the RLC SDU payload size by 320 bits. For the case of 2 SDUs transmitted by the SS, each of the payload sizes are incremented by 320 bits. The SS calculates the new E-TFC transport block size from the relevant Transport Block Size Table. If this transport block size is supported by the UE under test, according to Table 7.1.6.3.2.5, then continue with step d else continue with step k.

k) The SS opens the UE test loop.

l) The SS release the radio bearer.

m) The SS may optionally deactivate the radio bearer test mode.

NOTE 1: The SS configures the physical channel parameters according to the actual UE category under test.

NOTE 2: Calculation of Downlink (DL) RLC SDU size:
DL SDU size = N_{PDUs} * 336 bits RLC PDU – headers associated with MAC and RLC.

RLC PDU = RLC 16 bits Sequence Number + 8 bits for the Optional Length Indicators + RLC pay load size. The Optional Length Indicator is present only in the delivery of the last RLC PDU.

The Optional Length Indicators consists of a 7 bits Length Indicator + 1 bit Extension Field of binary value = "0". The 7 bit length indicator indicates the number of octets between the end of the RLC header up to and including the last octet of the (DL) RLC SDU ending within the PDU.

Therefore, the RLC payload has two different sizes of 320 bits (336 – 16 bits Sequence Number) and 312 bits (336 – 16 bits sequence Number - (7 bits Length Indicator + 1 bit extension field)).

N_{PDUs} = FLOOR ((TBS size – MAC-e header size – MAC-es header size) / MAC-d PDU size) = FLOOR ((TBS size -18) / 336).

For N_{PDUs} = 1
DL RLC SDU payload has size 312 bits

For $1 < N_{PDUs} < 36$
There are (N_{PDUs} – 1) RLC payloads of size 320 bits with the last RLC payload size 312 bits
DL RLC SDU payload size = (N_{PDUs} -1) * 320 + 312

For $N_{PDUs} \geq 36$
The test data for transport channels on HS-DSCH and E-DCH is divided into 2 RLC SDUs so that the SDU size does not exceed 1500 octets (limit of SDU size in SM)

The payload data of the MAC-d PDUs contains 2 RLC SDUs of size

((N_{PDUs} – 2) * 320 + 2 * 312) / 2

$N_{PDU} = N_{PDUs} + 2$

Calculation of E-TFC TB Size:
Select the E-TFC Index/TB Size = Number of MAC-d PDU * 336 bits RLC PDU + 18 bits MAC-es and MAC-e headers (6 bits N + 6 bits TSN + 6 bits DDI) according to the E-DCH Transport Block Size Tables for FDD per 25.321 Annex B,

As an example TBS value of 716 bits is used by the UE in the 10mS Index 0 subtest to deliver UL RLC SDU size o f 84 bytes = 672bit + 18 bits MAC headers = 690 bits

NOTE 3: Calculation of TEBS value:
Using the E-TFC TB size determined in Note 2 above, select the TEBS index according to 25.321 Table 9.2.5.3.2-1.

Expected sequence

Step	Direction	Message	Comments
	UE SS		
1	<--	SYSTEM INFORMATION (BCCH)	Broadcast
2	<--	PAGING TYPE 1 (PCCH)	Paging (PS domain, P-TMSI)
3	-->	RRC CONNECTION REQUEST (CCCH)	RRC
4	<--	RRC CONNECTION SETUP (CCCH)	RRC
5	-->	RRC CONNECTION SETUP COMPLETE (DCCH)	RRC
6	-->	SERVICE REQUEST (DCCH)	GMM
7	<--	SECURITY MODE COMMAND	RRC see note 1
8	-->	SECURITY MODE COMPLETE	RRC see note 1
9	<--	ACTIVATE RB TEST MODE (DCCH)	TC
10	-->	ACTIVATE RB TEST MODE COMPLETE (DCCH)	TC
11	<--	RADIO BEARER SETUP (DCCH)	RRC. For the PS radio bearer the 'pdcp info' IE shall be omitted.
12	-->	RADIO BEARER SETUP COMPLETE (DCCH)	RRC
13	<--	CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 with no "LB Setup RB IE#k" parameter set (UE shall return an UL RLC SDU with the same size as the received RLC SDU in downlink)
14	-->	CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
15	SS		The SS initially creates one RLC SDU with payload size 312bits
16	←	Removal of absolute grant	Signalling value 1
17	<--	DOWNLINK RLC SDU(s)	Send test data. The data contains 1 RLC SDU or 2 SDUs (refer to Note 2 in test procedure above)
18	→	SI indicating data for transmission	This can be verified from the indicated Total E-DCH Buffer Status (TEBS)
19	<--	Absolute grant allowing the UE to transmit at maximum bit rate.	Signalling value 31
20	-->	UPLINK RLC SDU(s)	The SS checks E-TFC from the UE and checks that the content of the received UL RLC SDU is correct and sent in the same TTI For Rel-7 and later release UE the SS checks that the UE has not used the transport block sizes correspondent to the E-TFCI values as listed in table 7.1.6.3.2a.6, but instead used the transport block size correspondent to the next possible larger E-TFCI value.
21	SS		The SS increases the SDU size(s) by 320 bits (refer to Note 2) and calculates the E-TFC transport block size required to send this data on E-DCH from the relevant Transport Block Size Table. If E-TFC TB size is supported by the E-DCH category then repeat steps 16 to 19
22	<--	OPEN UE TEST LOOP (DCCH)	TC
23	-->	OPEN UE TEST LOOP COMPLETE (DCCH)	TC
24		RB RELEASE	RRC
25	<--	DEACTIVATE RB TEST MODE	TC Optional step
26	-->	DEACTIVATE RB TEST MODE COMPLETE	TC Optional step
Note 1	In addition to activate integrity protection Step 7 and Step 8 are inserted in order to stop T3317 timer in the UE, which starts after transmitting SERVICE REQUEST message.		

7.1.6.3.2a.5 Test requirements

1. In step 20, the SS verifies that the received E-TFC has the correct size. For Rel-7 and later release UE the SS checks that the UE has not used the transport block sizes correspondent to the E-TFCI values as listed in table 7.1.6.3.2a.6, but instead used the transport block size correspondent to the next possible larger E-TFCI value,.

2. In step 20, the SS shall receive the RLC SDU(s) in the same TTI and with the same content as sent in downlink.

7.1.6.3.3 Impact on E-TFCI selection on MAC at UE for UL DRX at Node B/ MAC Inactivity Threshold>1

7.1.6.3.3.1 Definition and applicability

All UEs which support UL DTX (E-DCH start time restriction).

7.1.6.3.3.2 Conformance requirement

In FDD mode, the rules for E-TFC selection provided below shall apply to UEs in CELL_DCH state with an E-DCH transport channel configured. These UEs shall apply the E-TFC selection procedure when invoked by the HARQ entity (see subclause 11.8.1.1.1). In the case where a 2ms TTI is configured, E-TFC selection shall not be performed for TTIs that overlap with an uplink compressed mode gap. The E-TFC restriction procedure described in [12] shall always be applied before the E-TFC selection process below. E-TFCs which (according to calculations in [16]) require channelisation codes which are not allowed by the value given by the Maximum channelisation codes for E-DPDCH or are not supported by the UE capability shall be considered as blocked. Furthermore, for UEs that are also configured with a DCH transport channel on uplink, the TFC selection procedure shall be applied before either of these.

…

In FDD, in case the DTX feature is configured by higher layers and no E-DCH transmission is performed in this TTI:

- if *MAC Inactivity Threshold* > 1 and no E-DCH transmission has been performed for *MAC Inactivity Threshold* - 1 previous TTIs or,

- if *MAC Inactivity Threshold* = 1:

  - E-TFC selection shall only be performed for the TTIs where the following conditions are fulfilled:

    - For 2ms TTI: [5*CFN + subframe number - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0;

    - For 10ms TTI: [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0.

    In 2ms TTI case, if the TTI that fulfilled [5*CFN + subframe number - UE DTX DRX Offset] mod MAC DTX Cycle = 0 overlapped with an uplink compressed mode transmission gap, the E-TFC selection shall be performed for the first TTI not overlapping with an uplink compressed mode transmission gap.

Reference(s)

TS 25.321 clauses 11.8.1.4

7.1.6.3.3.3 Test purpose

The purpose of this test case is to verify that

1. To verify that when no E-DCH transmission has been performed for MAC Inactivity Threshold -1 previous TTI, UE start E-DCH transmission in TTI satisfying [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0.

2. To verify that when E-DCH transmission has been performed within MAC Inactivity Threshold -1 previous TTI, UE start E-DCH transmission immediately[Grant available].

7.1.6.3.3.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration Streaming or interactive or background / UL: [max bit rate depending on UE category and TTI] DL: [max bit rate depending on UE category] / UM PS RAB + UL: [max bit rate depending on UE category and TTI] DL: [max bit rate depending on UE category] SRBs for DCCH on E-DCH and HS-DSCH as specified in TS 34.108, clause 6.11.4i.1. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25

DL_DRX is not activated and default UL_DTX parameters are applied.

The following UL_DRX parameters are specific for this test case:

Parameter	Value
E-DCH TTI	10 ms
MAC DTX Cycle	20
MAC Inactivity Threshold	128
UE DTX DRX Offset	10 (multiple of 5)

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Test procedure

a) SS waits for 1.5 seconds, so that condition for MAC Inactivity is satisfied.

b) SS transmits 5 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

c) SS waits until an SI is received. SS checks that the CFN in which SI is received satisfies condition [5*CFN - UE DTX DRX Offset] mod MAC DTX Cycle = 0.

d) SS issues an absolute grant that allows the UE to send 1 RLC PDU per TTI (signalling value 4)

e) SS starts receiving loop backed RLC PDU's.

f) SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1Expected sequence

g) SS receives loop backed RLC PDU. SS repeats steps f & g, until CFN in which loop backed PDU is received satisfies condition [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* ≠ 0.

h) SS waits for 1.5 seconds, so that condition for MAC Inactivity is satisfied.

i) SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

j) SS receives loop backed RLC PDU. SS checks that the CFN in which loop backed PDU is received satisfies condition [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0.

k) SS repeats steps h-j, 10 times and always condition [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0 is satisfied.

Step	Direction UE	SS	Message	Comments
1				SS Waits for 1.5 seconds so that MAC_Inactivity_Threshold is satisfied
2	←		5 RLC PDUs on LCH 1	
3	→		SI indicating data on LCH 1	SS Checks that [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0 is satisfied for transmission of SI
4	←		Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 4
5	→		MAC es PDU containing 1 RLC PDU from LCH 1	First Loop Backed PDU.
6	→		MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated until all remaining 4 RLC SDU's are received on consecutive TTI's
7	←		1 RLC PDUs on LCH 1	
8	→		MAC es PDU containing 1 RLC PDU from LCH 1	SS Checks that [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* ≠ 0 is satisfied If above equation is not satisfied steps 7 and 8 are repeated.
9				SS Waits for 1.5 seconds so that MAC_Inactivity_Threshold is satisfied
10	←		1 RLC PDUs on LCH 1	
11	→		MAC es PDU containing 1 RLC PDU from LCH 1	SS Checks that [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0 is satisfied
				Steps 9 to 11 are repeated 10 times

Specific Message Contents

None

7.1.6.3.3.5 Test requirements

1. In step 3, the CFN of transmitted SI satisfies [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0.
2. In step 8, the CFN of loop backed PDU satisfies [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* ≠ 0
3. In step 11,for all iterations, the CFN of loop backed PDU satisfies [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0

7.1.6.3.4 Impact on E-TFCI selection on MAC at UE for UL DRX at Node B/ MAC Inactivity Threshold =1

7.1.6.3.4.1 Definition and applicability

All UEs which support UL DTX (E-DCH start time restriction).

7.1.6.3.4.2 Conformance requirement

In FDD mode, the rules for E-TFC selection provided below shall apply to UEs in CELL_DCH state with an E-DCH transport channel configured. These UEs shall apply the E-TFC selection procedure when invoked by the HARQ entity (see subclause 11.8.1.1.1). In the case where a 2ms TTI is configured, E-TFC selection shall not be performed for TTIs that overlap with an uplink compressed mode gap. The E-TFC restriction procedure described in [12] shall always be applied before the E-TFC selection process below. E-TFCs which (according to calculations in [16]) require channelisation codes which are not allowed by the value given by the Maximum channelisation codes for E-DPDCH or are not supported by the UE capability shall be considered as blocked. Furthermore, for UEs that are also configured with a DCH transport channel on uplink, the TFC selection procedure shall be applied before either of these.

…

In FDD, in case the DTX feature is configured by higher layers and no E-DCH transmission is performed in this TTI:

- if *MAC Inactivity Threshold* > 1 and no E-DCH transmission has been performed for *MAC Inactivity Threshold* - 1 previous TTIs or,

- if *MAC Inactivity Threshold* = 1:

  - E-TFC selection shall only be performed for the TTIs where the following conditions are fulfilled:

    - For 2ms TTI: [5*CFN + subframe number - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0;

    - For 10ms TTI: [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0.

  In 2ms TTI case, if the TTI that fulfilled [5*CFN + subframe number - UE DTX DRX Offset] mod MAC DTX Cycle = 0 overlapped with an uplink compressed mode transmission gap, the E-TFC selection shall be performed for the first TTI not overlapping with an uplink compressed mode transmission gap.

Reference(s)

TS 25.321 clauses 11.8.1.4

7.1.6.3.4.3 Test purpose

To verify that UE always start E-DCH transmission in TTI satisfying [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0.

7.1.6.3.4.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration Streaming or interactive or background / UL: [max bit rate depending on UE category and TTI] DL: [max bit rate depending on UE category] / UM PS RAB + UL: [max bit rate depending on UE category and TTI] DL: [max bit rate depending on UE category] SRBs for DCCH on E-DCH and HS-DSCH as specified in TS 34.108, clause 6.11.4i.1. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25

DL_DRX is not activated and default UL_DTX parameters are applied.

The following UL_DRX parameters are specific for this test case:

Parameter	Value
E-DCH TTI	10 ms
MAC DTX Cycle	20
MAC Inactivity Threshold	1
UE DTX DRX Offset	10 (multiple of 5)

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Test procedure

a) SS transmits 5 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1Expected sequence

b) SS waits until an SI is received. The SS checks that the CFN in which SI is received satisfies condition [5*CFN - UE DTX DRX Offset] mod MAC DTX Cycle = 0.

c) SS issues an absolute grant that allows the UE to send 1 RLC PDU per TTI (signalling value 4)

d) SS starts receiving loop backed RLC PDU's. SS checks that the CFN in which each loop backed PDU received satisfies condition [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0.

e) SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1Expected sequence

f) SS receives loop backed RLC PDU..

g) SS repeats steps e & f, 10 times and always condition [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0 is satisfied.

Step	Direction UE SS	Message	Comments
1	←	5 RLC PDUs on LCH 1	
2	→	SI indicating data on LCH 1	SS Checks that [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0 is satisfied for transmission of SI
3	←	Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 4
4	→	MAC es PDU containing 1 RLC PDU from LCH 1	First Loop Backed PDU. SS Checks that [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0 is satisfied
5	→	MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated until all remaining 4 RLC SDU's are received. SS Checks that [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0 is satisfied for each of the PDUs.
6	←	1 RLC PDUs on LCH 1	
7	→	MAC es PDU containing 1 RLC PDU from LCH 1	SS Checks that [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0 is satisfied
			Steps 6 & 7 are repeated 10 times

Specific Message Contents

None

7.1.6.3.4.5 Test requirements

1. In step 4, the CFN of loop backed PDU satisfies [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0.

2. In step 2, the CFN of transmitted SI satisfies [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0

3. In step 5, for all 4 transmissions, the CFN of the loop backed PDUs satisfies [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0

4. In step 7, for all iterations, the CFN of loop backed PDU satisfies [5*CFN - *UE DTX DRX Offset*] **mod** *MAC DTX Cycle* = 0

7.1.6.3.5 MAC-es/e transport block size selection(1.28Mcps TDD)

7.1.6.3.5.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.3.5.2 Conformance requirement

Extract from TS 25.321 clause 9.2.6.4

For 1.28 Mcps TDD, the normative description of the mapping between the TB index and the corresponding transport block size is provided in Annex BC.

[…]

Reference(s)

TS 25.321 clause 9.2.6.4

7.1.6.3.2.3 Test purpose

To verify that the UE transmits all possible transport block sizes within the UE capability.

7.1.6.3.2.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

UE in idle mode

The following parameters are specific for this test case:

Sub-tests and test points for UE HS-DSCH physical layer category 6. Testing of UE supporting UE HS-DSCH physical layer category 13 to 15 shall be performed in accordance to test parameters, sub-tests and test points for UE HS-DSCH physical layer category 10

Common for all UE HS-DSCH categories:

Parameter	Value
MAC-d PDU size	336 bits
MAC-hs receiver window size	16
Number of HARQ processes	1
Number of reordering queues	1

Common for all UE E-DCH categories:

Parameter	Value
T-WAIT	200 ms (see 25.331 10.3.6.103)

Specific depending on E-DCH category:

Parameter	E-DCH Category	Value
RLC Transmission window size	1 to 5	512
	6	1536
E-TFCI table	1 to 6	See table 7.1.6.3.2.5

Specific depending on HS-DSCH category:

Parameter	HS-DSCH Category	Value
RLC Receiving window size	1 to 6	512
	7 and 8	1536
	9 and 10	2047
	11 and 12	1024

The mapping between the chosen E-TFC index and the corresponding E-DCH transport block size is given in the following tables:

Table 7.1.6.3.5.1 5ms TTI E-DCH Transport Block Size Table 0

	Category 1-2			Category 3-6				
TB index	1 Timeslot TBS	2 Timeslots TBS	3 Timeslots TBS	1 Timeslot TBS	2 Timeslots TBS	3 Timeslots TBS	4 Timeslots TBS	5 Timeslots TBS
0	23	23	23	23	23	23	23	23
1	116	116	116	116	116	116	116	116
2	162	162	162	162	162	162	162	162
3	167	169	170	169	171	172	173	173
4	173	177	180	177	181	184	186	186
5	179	186	190	186	192	196	199	199
6	186	195	200	194	204	209	213	213
7	192	204	211	204	216	223	229	229
8	199	214	222	213	229	238	245	245
9	206	224	235	223	242	254	263	263
10	213	234	247	234	257	271	282	282
11	221	246	261	245	272	289	302	302
12	229	257	275	257	288	309	324	324
13	237	270	290	269	306	329	347	347
14	245	282	306	282	324	351	372	372
15	254	296	323	295	343	375	399	399
16	263	310	341	309	364	400	427	427
17	272	325	359	324	385	427	458	458
18	282	340	379	339	408	455	491	491
19	292	356	400	355	433	486	526	526
20	302	373	422	372	459	518	564	564
21	313	391	445	390	486	553	605	605
22	324	410	469	408	515	589	648	648
23	335	429	495	427	546	629	695	695
24	347	450	522	448	578	671	745	745
25	359	471	550	469	613	716	799	799
26	372	493	581	491	649	764	856	856
27	385	517	612	514	688	815	918	918
28	399	541	646	539	729	869	983	983
29	413	567	681	564	773	927	1054	1054
30	428	594	718	591	819	989	1130	1130
31	443	622	758	619	867	1055	1211	1211
32	458	652	799	648	919	1125	1298	1298
33	475	683	843	679	974	1201	1392	1392
34	491	716	889	711	1032	1281	1492	1492
35	509	750	937	745	1094	1366	1599	1599
36	527	785	989	780	1159	1458	1714	1714
37	545	823	1043	817	1228	1555	1837	1837
38	565	862	1100	856	1301	1659	1969	1969
39	585	903	1160	896	1379	1770	2110	2110
40	605	946	1223	938	1461	1888	2262	2262
41	627	991	1290	983	1548	2014	2425	2425
42	649	1038	1361	1029	1640	2148	2599	2599
43	672	1087	1435	1078	1738	2292	2786	2786
44	696	1139	1514	1129	1841	2445	2986	2986
45	720	1193	1596	1183	1951	2608	3200	3200
46	746	1250	1684	1239	2067	2782	3430	3430
47	772	1309	1776	1297	2191	2968	3677	3677
48	799	1372	1873	1359	2321	3166	3941	3941
49	827	1437	1975	1423	2460	3377	4224	4224
50	857	1505	2083	1491	2606	3603	4528	4528
51	887	1577	2197	1561	2762	3843	4853	4853
52	918	1652	2317	1635	2926	4100	5202	5202
53	951	1730	2444	1712	3101	4374	5576	5576
54	984	1813	2578	1794	3285	4666	5976	5976
55	1019	1899	2719	1878	3481	4977	6406	6406
56	1055	1989	2867	1967	3689	5310	6866	6866
57	1092	2084	3024	2060	3908	5664	7359	7359

58	1131	2183	3189	2158	4141	6042	7888	7888
59	1171	2287	3364	2260	4388	6446	8455	8455
60	1212	2395	3547	2367	4650	6876	9062	9062
61	1255	2509	3741	2479	4927	7335	9713	9713
62	1300	2629	3946	2597	5220	7825	10411	10411
63	1346	2754	4162	2720	5532	8348	11160	11160

Table 7.1.6.3.5.2 Applicable E-TFS indexes for sub-tests 1 to 4 and UE E-DCH categories 1 to 6.

			Applicable E-TFS indexes					
Sub-test	**E-DCH TTI**	**E-DCH Transport Block Size Table**	**Category 1**	**Category 2**	**Category 3**	**Category 4**	**Category 5**	**Category 6**
1	5ms	5ms TTI Table 0, Table 7.1.6.3.5.1	0..101	0..119	0..119	0..127	0..127	0..127
NOTE 1: Applicable indexes depends on the UE capability of "Maximum number of bits of an E-DCH transport block transmitted within a 5 ms E-DCH TTI" and "Maximum number of bits of an E-DCH transport block transmitted within a 5 ms E-DCH TTI" as specified in TS 25.306 clause 5.1.								

Test procedure

a) The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.5.4.7.2 using condition A11 as specified in clause 9.1 of TS 34.108.. See note 1.

b) The SS closes the test loop using UE test loop mode 1 and configuring the UL RLC SDU size to be equal to the received DL SDU size (i.e. not setting the UL RLC SDU size parameter).

c) SS sets *E-TFC index* = 0.

d) The SS removes the scheduling grant for E-DCH for the UE.

e) The SS transmits two RLC SDUs of size (*TBS_size* – 18)*160 / 336 – 8 bits, where the value for *TBS_size* is derived from the applicable E-TFS index table as specified in Table 7.1.6.3.5.2 for the sub-test.

f) The SS waits for an SI to be received that indicates that the two RLC SDUs are available for transmission (can be identified from the content of the SI)

g) The SS issues an absolute grant that allows the UE to send at maximum bit rate

h) The SS waits until data is received and verifies that the looped back SDU has correct content

i) The SS verifies that the received E-TFC has correct size

j) The SS increments the parameter *E-TFC index* by one. If the *E-TFC index* is supported by the UE under test according to Table 7.1.6.3.5.2 then continue with step d else continue with step k.

k) The SS opens the UE test loop.

l) The SS release the radio bearer.

m) The SS may optionally deactivate the radio bearer test mode.

NOTE 1: The SS configures the physical channel parameters according to the actual UE category under test.

NOTE 2: The test data for transport channels on HS-DSCH and E-DCH is divided into 2 RLC SDUs to keep the SDU size not to exceed 1500 octets (limit of SDU size in SM). Calculation of RLC SDU size:

RLC SDUs of size = *Number of MAC-d PDUs* * *RLC payload size* / 2 – 8 bits (size of 7 bit length indicator and expansion bit) where the *RLC payload size* is 320 bits and the *Number of MAC-d PDUs* = (*TBS size* – *MAC-e header size* – *MAC-es header size*) / *MAD-d PDU size* = (*TBS size* – 18) / 336. This gives that the *RLC SDUs of size* = (TBS size – 18) *160 / 336 – 8 bits.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	<--		SYSTEM INFORMATION (BCCH)	Broadcast
2	<--		PAGING TYPE 1 (PCCH)	Paging (PS domain, P-TMSI)
3	-->		RRC CONNECTION REQUEST (CCCH)	RRC
4	<--		RRC CONNECTION SETUP (CCCH)	RRC
5	-->		RRC CONNECTION SETUP COMPLETE (DCCH)	RRC
6	-->		SERVICE REQUEST (DCCH)	GMM
7	<--		SECURITY MODE COMMAND	RRC see note 1
8	-->		SECURITY MODE COMPLETE	RRC see note 1
9	<--		ACTIVATE RB TEST MODE (DCCH)	TC
10	-->		ACTIVATE RB TEST MODE COMPLETE (DCCH)	TC
11	<--		RADIO BEARER SETUP (DCCH)	RRC. For the PS radio bearer the 'pdcp info' IE shall be omitted.
12	-->		RADIO BEARER SETUP COMPLETE (DCCH)	RRC
13	<--		CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 with no "LB Setup RB IE#k" parameter set (UE shall return an UL RLC SDU with the same size as the received RLC SDU in downlink)
14	-->		CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
15	SS			The SS creates two RLC SDUs according to the E-TFC under test
16	←		Removal of absolute grant	Signalling value 1
17	<--		DOWNLINK RLC SDU#1 DOWNLINK RLC SDU#2	Send test data. The MAC-hs PDU contains 4 RLC SDUs
18	→		SI indicating 2 RLC SDUs	This can be verified from the indicated Total E-DCH Buffer Status (TEBS)
19	<--		Absolute grant allowing the UE to transmit at maximum bit rate.	
20	-->		UPLINK RLC SDUs	The SS checks that the content of the received UL RLC SDUs are correct
21	SS			The SS calculates test data for next E-TFC index and repeat steps 16 to 19 until all applicable E-TFC indexes have been tested.
22	<--		OPEN UE TEST LOOP (DCCH)	TC
23	-->		OPEN UE TEST LOOP COMPLETE (DCCH)	TC
24			RB RELEASE	RRC
25	<--		DEACTIVATE RB TEST MODE	TC Optional step
26	-->		DEACTIVATE RB TEST MODE COMPLETE	TC Optional step
Note 1: In addition to activate integrity protection Step 6 and Step 7 are inserted in order to stop T3317 timer in the UE, which starts after transmitting SERVICE REQUEST message.				

7.1.6.3.2.5 Test requirements

1. In step 20, the SS verifies that the received E-TFC has the correct size
2. In step 20, the SS shall receive 2 RLC SDUs with the same content as sent in downlink.

7.1.6.4 MAC-es/e - E-DCH retransmissions

7.1.6.4.1 MAC-es/e process handling

7.1.6.4.1.1 Definition and applicability

All UEs which support E-DCH with 2ms TTI. (FDD)/ All UEs which support E-DCH(1.28Mcps TDD).

7.1.6.4.1.2 Conformance requirement

Extract from 25.331:

1> for FDD:

2> if the IE "Non-scheduled transmission grant info" is included:

3> if the TTI configured on the E-DCH equals 2ms, and the IE "2ms non-scheduled transmission grant HARQ process allocation" is configured for this MAC-d flow:

4> MAC-d PDU's for logical channels belonging to this MAC-d flow shall only be included in a MAC-e PDU transmitted by HARQ processes allowed by the IE "2ms non-scheduled transmission HARQ process allocation", with a total contribution from this MAC-d flow not exceeding the size as signalled by the IE "Max MAC-e PDU contents size".

1> for TDD:

2> if the IE "Non-scheduled transmission grant info" is included:

3> MAC-d PDU's for logical channels belonging to this MAC-d flow shall only be included in a MAC-e PDU transmitted by HARQ processes designated as non scheduled (Ids 4 – 7) in the TTIs indicated (as determined from the IEs "Activation Time", "Resource Duration" and "Resource Periodicity").

Extract from 25.331:

When the variable E_DCH_TRANSMISSION is set to TRUE the UE shall:

1> for FDD:

2> configure the UL E-DPCCH in accordance with the stored IE "E-DPCCH" configuration;

2> configure the MAC with the stored IE "E-DPDCH" configuration and/or the information contained in IE "Scheduled Transmission configuration".

1> for TDD:

2> configure the E-RUCCH with the stored E-RUCCH configuration;

2> configure the MAC with the stored E-PUCH configuration.

Extract from 25.321:

RRC can allocate non-scheduled transmission grants to individual MAC-d flows in order to reduce the transmission delays. When a 2ms TTI is configured each non-scheduled grant is applicable to the specific set of HARQ processes indicated by RRC. The applicability of scheduled grants can be also restricted to a specific set of HARQ processes when a 2ms TTI is configured. HARQ process restriction and reservation is under the control of the serving cell Node B and indicated to the UE by RRC

Extract From 25.321 clause 11.9.1.4:

RRC can allocate non-scheduled transmission grants to individual MAC-d flows in order to reduce the transmission delays.

The UE shall determine whether to take scheduled or non-scheduled grants into account in the upcoming transmission. If neither are supposed to be taken into account (i.e. the TTI is not available for non-scheduled transmission and no Grant for scheduled transmission has been received) then no grant shall be assumed to exist. If a grant exists then the transmission format and data allocation shall follow the requirements below.

Reference(s)

TS 25.321 clauses 11.8.1.4, 11.9.1.4,. TS 25.331 clauses 8.6.5.18 and 8.6.6.37

7.1.6.4.1.3 Test purpose

To verify that the UE performs transmissions and retransmissions in the correct MAC-es process.

To verify that the UE uses only the allowed HARQ processes for scheduled and non-scheduled transmissions.

7.1.6.4.1.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4d(FDD) /6.11.5.4.7.7(1.28Mcps TDD) using condition A15(FDD) /A14(1.28Mcps TDD) as specified in clause 9.1 of TS 34.108. The following parameters are specific for this test case with the logical channel, transport channel and queue identities set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the test case			

The following parameters are specific for this test case:

Parameter	Value
TTI for Radio bearer	2 ms (FDD)
TTI for Radio bearer	5 ms (1.28Mcps TDD)
Periodicity for scheduling info	No periodic scheduling info
E-TFCI table	Table 0 for 2 ms TTI
E-TFCI table	5ms TTI E-DCH Transport Block Size Table 0(1.28Mcps TDD)
HARQ RV Configuration	rv0

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Test procedure

In this test procedure the UE is configured with two logical channels, with Id 7 (LCH 1) and 8 (LCH2). LCH 1 is mapped to MAC-d flow 2 and LCH 2 is mapped to MAC-d flow3. The MAC-d flow 2 has been configured with non-scheduled transmissions allowed in HARQ process 1(FDD) / one HARQ process of 4 to 7 (1.28Mcps TDD), with a rate exceeding 1 SDU/TTI and the value of the "Max MAC-e PDU contents size" is 500 bits. MAC-d flow 3 has been configured with a scheduled transmission allowed in HARQ process 2/ one HARQ process of 0 to 3(1.28Mcps TDD)..

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1

c) The SS waits until data is received and checks that the data is received in HARQ process 1(FDD) / one HARQ process of 4 to7 (1.28Mcps TDD)

d) The SS sends a HARQ NACK

e) The SS waits until the retransmission is received and checks that the data is received in HARQ process 1(FDD) / one HARQ process of 4 to7 (1.28Mcps TDD)

f) The SS transmits 8 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH 2

g) The SS waits until an SI is received.

h) The SS issues primary absolute grant corresponding to 1 RLC PDU of size 41 octets per TTI (signalling value 4), with Absolute Grant Scope set as "All HARQ processes" (FDD)/ The SS issues absolute grant corresponding to 1 RLC PDU of size 41 octets per TTI(1.28Mcps TDD).

i) The SS waits until data is received and checks that the data is received in HARQ process 2/ one HARQ process of 0 to 3(1.28Mcps TDD).

j) The SS transmits 8 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1

k) The SS waits until data is received and checks that the data is received in HARQ process 1(FDD) / one HARQ process of 4 to7 (1.28Mcps TDD)

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	1 RLC PDU on LCH 1	
2	→	MAC-es PDU containing 1 RLC PDU	
3	←	HARQ NACK	
4	→	MAC-es PDU containing 1 RLC PDU	
5	←	8 RLC SDU's on LCH 2	
6	→	SI indicating data on LCH 2	
7	←	Primary Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 4
8	→	MAC-es PDU containing 1 RLC PDU	PDU shall be received in HARQ process 2/ one HARQ process of 0 to 3(1.28Mcps TDD). This step is repeated until all 8 RLC SDU's are received on LCH2.
9	←	8 RLC SDU's on LCH 1	
10	→	MAC-es PDU containing 1 RLC PDU	PDU shall be received in HARQ process 1(FDD) / one HARQ process of 4 to7 (1.28Mcps TDD). This step is repeated until all 8 RLC SDU's are received on LCH1.

Specific Message Contents

None

7.1.6.4.1.5 Test requirements

1. In step 2 the SS shall receive a MAC-es PDU in HARQ process 1(FDD) / one HARQ process of 4 to7 (1.28Mcps TDD).

2. In step 4 the SS shall receive a MAC-es PDU in HARQ process 1(FDD) / one HARQ process of 4 to7 (1.28Mcps TDD).

3. In step 8 the SS shall receive all MAC-es PDUs in HARQ process 2/ one HARQ process of 0 to 3(1.28Mcps TDD).

4. In step 10 the SS shall receive all MAC-es PDUs in HARQ process 1(FDD) / one HARQ process of 4 to7 (1.28Mcps TDD).

7.1.6.4.2 MAC-es/e maximum number of retransmissions

7.1.6.4.2.1 Definition and applicability

All UEs which support E-DCH.

7.1.6.4.2.2 Conformance requirement

Extract From 25.321 clause 11.8.1.4:

For each MAC-d flow, RRC configures MAC with a HARQ profile and a multiplexing list. Additionally, RRC configures MAC with a power offset for "Control-only" transmissions. This power offset and a maximum number of

HARQ transmissions of 8 will be used to define a HARQ profile for "Control-only" transmissions which will be used, in case the Scheduling Information needs to be transmitted without any higher-layer data. The HARQ profile includes the power offset and maximum number of HARQ transmissions to use for this MAC-d flow. The multiplexing list identifies for each MAC-d flow(s), the other MAC-d flows from which data can be multiplexed in a transmission that uses the power offset included in its HARQ profile.

[..]

The E-TFC selection function shall provide this MAC-e PDU and transmission HARQ profile to the HARQ entity. The maximum number of HARQ transmissions and the power offset in this profile, shall be set respectively to the maximum of the Max Number of HARQ Transmissions of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission and to the Nominal Power Offset. The HARQ entity shall also be informed of whether the transmission includes Scheduling Information and whether this information is sent by itself or with higher-layer data.

Extract From 25.321 clause 11.9.1.4:

[..]

For each MAC-d flow, RRC configures MAC-e with a HARQ profile and multiplexing list. Additionally, RRC configures MAC with a power offset in case the Scheduling Information needs to be transmitted without any higher-layer data. The HARQ profile includes the power offset and maximum number of HARQ transmissions to use for this MAC-d flow. For 1.28 Mcps TDD, the HARQ profile also includes a retransmission timer attribute. The multiplexing list identifies for each MAC-d flow(s), the other MAC-d flows for which data can be multiplexed in a transmission that uses the power offset included in its HARQ profile.

[..]

The E-TFC selection function shall provide this MAC-e PDU and transmission HARQ profile to the HARQ entity. The selected E-TFC is also provided (Note: for 1.28Mcps TDD, the signalled transport block size index, i.e. E-TFCI, is the index of the selected E-TFC in the candidate set.). The maximum number of HARQ transmissions and the power offset in this profile shall be set respectively to the maximum of both the Max Number of HARQ Transmissions and of the power offset of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission. For 1.28 Mcps TDD, the retransmission timer shall be set to the maximum of the retransmission timer value of the HARQ profiles that are permitted to be multiplexed into the transmission. Each HARQ process which is associated with a buffer holding a MAC-e PDU for potential retransmission shall maintain the HARQ profile and the number of re-transmissions that have occurred. For 1.28 Mcps TDD, the HARQ process shall also maintain the value of RTX_TIMER.

Reference(s)

TS 25.321 clause 11.8.1.4, 11.9.1.4

7.1.6.4.2.3 Test purpose

To verify that the UE, when 2 MAC d flows are multiplexed, follows the maximum number of retransmissions according to the HARQ profiles (different values configured for maximum number of retransmissions for each HARQ profile).

7.1.6.4.2.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4d(FDD) /6.11.5.4.7.7(1.28Mcps TDD) using condition A15(FDD) /A14(1.28Mcps TDD) as specified in clause 9.1 of TS 34.108. The logical channel, transport channel, maximum number of retransmissions and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Max. retransmissions	Comment
7 (LCH1)	2	1	2	RB25
8 (LCH2)	3	2	4	RB17
NOTE: The RAB combination also includes SRBs on E-DCH which are not used in the testcase				

The following parameters are specific for this test case:

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (FDD)
T-WAIT	200 ms (see 25.331 10.3.6.103)(1.28Mcps TDD)
E-DCH MAC-d flow multiplexing list	11111111 (See 25.331 10.3.5.1b) Note 1
HARQ RV Configuration	rv0
Note 1: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3. The UE is not given any grant to transmit on E-DCH.

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

c) The SS waits for an SI to be received that indicates that data is available

d) The SS issues an absolute grant that allows the UE to send with a rate sufficient to accommodate one RLC PDU per TTI (signalling value 4)

e) For each received transmission, the SS sends a negative HARQ acknowledgement and verifies that exactly 2 retransmissions are made by the UE.

f) The SS sets the absolute grant to zero for the UE(FDD only)

g) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

h) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

i) The SS waits for an SI to be received that indicates that data is available on both LCHs.

j) The SS issues an absolute grant that allows the UE to send with a rate sufficient to accommodate two RLC PDUs per TTI (signalling value 5)

k) For each received transmission, the SS sends a negative HARQ acknowledgement and verifies that exactly 4 retransmissions are made by the UE (maximum from the HARQ profiles for LCH1 and LCH2).

NOTE: The UE may send an SI after step g but this SI would only indicate data on LCH2. This SI will be ignored.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		

1	←	1 RLC PDUs on LCH 1	
2	→	SI showing that data is available for LCH 1	
3	←	Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 4
4	→	MAC es PDU containing 1 RLC PDU from LCH 1	
5	←	HARQ NACK	
6	SS		SS sends a HARQ NACK for each received retransmission. After the second retransmission the SS waits 1 s to verify that no further retransmissions occur.
7	←	Removal of absolute grant	Signalling value 1(FDD only)
8	←	1 RLC PDUs on LCH 2	
9	←	1 RLC PDUs on LCH 1	
10	→	Potential SI indicating data on LCH 2	This SI is ignored by the SS
11	→	SI showing that data is available for LCH 1 and LCH 2	
12	←	Absolute grant allowing the UE to transmit 2 RLC PDUs per TTI	Signalling value 5
13	→	MAC e PDU containing 1 RLC PDU from LCH 1 and 1 RLC PDU from LCH 2 (NOTE1)	
14	←	HARQ NACK	
15	SS		SS sends a HARQ NACK for each received retransmission. After the fourth retransmission the SS waits 1 s to verify that no further retransmissions occur.
NOTE 1: MAC SDU for LCH 1 and 2 can come in any order			

Specific Message Contents

None

7.1.6.4.2.5 Test requirements

1. In step 6, exactly 2 retransmission shall be performed by the UE.
2. In step 15, exactly 4 retransmissions shall be performed by the UE.

7.1.6.4.3 MAC-es/e Correct handling of MAC-es/e reset

7.1.6.4.3.1 Definition and applicability

All UEs which support E-DCH (FDD) / All UEs which support E-DCH(1.28Mcps TDD).

7.1.6.4.3.2 Conformance requirement

For FDD, if a reset of the MAC-es/e entity is requested by upper layers, the UE shall at the activation time indicated by higher layers:

- flush all HARQ processes.
- set CURRENT_TSN to 0 for all the logical channels mapped to E-DCH.

NOTE: In this case, the HARQ entity will not notify the Scheduling Information Reporting function if a flushed MAC-e PDU contained a triggered Scheduling Information (rely on periodic triggering).

For 1.28Mcps TDD, if a reset of MAC-es/e entity is requested by upper layers, the UE shall at the activation time indicated by higher layer:

- flush all HARQ processes;
- set CURRENT_TSN to 0 for all the logical channels mapped to E-DCH;
- stop all active timers (the timers include Retransmission timer, T_SI, T_WAIT, T_RUCCH);

- set CURRENT_RUCCH to 0.

Reference(s)

TS 25.321 clause 11.8.1.7, 11.9.1.6.

7.1.6.4.3.3 Test purpose

The purpose of this test case is to verify that the UE correctly handles a MAC-es/e reset procedure.

7.1.6.4.3.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4c (FDD) /6.11.5.4.7.6 (1.28Mcps TDD) using condition A12 (FDD) / A11 (1.28Mcps TDD) as specified in clause 9.1 of TS 34.108 as specified in clause 9.1 of TS 34.108. The following parameters are specific for this test case:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25

The following parameters are specific for this test case:

Parameter	Value	
E-DCH MAC-d flow maximum number of retransmissions	15	
E-DCH MAC-d flow retransmission timer	>40	Only for 1.28Mcps TDD
HARQ RV Configuration	rv0	

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Test procedure

In this test procedure The UE is configured with one logical channel, with Id 7 (LCH1).

a) SS has not issued any scheduling grant for E-DCH to the UE.

b) SS transmits 1 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

c) SS waits until an SI is received.

d) The SS issues primary absolute grant corresponding to 1 RLC PDU of size 41 octets per TTI (signalling value 4), with Absolute Grant Scope set as "All HARQ process" (FDD) / The SS issues absolute grant corresponding to 1 RLC PDU of size 41 octets per TTI(1.28Mcps TDD).

e) SS starts receiving loop backed RLC PDU’s.

f) The SS sends HARQ ACK.

g) SS transmits 1 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

h) SS starts receiving loop backed RLC PDU’s.

i) The SS continuously sends HARQ NACKs. The UE continuously performs retransmissions of the same PDU.

j) The SS waits 40 ms after completing step h), then sends a Radio Bearer Reconfiguration message with the MAC-es/e reset indicator set to true and activation time set to “now”.

k) SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

l) SS starts receiving loop backed RLC PDU's.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	1 RLC PDUs on LCH 1	
2	→	SI indicating data on LCH 1	
3	←	Primary Absolute grant (FDD) / Absolute grant (1.28Mcps TDD) allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 4
4	→	MAC es PDU containing 1 RLC PDU's from LCH 1	
5	←	SS sends HARQ ACK	
6	←	1 RLC PDUs on LCH 1	
7	→	MAC es PDU containing 1 RLC PDU's from LCH 1	
8	←	SS continuously sends HARQ NACKs	UE continuously performs retransmissions of the same PDU
9	←	SS triggers a Radio Bearer Reconfiguration	MAC-es/e reset indicator set to "TRUE" and activation time set to "now"
10	←	1 RLC PDUs on LCH 1	
11	→	MAC es PDU containing 1 RLC PDUs from LCH 1	

Specific Message Contents

None

7.1.6.4.3.5 Test requirements

1. In step 9, UE shall abort transmission of the MAC-e PDU
2. In step 11, UE shall start sending loop backed PDU, with one RLC PDU per TTI.
3. In step 11, The TSN field in the MAC-es PDU shall be set to zero.

7.1.6a E-DCH MAC-es/e for 3.84 and 7.68Mcps TDD

7.1.6a.1 MAC-es/e multiplexing

7.1.6a.1.1 MAC-es/e multiplexing without RRC restrictions

7.1.6a.1.1.1 Definition and applicability

All UEs which support E-DCH and 3.84Mcps or 7.68Mcps TDD.

7.1.6a.1.1.2 Conformance requirement

From 25.321 clause 9.1.5:

In the case of E-DCH there are two MAC sublayers, MAC-e and MAC-es. MAC-es sits on top of MAC-e and receives PDUs directly from MAC-d. MAC-es SDUs (i.e. MAC-d PDUs) of the same size, coming from a particular logical channel can be multiplexed together into a single MAC-es payload. To this payload is prepended the MAC-es header (see subclause 9.2.4.1). The number of PDUs, as well as the DDI value identifying the logical channel, the MAC-d flow and the MAC-es SDU size are included as part of the MAC-e header. In case sufficient space is left in the E-DCH transport block or if Scheduling Information needs to be transmitted, an SI will be included at the end of the MAC-e PDU (see subclause 9.2.4.2). Multiple MAC-es PDUs, but only one MAC-e PDU can be transmitted in a TTI.

[…]

From 25.331 clause 8.6.5.18:

1> if the IE "E-DCH MAC-d flow multiplexing list" is included:

2> only multiplex MAC-d PDU's from the E-DCH MAC-d flow indicated in the IE "E-DCH MAC-d flow identity" with MAC-d PDU's from E-DCH MAC-d flows with which multiplexing in the same MAC-e PDU is allowed in accordance to the IE "E-DCH MAC-d flow multiplexing list".

[…]

Reference(s)

TS 25.321 clause 9.1.5, TS 25.331 clause 8.6.5.18

7.1.6a.1.1.3 Test purpose

The purpose of this test case is to verify that the UE multiplexes data from different logical channels in the same TTI when no restriction on the multiplexing is configured by RRC.

7.1.6a.1.1.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4h using condition A15 as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the testcase			

The following parameters are specific for this test case:

Parameter	Value
T-RUCCH	200ms (see 25.331 10.3.6.103)
E-DCH MAC-d flow multiplexing list	11111111 (See 25.331 10.3.5.1b) Note 1
Note 1: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3.

a) The SS has not issued any scheduling grants for E-DCH to the UE

b) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

c) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

d) The SS waits for an SI to be received that indicates that data is available on both logical channels (can be identified from the content of the SI)

e) The SS issues an absolute grant that allows the UE to send with a high rate (signalling value 10, code resource related value 0 (i.e. SF1) and timeslot resource related information set to indicate all timeslots on which PUCH can be allocated for TDD only; thus allowing a rate well above 2 SDUs/TTI)

f) The SS waits until data is received and verifies that data from the two LCHs is received in the same TTI

NOTE: The UE may send an SI after step 1 but this SI would only indicate data on LCH2. This SI will be ignored.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		1 RLC PDU on LCH 2	
2	←		1 RLC PDU on LCH 1	
3	→		Potential SI indicating data on LCH 2	This SI is ignored by the SS
4	→		SI indicating data on LCH 1 and LCH 2	This can be verified from the indicated fraction of data on LCH1
5	←		Absolute grant allowing UE to transmit on E-DCH	This grant must be sufficiently high to allow a rate corresponding to at least 2 RLC PDUs/TTI, signalling value 10
6	→		MAC e/es PDU containing 1 RLC PDU on LCH 1 and one RLC PDU on LCH 2	

Specific Message Contents

None

7.1.6a.1.1.5 Test requirements

1. After step 2 the SS shall receive an SI indicating that data is available on LCH 1 and LCH 2 but no RLC PDUs shall be received
2. In step 6, the SS shall receive 1 RLC PDU on LCH 1 and one RLC PDU on LCH 2 in the same TTI

7.1.6a.1.2 MAC-es/e multiplexing with RRC restrictions

7.1.6a.1.2.1 Definition and applicability

All UEs which support E-DCH and 3.84Mcps or 7.68Mcps TDD.

7.1.6a.1.2.2 Conformance requirement

From 25.321 clause 9.1.5:

In the case of E-DCH there are two MAC sublayers, MAC-e and MAC-es. MAC-es sits on top of MAC-e and receives PDUs directly from MAC-d. MAC-es SDUs (i.e. MAC-d PDUs) of the same size, coming from a particular logical channel can be multiplexed together into a single MAC-es payload. To this payload is prepended the MAC-es header (see subclause 9.2.4.1). The number of PDUs, as well as the DDI value identifying the logical channel, the MAC-d flow and the MAC-es SDU size are included as part of the MAC-e header. In case sufficient space is left in the E-DCH transport block or if Scheduling Information needs to be transmitted, an SI will be included at the end of the MAC-e PDU (see subclause 9.2.4.2). Multiple MAC-es PDUs, but only one MAC-e PDU can be transmitted in a TTI.

[…]

From 25.331 clause 8.6.5.18:

1> if the IE "E-DCH MAC-d flow multiplexing list" is included:

2> only multiplex MAC-d PDU’s from the E-DCH MAC-d flow indicated in the IE "E-DCH MAC-d flow identity" with MAC-d PDU’s from E-DCH MAC-d flows with which multiplexing in the same MAC-e PDU is allowed in accordance to the IE "E-DCH MAC-d flow multiplexing list".

[…]

Reference(s)

TS 25.321 clause 9.1.5, TS 25.331 clause 8.6.5.18

7.1.6a.1.2.3 Test purpose

The purpose of this test case is to verify that the UE does not multiplex data from different logical channels in the same TTI when the multiplexing has been restricted by RRC.

7.1.6a.1.2.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4d using condition A15 as specified in clause 9.1 of TS 34.108.The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the test case			

The following parameters are specific for this test case:

Parameter	Value
T-RUCCH	200ms (see 25.331 10.3.6.103)
E-DCH MAC-d flow multiplexing list	00000000 (See 25.331 10.3.5.1b) Note 1
Note 1: This configuration means that no multiplexing is allowed	

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3.

a) The SS has not issued any scheduling grants for E-DCH to the UE

b) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

c) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

d) The SS waits for an SI to be received that indicates that data is available on both logical channels (can be identified from the content of the SI)

e) The SS issues an absolute grant that allows the UE to send with a high rate (signalling value 10, code resource related value 0 (i.e. SF1) and timeslot resource related information set to indicate all timeslots on which PUCH can be allocated; thus allowing a rate well above 2 SDUs/TTI)

f) The SS waits until data is received and verifies that only data from LCH1 is received in the first TTI

g) The SS verifies that data from LCH2 is received (in a separate TTI from the data from LCH1)

Expected sequence

Step	Direction		Message	Comments
	UE	SS		

1	←	1 RLC PDU on LCH 2	
2	←	1 RLC PDU on LCH 1	
3	→	Potential SI indicating data on LCH 2	This SI is ignored by the SS
4	→	SI indicating data on LCH 1 and LCH 2	This can be verified from the indicated fraction of data on LCH1
5	←	Absolute grant allowing UE to transmit on E-DCH	This grant must be sufficiently high to allow a rate corresponding to at least 2 RLC PDUs/TTI, signalling value 10
6	→	MAC e/es PDU containing 1 RLC PDU on LCH 1	
7	→	MAC e/es PDU containing 1 RLC PDU on LCH 2	

Specific Message Contents

None

7.1.6a.1.2.5 Test requirements

1. After step 2 the SS shall receive an SI indicating that data is available on LCH 1 and LCH 2 but no RLC PDUs shall be received
2. In step 6, the SS shall receive 1 RLC PDU on LCH 1 but no data from LCH 2
3. In step 7, the SS shall receive 1 RLC PDU on LCH 2 but no data from LCH 1

7.1.6a.1.3 Correct settings of MAC-es/e header fields

7.1.6a.1.3.1 Definition and applicability

All UEs which support E-DCH and 3.84Mcps or 7.68Mcps TDD.

7.1.6a.1.3.2 Conformance requirement

Extract from 25.321:

[…]

- Transmission Sequence Number (TSN):
  The TSN field provides the transmission sequence number for the MAC-es PDU. This information is used for reordering purposes to support in-sequence delivery to higher layers. The length of the TSN field is 6 bits.

[…]

- Data description indicator (DDI):
  The DDI field identifies the logical channel, MAC-d flow and size of the MAC-d PDUs concatenated into the associated MAC-es PDU. The mapping between the DDI values and the logical channel ID, MAC-d flow and PDU size is provided by higher layers. The length of the DDI field is 6 bits.

  - For FDD: When, due to the quantization in the transport block sizes that can be supported or triggering of the Scheduling Information, the size of the data plus header is less than or equal to the TB size of the E-TFC selected by the UE minus 24 bits, the DDI value [111111] shall be appended at the end of the MAC-e header and a Scheduling Information shall be concatenated into this MAC-e PDU, where DDI value [111111] indicates that there is a Scheduling Information concatenated in this MAC-e PDU. Otherwise, if the size of the data plus header is less than or equal to the TB size of the E-TFC selected by the UE minus 18 bits, a Scheduling Information shall be concatenated into this MAC-e PDU. In any other case it is understood that another MAC-es PDU or Scheduling Information does not fit and it is therefore not necessary to reserve room in the transport block for an additional DDI field.

  - For TDD: When, due to the quantization in the transport block sizes that can be supported or triggering of the Scheduling Information (due to timer expiry, see subclauses 11.9.1.4a and 11.9.1.5), the size of the data plus header is less than or equal to the TB size of the E-TFC selected by the UE minus 29bits, the DDI value [111111] shall be appended at the end of the MAC-e header and a Scheduling Information shall be concatenated into this MAC-e PDU, where DDI value [111111] indicates that there is a Scheduling Information concatenated in this MAC-e PDU. Otherwise, if the size of the data plus header is less than or equal to the TB size of the E-TFC selected by the UE minus 23 bits, a Scheduling Information shall be concatenated into this MAC-e PDU. In any other case it is understood that another MAC-es PDU or Scheduling Information does not fit and it is therefore not necessary to reserve room in the transport block for an additional DDI field.

- Number of MAC-d PDUs (N):
  The number of consecutive MAC-d PDUs corresponding to the same DDI value. The length of the N field is 6 bits.

Reference(s)

TS 25.321 clauses 9.2.4.1, 9.2.4.2

7.1.6a.1.3.3 Test purpose

The purpose of this test case is to verify that the UE sets the MAC-es/e header fields in a correct way.

7.1.6a.1.3.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4h using condition A15 as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the testcase			

The following parameters are specific for this test case:

Parameter	Value
T-RUCCH	200ms (see 25.331 10.3.6.103)
E-DCH MAC-d flow multiplexing list	11111111 (See 25.331 10.3.5.1b) Note 1
Note 1: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3.

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS transmits 4 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

c) The SS issues an absolute grant that allows the UE to send with a high rate (signalling value 10, code resource related value 0 (i.e. SF1) and timeslot resource related information set to indicate all timeslots on which PUCH can be allocated, allowing rates well above 5 SDUs/TTI)

d) The SS waits until data is received and checks the values of the header parameters

e) The SS removes the scheduling grant for E-DCH for the UE

f) The SS transmits three SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

g) The SS transmits two SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

h) The SS issues an absolute grant that allows the UE to send with a high rate (signalling value 10, allowing rates well above 5 SDUs/TTI)

i) The SS waits until data is received and checks the values of the header parameters

j) The SS transmits two SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

k) The SS waits until data is received and checks the values of the header parameters

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	4 RLC PDUs on LCH 2	
2	→	SI indicating data on LCH 2	
3	←	Absolute grant allowing UE to transmit on E-DCH	This grant must be sufficiently high to allow a rate corresponding to at least 5 RLC PDUs/TTI
4	→	1 MAC-es PDU containing 4 RLC PDUs on LCH 2	SS checks header fields
5	←	Removal of scheduling grant for UE	
6	←	3 RLC PDUs on LCH 2	
7	←	2 RLC PDUs on LCH 1	
8	→	Potential SI indicating data on LCH 2	This SI is ignored by the SS
8a		SI indicating data on LCH1 and LCH 2	
9	←	Absolute grant allowing UE to transmit on E-DCH	This grant must be sufficiently high to allow a rate corresponding to at least 5 RLC PDUs/TTI,
10	→	2 MAC-es PDUs containing 2 RLC PDUs on LCH 1 and 3 RLC PDUs on LCH 2 respectively	SS checks header fields
11	←	2 RLC PDUs on LCH 2	
12	→	1 MAC-es PDU containing 2 RLC PDUs on LCH 2	SS checks header fields

Specific Message Contents

None

7.1.6a.1.3.5 Test requirements

1. After step 4, the SS shall receive 1 MAC-es PDU shall be received where:

   - The TSN is set to 0, DDI is set to 6 and N is set to 4

2. After step 10, the SS shall receive 2 MAC-es PDUs shall be received where:

   - For MAC-es PDU 1: The TSN is set to 0, DDI is set to 5 and N is set to 2

   - For MAC-es PDU 2: The TSN is set to 1, DDI is set to 6 and N is set to 3

3. After step 12, the SS shall receive 1 MAC-es PDU where:

   - The TSN is set to 2, DDI is set to 6 and N is set to 2

7.1.6a.2 MAC-es/e – Scheduling

7.1.6a.2.1 Correct settings of MAC-es/e scheduling information

7.1.6a.2.1.1 Definition and applicability

All UEs which support E-DCH and 3.84Mcps or 7.68Mcps TDD.

7.1.6a.2.1.2 Conformance requirement

This control information is used by UEs to indicate to the Node B the amount of resources they require. Scheduling Information is sent via the E-PUCH in the MAC-e header when the UE is granted resource and by the E-RUCCH when no resource has been granted. Scheduling Information consists of three components as defined in subclause 9.2.6.3.3 -

- Buffer Information: This consists of:
  - Highest priority Logical Channel (HLID)
  - Total E-DCH Buffer Status (TEBS)
  - Highest priority Logical channel Buffer Status (HLBS)

- UE Power Headroom (UPH): The UPH field indicates the ratio of the maximum UE transmission power and the calculated UE transmit power defined as in [18] that would result for β_e equal to 0. The length of UPH is 5 bits.

- Serving and Neighbour Cell Pathloss (SNPL): This may be used by the Node-B to assist with its estimation of the degree of intercell interference each UE will generate and hence the absolute grant power value and physical resources to assign . The length of SNPL is 5 bits.

The length of TEBS field is 5 bits, the values taken by TEBS are shown in Table 9.2.5.3.2-1[in TS25.331]. The length of HLBS is 4 bits, the values taken by HLBS are shown in table 9.2.5.3.2-2 [in TS25.331].

[…]

If a UE has no Grant and the TEBS becomes larger than zero, the transmission of Scheduling Information shall be sent via E-RUCCH.

If the UE has a Grant then Scheduling Information may be included in the MAC-e PDU according to subclause 9.2.4.2. If the UE has a Grant and scheduling information delay timer ≥ T-SCHED then the UE shall include Scheduling Information in the next MAC-e PDU sent and the scheduling information delay timer shall be restarted. If the UE does not receive any Grant before the scheduling information delay timer > T-SCHED + T-RUCCH /2 then the UE shall send scheduling information via the E-RUCCH and shall stop and reset the scheduling information delay timer.

Reference(s)

TS 25.321 clause 9.2.6.3, 11.9.1.4a

7.1.6a.2.1.3 Test purpose

The purpose of this test case is to verify that the UE sends the E-DCH scheduling information with correct content and with correct triggers.

7.1.6a.2.1.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4h using condition A15 as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the testcase			

The following parameters are specific for this test case:

Parameter	Value
T-RUCCH	200 ms (see 25.331 10.3.6.103) Note 1
T-SCHED	160ms (see 25.331 10.3.6.103)
E-DCH MAC-d flow multiplexing list	11111111 (See 25.331 10.3.5.1b) Note 2
E-DCH Transport Block Size Table	0
Note 1: The persistence value will result in the time between sending scheduling information on the E-RUCCH to obe variable, however only a single ASC is defined and thus the persistence is configured to 1. Note 2: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3.

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS waits for at least 1000 ms and verifies that no SI is received

c) The SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

d) The SS waits until an SI is received at time **T0**

e) The SS waits until the next SI is received at time **T1** and checks the content

f) The SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1 at time **T2**

g) The SS waits until the next SI is received at time **T3** and checks the content

h) The SS issues an absolute grant that allows the UE to transmit 1 SDUs/TTI

i) The SS waits until all data has been received

j) The SS removes the scheduling grant for the UE

k) The SS transmits 24 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1

l) The SS issues an absolute grant that allows the UE to transmit 1 SDUs/TTI

m) The SS waits until the next SI is received with payload at time **T4**

n) The SS waits until the next SI is received with payload at time **T5**

o) The SS waits until all data is received

p) Void

q) The SS issues an absolute grant that allows the UE to transmit 5 SDUs/TTI

r) The SS transmits 5 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

s) The SS waits until the 5 SDUs are received and checks that contain both a regular SI and the special DDI (value = 63) NOTE

NOTE: 5 336 bit PDUs and 18 bit Mac-e/es header require a TB size of 1698 bits. The nearest higher TB size is 1730, which is able to additionally hold an SI + the special DDI.

Expected sequence

Step	Direction UE / SS	Message	Comments
1	SS		After the radio bearer has been established the SS waits 1000 ms. No SI shall be received during this time
2	←	1 RLC PDUs on LCH 2	
3	→	SI indicating data on LCH 2	Time **T0**
4	→	SI indicating data on LCH 2	Time **T1**
5	←	1 RLC PDUs on LCH 1	Time **T2**
6	→	SI indicating data on LCH 1 and LCH 2	Time **T3.** Presence of data on LCH 1 and LCH 2 can be verified from the indicated fraction of data on LCH1
7	←	Absolute grant allowing the UE to transmit 1 RLC PDUs per TTI	
8	→	Data on LCH 1 and LCH 2	
8a	←	Removal of absolute grant	
9	←	24 RLC PDUs on LCH 1	
9a	←	Absolute grant allowing the UE to transmit 1 RLC PDUs per TTI	
10	→	Data and SI	Time **T4**
11	→	Data only	
12	→	Data and SI	Time **T5**
13	→	Data only	
14	SS		After all data has been received, SS waits 1000ms. No SI shall be received during this time.
15	←	void	
16	→	void	
17	←	Absolute grant allowing the UE to transmit 5 RLC PDUs per TTI	
18	←	5 RLC PDUs on LCH 1	
19	→	Data and SI	The received transport block shall in addition to the 5 PDUs contain a regular SI and the special DDI (value = 63). As there is no data left in buffers, TEBS is set as 0, HLID is set as '0000' and HLBS is set as 0.
NOTE 1: General timer tolerance as defined by 34.108 sub-clause 4.2.3 applies. NOTE 2: Step 10 and 11 can occur in any order. SS should accept these PDUs in any order and verify the time difference between T5 and T4 as per the test requirement.			

Specific Message Contents

None

7.1.6a.2.1.5 Test requirements

1. In step 1 the SS shall not receive any SI since the UE buffer is empty
2. In step 3 the SS shall receive an SI (content ignored)
3. In step 4 the SS shall receive an SI indicating
   - Total E-DCH Buffer Status (TEBS) Index = 6 ($32 < TEBS \leq 42$).
   - Highest priority Logical channel ID (HLID) = LCH 2.
   - Highest Priority Logical Channel Buffer Status (HLBS) Index = 15 ($82\% < HLBS \leq 100\%$).
4. In step 6 the SS shall receive an SI indicating

- Total E-DCH Buffer Status (TEBS) Index = 9 (73 < TEBS ≤ 97).
- Highest priority Logical channel ID (HLID) = LCH 1.
- Highest Priority Logical Channel Buffer Status (HLBS) Index = 12 (45% < HLBS ≤ 55%).

5. T1-T0 shall equal 200 ms
6. T3-T2 shall be less then 120 ms. Note 1.
7. T5-T4 shall equal 160ms
8. In step 14, the SS shall not receive any SI since the UE buffer is empty.
9. In step 19, the received transport block shall in addition to the payload include a regular SI and the special DDI (value = 63). TEBS, HLID and HLBS shall be set as zero.

NOTE 1: 120ms = 2 TTI(for Data to be transmitted from RLC to MAC) + Maximum UE test loop delay (10*TTI according to 34.109=100ms).

7.1.6a.2.2 Correct settings of MAC-es/e scheduling information when scheduling delay timer expires

7.1.6a.2.2.1 Definition and applicability

All UEs which support E-DCH and 3.84Mcps or 7.68Mcps TDD.

7.1.6a.2.2.2 Conformance requirement

If the UE has a Grant then Scheduling Information may be included in the MAC-e PDU according to subclause 9.2.4.2. If the UE has a Grant and scheduling information delay timer ≥ T-SCHED then the UE shall include Scheduling Information in the next MAC-e PDU sent and the scheduling information delay timer shall be restarted. If the UE does not receive any Grant before the scheduling information delay timer > T-SCHED + T-RUCCH /2 then the UE shall send scheduling information via the E-RUCCH and shall stop and reset the scheduling information delay timer.

Reference(s)

TS 25.321 clause 11.9.1.4a

7.1.6a.2.2.3 Test purpose

The purpose of this test case is to verify that the UE sends the E-DCH scheduling information using the correct trigger when a previous grant has been sent to the UE so the scheduling information delay timer is running but no subsequent grant is sent to the UE.

7.1.6a.2.2.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4h using condition A15 as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the testcase			

The following parameters are specific for this test case:

Parameter	Value
T-RUCCH	200 ms (see 25.331 10.3.6.103) Note 1
T-SCHED	160ms (see 25.331 10.3.6.103)
E-DCH MAC-d flow multiplexing list	11111111 (See 25.331 10.3.5.1b) Note 2
Note 1: The persistence value will result in the time between sending scheduling information on the E-RUCCH to obe variable, however only a single ASC is defined and thus the persistence is configured to 1. Note 2: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3.

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS waits for at least 1000 ms and verifies that no SI is received

c) The SS transmits 10 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

d) The SS waits until an SI is received at T0.

h) The SS issues an absolute grant that allows the UE to transmit 1 SDUs/TTI once every 40ms.

i) The SS continues to send absolute grants while waiting to receive a SI from the UE sent in a MAC-e PDU at time T1.

j) The SS stops issuing absolute grants to the UE.

k) The SS waits for a SI from the UE at T2.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	SS			After the radio bearer has been established the SS waits 1000 ms. No SI shall be received during this time
2	←		10 RLC PDUs on LCH 2	
3	→		SI indicating data on LCH 2	Time **T0**
4	←		Absolute grant allowing the UE to transmit 1 RLC PDUs per TTI	This grant is made every 40ms until step 6.
5	→		Data on LCH 2 (no SI included)	
6	→		Data on LCH 2 (with SI included)	Time **T1**
7			SS stops sending absolute grants to the UE	
8	→		E-RUCCH which contains SI	Time **T2**

Specific Message Contents

None

7.1.6a.2.2.5 Test requirements

1. In step 1 the SS shall not receive any SI since the UE buffer is empty

2. In step 3 the SS shall receive an SI (content ignored)

3. T1-T0 shall equal 160 ms

4. T2-T1 shall be less then 260 ms.

7.1.6a.2.3 MAC-es/e correct handling of scheduled transmissions

7.1.6a.2.3.1 Definition and applicability

All UEs which support E-DCH.

7.1.6a.2.3.2 Conformance requirement

Extract from 25.321 clause 9.2.6.2.1:

The Absolute Grant is sent on downlink on a set of configured E-AGCHs from the serving E-DCH cell and allows the Node B scheduler to directly adjust the granted rate and assigned physical resources for UEs under its control. The physical resource assignment indicates to the UE the maximum amount of uplink resources that it may use for a scheduled transmission.

[…]

The absolute grant message itself includes multiple fields that are multiplexed together into between 14 and 28 bits for 3.84/7.68 Mcps TDD and between 23 and 26 bits for 1.28 Mcps TDD (depending on the system configuration) inside the MAC-e of the Node B and then submitted to the physical layer for transmission on the E-AGCH. These fields are:

- Absolute Grant Value:
  For TDD, this field indicates the maximum E-DCH traffic to reference power ratio (E-PUCH/$P_{e\text{-}base}$) per TDD resource unit that the UE is allowed to use on the E-DCH resources associated with the Absolute Grant. A TDD resource unit is defined as one sixteenth of the OVSF codespace in one timeslot. The length of the Absolute Grant Value field for TDD is 5 bits.

- Channelisation Code:
  This field describes the code component of the physical resource grant. For 1.28/3.84 Mcps TDD it comprises an enumerated value of length 5 bits indicating which node on the OVSF code tree has been allocated. For 7.68 Mcps TDD it comprises an enumerated value of length 6 bits indicating which node on the OVSF tree has been allocated. The mapping between the allocated OVSF and the enumerated node 0…30 for 1.28/3.84 Mcps and 0…62 for 7.68 Mcps is as given in [19].

- Timeslot Resource Related Information:
  This field describes the timeslot component of the physical resource grant and comprises a bitmap of length n_{TRRI} indicating which of the timeslots configured for E-DCH use by RRC have been allocated with the LSB corresponding to the lowest numbered E-DCH timeslot and the MSB corresponding to the highest numbered timeslot. The length of the TRRI field (n_{TRRI}) is 5 bits for 1.28 Mcps TDD and is configurable by RRC on a per-cell basis between 1 and 12 bits for 3.84/7.68 Mcps TDD.

- Resource Duration Indicator:
  Optionally, RRC may configure, on a per-cell basis the presence of a resource duration indicator field on E-AGCH for TDD. If configured as present in a cell, 3 bits are used to indicate the number of TTI's allocated and the spacing between the allocated TTIs via a single grant according to table 9.2.6.2.1-2. If the field is configured as not present on E-AGCH in the cell, a value of 0 is implicitly assumed by the UE corresponding to 1 TTI.

Table 9.2.6.2.1-2 – Resource Duration Indicator (RDI) interpretation

Resource Duration Indicator (3 bits)	TTIs allocated	TTI spacing
0	1	1
1	2	1
2	2	2
3	2	4
4	4	1
5	4	2
6	4	4
7	8	1

- E-AGCH Cyclic Sequence Number (ECSN):
  The ECSN is a 3-bit field used to assist the UE with outer-loop power control of E-AGCH (cf. HCSN for HS-SCCH).

- E-HICH Indicator(EI) (1.28 Mcps TDD only)
  The E-HICH indicator (EI) consists of 2 bits and is used to indicate which E-HICH will convey the acknowledgement indicator for the scheduled UEs.

- E-UCCH Number Indicator (ENI) (1.28 Mcps TDD only)
  The E-UCCH Number Indicator (ENI) is a 3-bit field used to indicate the detailed number of E-UCCH.

[…]

The UE determines whether each TTI is available for scheduled or non-scheduled transmissions.

The parameters applicable to a transmission are timeslots, code and maximum power. In the case of non-scheduled transmission, these parameters are set by RRC and retransmissions and/or new transmissions may occur in frames at intervals set by RRC. For scheduled transmission, the parameters are received via the E-AGCH.

Reference(s)

TS 25.321 clauses 9.2.6.2.1., 11.9.1.3

7.1.6a.2.3.3 Test purpose

To verify that the UE transmits different amount of data when the absolute grant varies.

7.1.6a.2.3.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4f using condition A12 as specified in clause 9.1.2 of TS 34.108. The following parameters are specific for this test case:

Parameter	Value
Periodicity for scheduling info	No periodic scheduling info

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Test procedure

Logical Channel with Id 7 (LCH 1) is mapped to MAC-d flow 2 with priority 1.

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS transmits 4 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1

c) SS waits until an SI is received

d) The SS issues an absolute grant that allows the UE to transmit 1 SDU/TTI (absolute grant signalling value 10, Timeslot Resource Related Information 0001, channelisation code 1, Resource Duration Indicator 4)

e) The SS waits until data is received and checks that only 1 SDU/TTI is transmitted

f) The SS waits until all 4 SDUs have been received

g) The SS transmits 8 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1

h) SS waits until an SI is received

i) The SS issues an absolute grant that allows the UE to transmit 4 SDUs/TTI (absolute grant signalling value 10, Timeslot Resource Related Information 1111, channelisation code 1, Resource Duration Indicator 1)

j) The SS waits until data is received and checks that only 4 SDUs/TTI is transmitted

k) The SS waits until all 8 SDUs have been received

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		4 RLC PDUs on LCH 1	
1a	→		SI indicating data on LCH 1	
2	←		Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	
3	→		MAC es PDU containing 1 RLC PDU, 4 TTIs in a row	
4	←		8 RLC PDUs on LCH 1	
4a	→		SI indicating data on LCH 1	
5	←		Absolute grant allowing the UE to transmit 4 RLC PDUs per TTI	
6	→		MAC es PDU containing 4 RLC PDUs, 2 TTIs in a row	

Specific Message Contents

None

7.1.6a.2.3.5 Test requirements

1. In step 3, the SS shall receive 1 MAC-es PDU containing 1 RLC PDU. This shall happen 4 TTIs in a row.
2. In step 6, the SS shall receive 1 MAC-es PDU containing 4 RLC PDUs. This shall happen 2 TTIs in a row.

7.1.6a.2.4 MAC-es/e combined non-scheduled and scheduled transmissions

7.1.6a.2.4.1 Definition and applicability

All UEs which support E-DCH.

7.1.6a.2.4.2 Conformance requirement

From 25.321 clause 11.9.1.4:

The transmission format and data allocation shall follow the requirements below:

[…]

- - RRC can allocate non-scheduled transmission grants to individual MAC-d flows in order to reduce the transmission delays;

[…]

- The UE shall determine whether to take scheduled or non-scheduled grants into account in the upcoming transmission. If neither are supposed to be taken into account (i.e. the TTI is not available for non-scheduled transmission and no Grant for scheduled transmission has been received) then no grant shall be assumed to exist. If a grant exists then the transmission format and data allocation shall follow the requirements below;

[…]

- For all logical channels, if the logical channel belongs to a non-scheduled MAC-d flow, its data shall be considered as available up to the largest block size determined for the corresponding non-scheduled grant. If the logical channel does not belong to a non-scheduled MAC-d flow, its data shall be considered as available up to the largest block size determined for the Serving Grant;

From 25.331 clause 8.6.5.18:

1> if the IE "E-DCH MAC-d flow multiplexing list" is included:

2> only multiplex MAC-d PDU's from the E-DCH MAC-d flow indicated in the IE "E-DCH MAC-d flow identity" with MAC-d PDU's from E-DCH MAC-d flows with which multiplexing in the same MAC-e or MAC-i PDU is allowed in accordance to the IE "E-DCH MAC-d flow multiplexing list".

[…]

1> for TDD:

2> if the IE "Non-scheduled transmission grant info" is included:

3> MAC-d PDU's for logical channels belonging to this MAC-d flow shall only be included in a MAC-e or MAC-i PDU transmitted by HARQ processes designated as non scheduled (Ids 4 – 7) in the TTIs indicated (for 3.84 Mcps TDD and 7.68 Mcps TDD, as determined from the IEs "Activation Time", "Resource Duration" and "Resource Periodicity"; for 1.28 Mcps TDD, as determined from the IEs "Activation Time", "Subframe number", "Resource Duration" and "Resource Periodicity", and the calculation of assigned Non-scheduled transmission grant is specified in subclause 8.6.6.16a).

2> if the IE "Scheduled transmission grant info" is included:

3> transmission of MAC-d PDUs for logical channels belonging to this MAC-d flow shall be in accordance with the received scheduled grant on E-AGCH (see [15]).

Reference(s)

TS 25.321 clause 11.9.1.4 , TS 25.331 clause 8.6.5.18

7.1.6a.2.4.3 Test purpose

To verify that the UE is able to handle combined non-scheduled and scheduled transmissions.

7.1.6a.2.4.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4h using condition A15 as specified in clause 9.1 of TS 34.108. The following parameters are specific for this test case with the logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the test case			

The following parameters are specific for this test case:

Parameter	Value
E-DCH MAC-d flow multiplexing list	11111111 (See 25.331 10.3.5.1b) Note 1
Note 1: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The UE is placed into UE test loop mode 1 with the UL SDU size for LCH 1 set to (25*41)-2 octets and LCH 2 size set to 39 octets.

Test procedure

The UE is configured with a non-scheduled grant on MAC-d flow 2, and the value of the "Max MAC-e PDU contents size" is 500 bits. The UE is not given any grant to transmit on MAC-d flow 3 (LCH 2).

a) The SS has not issued any grant for E-DCH on MAC-d flow 3 (LCH 2)

b) The SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH 2

c) The SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1

d) The SS waits until data is received and checks that the first TTI contains only data on LCH 1

e) The SS issues an absolute grant that allows the UE to send with a high rate on LCH 2 (well above 1 SDU/TTI) immediately after the previous step (i.e. not more than one TTI after the first data on LCH 1 has been looped back).

f) The SS receives data from the two logical channels LCH 1 and LCH 2 in one TTI.

g) The SS removes the scheduling grant for E-DCH for the UE

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		1 RLC PDU on LCH 2	SDU size is 40 bytes
2	←		1 RLC PDU on LCH 1	SDU size is 40 bytes
2a	→		SI indicating data on LCH 2	Step 2a and 3 can happen in any order
3	→		MAC es PDU containing 1 RLC PDU on LCH 1	
4	←		Absolute grant allowing the UE to transmit with high data rate on LCH 2	Signalling value 31
5	→		MAC es PDU containing 1 RLC PDU on LCH 1 and 1 RLC PDU on LCH 2	Before and after this step, SS continues to receive 1 RLC PDU on LCH 1 per TTI, until complete SDU consisting of 25 PDU's is received.
6	←		Removal of absolute grant	Signalling value 1

Specific Message Contents

None

7.1.6a.2.4.5 Test requirements

1. In step 3, the SS shall receive 1 MAC-es PDU containing 1 RLC PDU on LCH 1.

2. In step 5, the SS shall receive 1 MAC-es PDU containing 1 RLC PDU on LCH 1 and 1 RLC PDU on LCH 2 within the same TTI.

7.1.6a.2.5 MAC-es/e Correct handling of HARQ profile power offsets

7.1.6a.2.5.1 Definition and applicability

All UEs which support E-DCH.

7.1.6a.2.5.2 Conformance requirement

In TDD, rules for E-TFC selection shall be applied as provided below.

UEs shall apply E-TFC selection when invoked by the HARQ entity (see subclause 11.9.1.1.1).

For each MAC-d flow, RRC configures MAC-e with a HARQ profile and multiplexing list. Additionally, RRC configures MAC with a power offset in case the Scheduling Information needs to be transmitted without any higher-layer data. The HARQ profile includes the power offset and maximum number of HARQ transmissions to use for this MAC-d flow. For 1.28 Mcps TDD, the HARQ profile also includes a retransmission timer attribute. The multiplexing list identifies for each MAC-d flow(s), the other MAC-d flows for which data can be multiplexed in a transmission that uses the power offset included in its HARQ profile.

RRC can control the scheduling of uplink data by giving each logical channel a priority between 1 and 8, where 1 is the highest priority and 8 the lowest. E-TFC selection in the UE shall be done in accordance with the priorities indicated by RRC. Logical channels have absolute priority, i.e. the UE shall maximise the transmission of higher priority data.

RRC can allocate non-scheduled transmission grants to individual MAC-d flows in order to reduce the transmission delays.

The UE shall determine whether to take scheduled or non-scheduled grants into account in the upcoming transmission. If neither are supposed to be taken into account (i.e. the TTI is not available for non-scheduled transmission and no Grant for scheduled transmission has been received) then no grant shall be assumed to exist. If a grant exists then the transmission format and data allocation shall follow the requirements below.

For each configured MAC-d flow, a given E-TFC can be in any of the following states:

- Supported state;
- Blocked state.

The E-TFC states are derived according to the following:

- If the transmission is a retransmission then only the E-TFC with the same block size as the original transmission may be in the supported state.
- For 1.28Mcps TDD, only E-TFCs from the E-TFCS (the table of TB sizes) which are consistent with the UE's E-DCH capability category shall be considered for the transmission;
- Only E-TFCs from the E-TFCS (the table of TB sizes) which can be supported by (exactly) the number of slots assigned by the grant shall be considered for the transmission;
- Only E-TFCs which result (for the granted timeslot and code physical resources) in a code rate lying between the maximum and minimum (inclusive) allowable code rates set by RRC [7] shall be considered for the transmission {note: the definition of the term "code rate" as used here is the same as that provided by [18]}. This shall be evaluated for both QPSK and 16-QAM modulation;
- P_{HARQ}, the HARQ profile power offset is selected (the HARQ profile for the transmission shall be selected among the HARQ profiles of MAC-d flows on which the highest priority logical channels with available data are mapped; Scheduling Information power offset shall be used when Scheduling Information is transmitted without any higher-layer data.)
- Only E-TFCs whose calculated transmission power requirement $P_{E\text{-}PUCH}$ (see [18]) is less than or equal to the available or granted power shall be considered for the transmission (note: this requirement does not apply in the case of a retransmission on non-scheduled resources).

For 3.84Mcps/7.68Mcps TDD, from those E-TFCs in the supported state the UE determines the largest block size that it is permitted to transmit within the given constraints.

For 1.28Mcps TDD, from those E-TFCs in the supported state, UE determines a candidate set with up to 64 E-TFCs, including the largest 63 E-TFCs, in addition to the E-TFC dedicated for SI. If the number of E-TFCs in the supported state is not greater than 63, all the E-TFCs in the supported state shall be included in the candidate set. The E-TFCs in the candidate set shall then be re-indexed in an ascending order and numbered from 0 to (Nmax -1), where Nmax is the number of E-TFC in the candidate set. From the candidate set the UE determines the largest block size that is permitted to transmit within the given constraints.

The UE shall select the modulation type associated with the determined E-TFC (note: if an E-TFC is supported by both QPSK and 16-QAM then 16-QAM modulation shall be used if its power requirement ($P_{E\text{-}PUCH}$) is lower than the power requirement for QPSK, otherwise QPSK modulation shall be used).

Data allocation shall then be performed in accordance with the following:

- For all logical channels, if the logical channel belongs to a non-scheduled MAC-d flow, its data shall be considered as available up to the largest block size determined for the corresponding non-scheduled grant. If the logical channel does not belong to a non-scheduled MAC-d flow, its data shall be considered as available up to the largest block size determined for the Serving Grant;
- The data allocation shall maximise the transmission of higher priority data;

- The UE shall select the E-TFC, SF and modulation which minimises the power used (3.84/7.68 Mcps TDD only);
- The UE shall select the E-TFC and modulation which minimises the power used (1.28 Mcps TDD only);

Once an appropriate E-TFC and data allocation are found according to the rules above, the "Multiplexing and TSN Setting" entity shall generate the corresponding MAC-e PDU.

In 1.28Mcps TDD, when Scheduling Information is triggered by timer per subclause 11.9.1.5, the E-TFC selection and data-allocation process shall assume that Scheduling Information has a priority higher than any other logical channel.

The E-TFC selection function shall provide this MAC-e PDU and transmission HARQ profile to the HARQ entity. The selected E-TFC is also provided (Note: for 1.28Mcps TDD, the signalled transport block size index, i.e. E-TFCI, is the index of the selected E-TFC in the candidate set.). The maximum number of HARQ transmissions and the power offset in this profile shall be set respectively to the maximum of both the Max Number of HARQ Transmissions and of the power offset of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission. For 1.28 Mcps TDD, the retransmission timer shall be set to the maximum of the retransmission timer value of the HARQ profiles that are permitted to be multiplexed into the transmission. Each HARQ process which is associated with a buffer holding a MAC-e PDU for potential retransmission shall maintain the HARQ profile and the number of re-transmissions that have occurred. For 1.28 Mcps TDD, the HARQ process shall also maintain the value of RTX_TIMER.

Reference(s)

TS 25.321 clause 11.9.1.4

7.1.6a.2.5.3 Test purpose

The purpose of this test case is to verify that the UE applies different HARQ profiles from different MAC-d flows to E-DCH transmissions accordingly and in case data from two MAC-d flows is transmitted in the same E-DCH transmission, the UE selects the correct power offset.

7.1.6a.2.5.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4h using condition A15 as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the testcase			

The following parameters are specific for this test case:

Parameter	Value
E-DCH MAC-d flow multiplexing list for MAC-d flow 2	11111111 (See 25.331 10.3.5.1b) Note 1
E-DCH MAC-d flow multiplexing list for MAC-d flow 3	11111111 (See 25.331 10.3.5.1b) Note 1
E-DCH MAC-d flow power offset for flow 2	3dB (see 25.331 subclause 10.3.5.1b)
E-DCH MAC-d flow power offset for flow 3	0dB (see 25.331 subclause 10.3.5.1b)
Note 1: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB 25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3.

a) SS has not issued any scheduling grant for E-DCH to the UE.

b) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

c) SS waits until an SI is received.

d) The SS issues absolute grant corresponding to 1 RLC PDU of size 41 octets per TTI when the Mac-d flow power offset is 3dB (signalling value 5), with Absolute Grant Scope set as "All HARQ processes".

e) SS starts receiving loop backed RLC PDU's.

f) The SS stops issuing absolute grants to the UE.

g) SS transmits 4 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH2.

h) SS waits until an SI is received.

i) The SS issues primary absolute grant corresponding to 2 RLC PDUs of size 41 octets per TTI when the Mac-d flow power offset is 0dB (signalling value 5), with Absolute Grant Scope set as "All HARQ processes".

j) SS starts receiving loop backed RLC PDU's.

k) The SS issues primary absolute grant corresponding to "ZERO GRANT", with Absolute Grant Scope set as "All HARQ processes".

l) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH2.

m) SS waits until an SI is received.

n) SS transmits 2 SDUs of size 40 bytes (plus 1 byte RLC length indicator) on LCH1.

o) SS waits until an SI is received.

p) The SS issues primary absolute grant corresponding to 3 RLC PDUs of size 41 octets per TTI when the Mac-d flow power offset is 3dB (signalling value 9), with Absolute Grant Scope set as "All HARQ processes".

q) SS starts receiving loop backed RLC PDU's.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		2 RLC PDUs on LCH 1	
2	→		SI indicating data on LCH 1	
3	←		Primary Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 5
4	→		MAC es PDU containing 1 RLC SDU from LCH 1	This step is repeated until all the RLC SDUs are transmitted
5	←		4 RLC PDUs on LCH 2	
6	→		SI indicating data on LCH 2	
7	←		Primary Absolute grant allowing the UE to transmit 2 RLC PDU per TTI	Signalling value 5
8	→		MAC es PDU containing 2 RLC SDU from LCH 2	This step is repeated until all the RLC SDUs are transmitted
8	←		Primary Absolute grant set to 'ZERO GRANT' and scope 'All HARQ Processes'	
10	←		2 RLC PDUs on LCH 2	
11	→		SI indicating data on LCH 2	
12	←		2 RLC PDUs on LCH 1	
13	→		SI indicating data on LCH 1	
14	←		Primary Absolute grant allowing the UE to transmit 3 RLC PDUs per TTI	Signalling value 9
15	→		MAC es PDU containing 2 RLC PDU's from LCH 1 and MAC es PDU containing 1 RLC PDU from LCH 2	
16	→		MAC es PDU containing 1 RLC PDU from LCH 2	

Specific Message Contents

None

7.1.6a.2.5.5 Test requirements

1. In step 4, UE shall loop back PDUs for two TTIs, with one RLC PDU per TTI.
2. In step 8, UE shall loop back PDUs for two TTIs, with two RLC PDUs per TTI.
3. In step 15, UE shall loop back PDUs for one TTI, with three RLC PDU per TTI (2 RLC PDU's from LCH1 and 1 RLC PDU from LCH 2).
4. In step 16, UE shall loop back PDU for one TTI, with one RLC PDU per TTI (1 RLC PDU from LCH 2).

7.1.6a.3 MAC-es/e- E-TFC selection

7.1.6a.3.1 MAC-es/e E-TFC priority

7.1.6a.3.1.1 Definition and applicability

All UEs which support E-DCH.

7.1.6a.3.1.2 Conformance requirement

Extract from TS 25.321 clause 11.9.1.4

[…]

RRC can control the scheduling of uplink data by giving each logical channel a priority between 1 and 8, where 1 is the highest priority and 8 the lowest. E-TFC selection in the UE shall be done in accordance with the priorities indicated by RRC. Logical channels have absolute priority, i.e. the UE shall maximise the transmission of higher priority data.

Reference(s)

TS 25.321 clause 11.9.1.4

7.1.6a.3.1.3 Test purpose

To verify that the UE transmits data in order of priority

7.1.6a.3.1.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4h using condition A15 as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
NOTE: The RAB combination also include SRBs on E-DCH on MAC-d flow 1 which are not used in the test case			

The following parameters are specific for this test case:

Parameter	Value
T-RUCCH	200ms (see 25.331 10.3.6.103)
E-DCH MAC-d flow multiplexing list	11111111 (See 25.331 10.3.5.1b) Note 1
Note 1: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The UE is placed into UE test loop mode 1 with the UL SDU size set to (10*41)-2 octets for RB25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3.

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

c) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

d) The SS waits for an SI to be received that indicates that data is available on both logical channels (can be identified from the content of the SI)

e) The SS issues an absolute grant that allows the UE to send 1 RLC PDU per TTI (signalling value 4)

f) The SS verifies that the first TTIs only contains data from LCH1 which have a higher priority

g) The SS verifies that data on LCH2 is only transmitted after all the data on LCH1 has been looped back

Expected sequence

Step	Direction		Message	Comments
	UE	SS		

1	←	1 RLC PDU on LCH 2	
2	←	1 RLC PDU on LCH 1	
3	→	Potential SI indicating data on LCH 2	This SI is ignored by the SS
4	→	SI indicating that data is available for LCH 1 and LCH 2	
5	←	Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 4
6	→	MAC es PDU containing 1 RLC PDU from LCH 1	This step is repeated until the whole RLC SDU is transmitted
7	→	MAC es PDU containing 1 RLC PDU from LCH 2	This step is repeated until the whole RLC SDU is transmitted

Specific Message Contents

None

7.1.6a.3.1.5 Test requirements

1. In step 6, the SS shall receive 1 MAC-es PDU containing 1 RLC PDU from LCH 1 in each TTI until the whole RLC SDU has been received.
2. In step 6, the SS verifies that no data is received on LCH 2 until all data on LCH 1 has been received
3. In step 7, the SS shall receive 1 MAC-es PDU containing 1 RLC PDU from LCH 2 in each TTI until the whole RLC SDU has been received

7.1.6a.3.2 MAC-es/e transport block size selection/ UL QPSK

7.1.6a.3.2.1 Definition and applicability

All UEs which support E-DCH.

7.1.6a.3.2.2 Conformance requirement

Extract from TS 25.321 clause 9.2.6.4

[…]

For 3.84 Mcps TDD, the normative description of the mapping between the E-TFC index and the corresponding transport block size is provided in Annex BA.

For 7.68 Mcps TDD, the normative description of the mapping between the E-TFC index and the corresponding transport block size is provided in Annex BB.

[…]

For 3.84 Mcps TDD, the mapping of transport block size L to signalled index $k_i = \{0,1,\ldots 127\}$ (see Annex BA.1) is given by the formula:

$$L = \left\lfloor 60 \times \rho^{k_n + k_i} \right\rfloor$$

In the above formula $\rho = 128^{\frac{1}{127}}$, k_i is the TBS index (0…127) and k_n is an integer selected based upon the number of timeslots allocated (n). Values for k_n are tabulated in Table 9.2.6.4.1.

Table 9.2.6.4.1: k_n tabulated as a function of the number of timeslots (n)

n	k_n
1	0
2	18
3	28
4	36
5	42
6	46
7	50
8	54
9	57
10	60
11	62
12	65

[…]

For 7.68 Mcps TDD, the mapping of transport block size L to signalled index $k_i = \{0,1,\ldots 127\}$ (see Annex BB.1) is given by the formula:

$$L = \left\lfloor 60 \times \rho^{k_n + k_i} \right\rfloor$$

In the above formula, $\rho = 256^{\frac{1}{127}}$ k_i is the TBS index (0…127) and k_n is an integer selected based upon the number of timeslots allocated (n). Values for k_n are tabulated in Table 9.2.6.4.2.

Table 9.2.6.4.2: k_n tabulated as a function of the number of timeslots (n)

n	k_n
1	0
2	15
3	25
4	31
5	36
6	41
7	44
8	47
9	50
10	52
11	54
12	56

Reference(s)

TS 25.321 clause 9.2.6.4, 9.2.6.4.1 and 9.2.6.4.2.

7.1.6a.3.2.3 Test purpose

To verify that the UE transmits all possible transport block sizes within the UE capability.

7.1.6a.3.2.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

UE in idle mode

The following parameters are specific for this test case:

Common for all UE HS-DSCH categories:

Parameter	Value
MAC-d PDU size	336 bits
MAC-hs receiver window size	16
Number of HARQ processes	1
Number of reordering queues	1

Common for all UE E-DCH categories:

Parameter	Value
T-RUCCH	200 ms (see 25.331 10.3.6.103)

Specific depending on E-DCH category for 3.84Mcps:

Parameter	E-DCH Category	Value
RLC Transmission window size	1 to 4	512
	5	1536
E-TFCI table	1 to 5	See table 7.1.6a.3.1

Specific depending on E-DCH category for 7.68Mcps:

Parameter	E-DCH Category	Value
RLC Transmission window size	1 to 4	512
	5 to 7	1536
E-TFCI table	1 to7	See table 7.1.6a.3.3

Specific depending on HS-DSCH category for 3.84Mcps:

Parameter	HS-DSCH Category	Value
RLC Receiving window size	1 to 6	512
	7 and 8	1536
	9	2047

Specific depending on HS-DSCH category for 7.68Mcps:

Parameter	HS-DSCH Category	Value
RLC Receiving window size	1 to 6	512
	7 to 10	1536
	11 to 13	2047

The mapping between the chosen E-TFC index and the corresponding E-DCH transport block size is given in the following table:

Table 7.1.6a.3.1 10ms TTI E-DCH Transport Block Size Table 0 for 3.84Mcps

N_{slots}	1	2	3	4	5	6	7	8	9	10	11	12
K_n	0	18	28	36	42	46	50	54	57	60	62	65
TBS index												
0	60	119	174	237	298	347	405	472	529	593	641	718
1	62	123	181	246	310	361	421	490	550	616	665	746
2	64	128	188	256	322	375	437	509	571	641	691	775
3	67	133	196	266	334	390	454	529	593	665	718	806
4	69	139	203	276	347	405	472	550	616	691	746	837
5	72	144	211	287	361	421	490	571	641	718	775	870
6	75	150	219	298	375	437	509	593	665	746	806	904
7	78	155	228	310	390	454	529	616	691	775	837	939
8	81	162	237	322	405	472	550	641	718	806	870	975
9	84	168	246	334	421	490	571	665	746	837	904	1013
10	87	174	256	347	437	509	593	691	775	870	939	1053
11	91	181	266	361	454	529	616	718	806	904	975	1094
12	94	188	276	375	472	550	641	746	837	939	1013	1136
13	98	196	287	390	490	571	665	775	870	975	1053	1181
14	102	203	298	405	509	593	691	806	904	1013	1094	1227
15	106	211	310	421	529	616	718	837	939	1053	1136	1275
16	110	219	322	437	550	641	746	870	975	1094	1181	1324
17	114	228	334	454	571	665	775	904	1013	1136	1227	1376
18	119	237	347	472	593	691	806	939	1053	1181	1275	1429
19	123	246	361	490	616	718	837	975	1094	1227	1324	1485
20	128	256	375	509	641	746	870	1013	1136	1275	1376	1543
21	133	266	390	529	665	775	904	1053	1181	1324	1429	1603
22	139	276	405	550	691	806	939	1094	1227	1376	1485	1665
23	144	287	421	571	718	837	975	1136	1275	1429	1543	1730
24	150	298	437	593	746	870	1013	1181	1324	1485	1603	1798
25	155	310	454	616	775	904	1053	1227	1376	1543	1665	1868
26	162	322	472	641	806	939	1094	1275	1429	1603	1730	1941
27	168	334	490	665	837	975	1136	1324	1485	1665	1798	2016
28	174	347	509	691	870	1013	1181	1376	1543	1730	1868	2095
29	181	361	529	718	904	1053	1227	1429	1603	1798	1941	2176
30	188	375	550	746	939	1094	1275	1485	1665	1868	2016	2261
31	196	390	571	775	975	1136	1324	1543	1730	1941	2095	2349
32	203	405	593	806	1013	1181	1376	1603	1798	2016	2176	2441
33	211	421	616	837	1053	1227	1429	1665	1868	2095	2261	2536
34	219	437	641	870	1094	1275	1485	1730	1941	2176	2349	2634
35	228	454	665	904	1136	1324	1543	1798	2016	2261	2441	2737
36	237	472	691	939	1181	1376	1603	1868	2095	2349	2536	2844
37	246	490	718	975	1227	1429	1665	1941	2176	2441	2634	2954
38	256	509	746	1013	1275	1485	1730	2016	2261	2536	2737	3070
39	266	529	775	1053	1324	1543	1798	2095	2349	2634	2844	3189
40	276	550	806	1094	1376	1603	1868	2176	2441	2737	2954	3313
41	287	571	837	1136	1429	1665	1941	2261	2536	2844	3070	3442
42	298	593	870	1181	1485	1730	2016	2349	2634	2954	3189	3576
43	310	616	904	1227	1543	1798	2095	2441	2737	3070	3313	3716
44	322	641	939	1275	1603	1868	2176	2536	2844	3189	3442	3861
45	334	665	975	1324	1665	1941	2261	2634	2954	3313	3576	4011
46	347	691	1013	1376	1730	2016	2349	2737	3070	3442	3716	4167
47	361	718	1053	1429	1798	2095	2441	2844	3189	3576	3861	4329
48	375	746	1094	1485	1868	2176	2536	2954	3313	3716	4011	4498

49	390	775	1136	1543	1941	2261	2634	3070	3442	3861	4167	4673
50	405	806	1181	1603	2016	2349	2737	3189	3576	4011	4329	4855
51	421	837	1227	1665	2095	2441	2844	3313	3716	4167	4498	5044
52	437	870	1275	1730	2176	2536	2954	3442	3861	4329	4673	5241
53	454	904	1324	1798	2261	2634	3070	3576	4011	4498	4855	5445
54	472	939	1376	1868	2349	2737	3189	3716	4167	4673	5044	5657
55	490	975	1429	1941	2441	2844	3313	3861	4329	4855	5241	5877
56	509	1013	1485	2016	2536	2954	3442	4011	4498	5044	5445	6106
57	529	1053	1543	2095	2634	3070	3576	4167	4673	5241	5657	6344
58	550	1094	1603	2176	2737	3189	3716	4329	4855	5445	5877	6591
59	571	1136	1665	2261	2844	3313	3861	4498	5044	5657	6106	6848
60	593	1181	1730	2349	2954	3442	4011	4673	5241	5877	6344	7115
61	616	1227	1798	2441	3070	3576	4167	4855	5445	6106	6591	7392
62	641	1275	1868	2536	3189	3716	4329	5044	5657	6344	6848	7680
63	665	1324	1941	2634	3313	3861	4498	5241	5877	6591	7115	7979
64	691	1376	2016	2737	3442	4011	4673	5445	6106	6848	7392	8289
65	718	1429	2095	2844	3576	4167	4855	5657	6344	7115	7680	8612
66	746	1485	2176	2954	3716	4329	5044	5877	6591	7392	7979	8948
67	775	1543	2261	3070	3861	4498	5241	6106	6848	7680	8289	9296
68	806	1603	2349	3189	4011	4673	5445	6344	7115	7979	8612	9658
69	837	1665	2441	3313	4167	4855	5657	6591	7392	8289	8948	10034
70	870	1730	2536	3442	4329	5044	5877	6848	7680	8612	9296	10425
71	904	1798	2634	3576	4498	5241	6106	7115	7979	8948	9658	10831
72	939	1868	2737	3716	4673	5445	6344	7392	8289	9296	10034	11253
73	975	1941	2844	3861	4855	5657	6591	7680	8612	9658	10425	11691
74	1013	2016	2954	4011	5044	5877	6848	7979	8948	10034	10831	12146
75	1053	2095	3070	4167	5241	6106	7115	8289	9296	10425	11253	12620
76	1094	2176	3189	4329	5445	6344	7392	8612	9658	10831	11691	13111
77	1136	2261	3313	4498	5657	6591	7680	8948	10034	11253	12146	13622
78	1181	2349	3442	4673	5877	6848	7979	9296	10425	11691	12620	14152
79	1227	2441	3576	4855	6106	7115	8289	9658	10831	12146	13111	14703
80	1275	2536	3716	5044	6344	7392	8612	10034	11253	12620	13622	15276
81	1324	2634	3861	5241	6591	7680	8948	10425	11691	13111	14152	15871
82	1376	2737	4011	5445	6848	7979	9296	10831	12146	13622	14703	16489
83	1429	2844	4167	5657	7115	8289	9658	11253	12620	14152	15276	17131
84	1485	2954	4329	5877	7392	8612	10034	11691	13111	14703	15871	17798
85	1543	3070	4498	6106	7680	8948	10425	12146	13622	15276	16489	18491
86	1603	3189	4673	6344	7979	9296	10831	12620	14152	15871	17131	19212
87	1665	3313	4855	6591	8289	9658	11253	13111	14703	16489	17798	19960
88	1730	3442	5044	6848	8612	10034	11691	13622	15276	17131	18491	20737
89	1798	3576	5241	7115	8948	10425	12146	14152	15871	17798	19212	21545
90	1868	3716	5445	7392	9296	10831	12620	14703	16489	18491	19960	22384
91	1941	3861	5657	7680	9658	11253	13111	15276	17131	19212	20737	23256
92	2016	4011	5877	7979	10034	11691	13622	15871	17798	19960	21545	24161
93	2095	4167	6106	8289	10425	12146	14152	16489	18491	20737	22384	25102
94	2176	4329	6344	8612	10831	12620	14703	17131	19212	21545	23256	26080
95	2261	4498	6591	8948	11253	13111	15276	17798	19960	22384	24161	27095
96	2349	4673	6848	9296	11691	13622	15871	18491	20737	23256	25102	28151
97	2441	4855	7115	9658	12146	14152	16489	19212	21545	24161	26080	29247
98	2536	5044	7392	10034	12620	14703	17131	19960	22384	25102	27095	30386
99	2634	5241	7680	10425	13111	15276	17798	20737	23256	26080	28151	31569
100	2737	5445	7979	10831	13622	15871	18491	21545	24161	27095	29247	32799
101	2844	5657	8289	11253	14152	16489	19212	22384	25102	28151	30386	34076

102	2954	5877	8612	11691	14703	17131	19960	23256	26080	29247	31569	35403
103	3070	6106	8948	12146	15276	17798	20737	24161	27095	30386	32799	36782
104	3189	6344	9296	12620	15871	18491	21545	25102	28151	31569	34076	38214
105	3313	6591	9658	13111	16489	19212	22384	26080	29247	32799	35403	39703
106	3442	6848	10034	13622	17131	19960	23256	27095	30386	34076	36782	41249
107	3576	7115	10425	14152	17798	20737	24161	28151	31569	35403	38214	42855
108	3716	7392	10831	14703	18491	21545	25102	29247	32799	36782	39703	44524
109	3861	7680	11253	15276	19212	22384	26080	30386	34076	38214	41249	46258
110	4011	7979	11691	15871	19960	23256	27095	31569	35403	39703	42855	48060
111	4167	8289	12146	16489	20737	24161	28151	32799	36782	41249	44524	49932
112	4329	8612	12620	17131	21545	25102	29247	34076	38214	42855	46258	51876
113	4498	8948	13111	17798	22384	26080	30386	35403	39703	44524	48060	53896
114	4673	9296	13622	18491	23256	27095	31569	36782	41249	46258	49932	55995
115	4855	9658	14152	19212	24161	28151	32799	38214	42855	48060	51876	58176
116	5044	10034	14703	19960	25102	29247	34076	39703	44524	49932	53896	60442
117	5241	10425	15276	20737	26080	30386	35403	41249	46258	51876	55995	62796
118	5445	10831	15871	21545	27095	31569	36782	42855	48060	53896	58176	65241
119	5657	11253	16489	22384	28151	32799	38214	44524	49932	55995	60442	67782
120	5877	11691	17131	23256	29247	34076	39703	46258	51876	58176	62796	70422
121	6106	12146	17798	24161	30386	35403	41249	48060	53896	60442	65241	73164
122	6344	12620	18491	25102	31569	36782	42855	49932	55995	62796	67782	76013
123	6591	13111	19212	26080	32799	38214	44524	51876	58176	65241	70422	78974
124	6848	13622	19960	27095	34076	39703	46258	53896	60442	67782	73164	82049
125	7115	14152	20737	28151	35403	41249	48060	55995	62796	70422	76013	85245
126	7392	14703	21545	29247	36782	42855	49932	58176	65241	73164	78974	88565
127	7680	15276	22384	30386	38214	44524	51876	60442	67782	76013	82049	92014

Table 7.1.6a.3.2 Applicable E-TFS indexes for sub-tests 1 to 3 and UE E-DCH categories 1 to 5 for 3.84Mcps.

			Applicable E-TFS indexes				
Sub-test	N_{slots}	E-DCH Transport Block Size Table	Category 1	Category 2	Category 3	Category 4	Category 5
1	**12**	**Table 7.1.6a.3.1**	**0..74**	**0..92**	**0..103**	**0..113**	**0..127**
2	**6**	**Table 7.1.6a.3.1**	**0..93**	**0..111**	**0.122**	**0..127**	**0..127**
3	**1**	**Table 7.1.6a.3.1**	**0..127**	**0..127**	**0..127**	**0..127**	**0..127**
NOTE 1: Applicable indexes depends on the UE capability of "Maximum number of bits of an E-DCH transport block transmitted within a 10 ms E-DCH TTI" as specified in TS 25.306 clause 5.1.							

Table 7.1.6a.3.3 10ms TTI E-DCH Transport Block Size Table 0 for 7.68Mcps

Nslots	1	2	3	4	5	6	7	8	9	10	11	12
kn	0	15	25	31	36	41	44	47	50	52	54	56
TBS index												
0	60	115	178	232	288	359	409	467	532	581	634	691
1	62	120	186	242	301	375	428	487	556	606	662	722
2	65	126	195	253	315	392	447	509	581	634	691	755
3	68	131	203	264	329	409	467	532	606	662	722	788
4	71	137	212	276	344	428	487	556	634	691	755	823
5	74	143	222	288	359	447	509	581	662	722	788	860
6	77	150	232	301	375	467	532	606	691	755	823	899
7	81	156	242	315	392	487	556	634	722	788	860	939
8	85	163	253	329	409	509	581	662	755	823	899	981
9	88	171	264	344	428	532	606	691	788	860	939	1024
10	92	178	276	359	447	556	634	722	823	899	981	1070
11	96	186	288	375	467	581	662	755	860	939	1024	1118
12	101	195	301	392	487	606	691	788	899	981	1070	1168
13	105	203	315	409	509	634	722	823	939	1024	1118	1220
14	110	212	329	428	532	662	755	860	981	1070	1168	1275
15	115	222	344	447	556	691	788	899	1024	1118	1220	1331
16	120	232	359	467	581	722	823	939	1070	1168	1275	1391
17	126	242	375	487	606	755	860	981	1118	1220	1331	1453
18	131	253	392	509	634	788	899	1024	1168	1275	1391	1518
19	137	264	409	532	662	823	939	1070	1220	1331	1453	1586
20	143	276	428	556	691	860	981	1118	1275	1391	1518	1656
21	150	288	447	581	722	899	1024	1168	1331	1453	1586	1730
22	156	301	467	606	755	939	1070	1220	1391	1518	1656	1808
23	163	315	487	634	788	981	1118	1275	1453	1586	1730	1888
24	171	329	509	662	823	1024	1168	1331	1518	1656	1808	1973
25	178	344	532	691	860	1070	1220	1391	1586	1730	1888	2061
26	186	359	556	722	899	1118	1275	1453	1656	1808	1973	2153
27	195	375	581	755	939	1168	1331	1518	1730	1888	2061	2249
28	203	392	606	788	981	1220	1391	1586	1808	1973	2153	2349
29	212	409	634	823	1024	1275	1453	1656	1888	2061	2249	2454
30	222	428	662	860	1070	1331	1518	1730	1973	2153	2349	2564
31	232	447	691	899	1118	1391	1586	1808	2061	2249	2454	2678

32	242	467	722	939	1168	1453	1656	1888	2153	2349	2564	2798
33	253	487	755	981	1220	1518	1730	1973	2249	2454	2678	2922
34	264	509	788	1024	1275	1586	1808	2061	2349	2564	2798	3053
35	276	532	823	1070	1331	1656	1888	2153	2454	2678	2922	3189
36	288	556	860	1118	1391	1730	1973	2249	2564	2798	3053	3331
37	301	581	899	1168	1453	1808	2061	2349	2678	2922	3189	3480
38	315	606	939	1220	1518	1888	2153	2454	2798	3053	3331	3636
39	329	634	981	1275	1586	1973	2249	2564	2922	3189	3480	3798
40	344	662	1024	1331	1656	2061	2349	2678	3053	3331	3636	3967
41	359	691	1070	1391	1730	2153	2454	2798	3189	3480	3798	4144
42	375	722	1118	1453	1808	2249	2564	2922	3331	3636	3967	4329
43	392	755	1168	1518	1888	2349	2678	3053	3480	3798	4144	4523
44	409	788	1220	1586	1973	2454	2798	3189	3636	3967	4329	4725
45	428	823	1275	1656	2061	2564	2922	3331	3798	4144	4523	4935
46	447	860	1331	1730	2153	2678	3053	3480	3967	4329	4725	5156
47	467	899	1391	1808	2249	2798	3189	3636	4144	4523	4935	5386
48	487	939	1453	1888	2349	2922	3331	3798	4329	4725	5156	5626
49	509	981	1518	1973	2454	3053	3480	3967	4523	4935	5386	5877
50	532	1024	1586	2061	2564	3189	3636	4144	4725	5156	5626	6140
51	556	1070	1656	2153	2678	3331	3798	4329	4935	5386	5877	6414
52	581	1118	1730	2249	2798	3480	3967	4523	5156	5626	6140	6700
53	606	1168	1808	2349	2922	3636	4144	4725	5386	5877	6414	6999
54	634	1220	1888	2454	3053	3798	4329	4935	5626	6140	6700	7311
55	662	1275	1973	2564	3189	3967	4523	5156	5877	6414	6999	7638
56	691	1331	2061	2678	3331	4144	4725	5386	6140	6700	7311	7979
57	722	1391	2153	2798	3480	4329	4935	5626	6414	6999	7638	8335
58	755	1453	2249	2922	3636	4523	5156	5877	6700	7311	7979	8707
59	788	1518	2349	3053	3798	4725	5386	6140	6999	7638	8335	9095
60	823	1586	2454	3189	3967	4935	5626	6414	7311	7979	8707	9501
61	860	1656	2564	3331	4144	5156	5877	6700	7638	8335	9095	9925
62	899	1730	2678	3480	4329	5386	6140	6999	7979	8707	9501	10368
63	939	1808	2798	3636	4523	5626	6414	7311	8335	9095	9925	10831
64	981	1888	2922	3798	4725	5877	6700	7638	8707	9501	10368	11314
65	1024	1973	3053	3967	4935	6140	6999	7979	9095	9925	10831	11819
66	1070	2061	3189	4144	5156	6414	7311	8335	9501	10368	11314	12347
67	1118	2153	3331	4329	5386	6700	7638	8707	9925	10831	11819	12898
68	1168	2249	3480	4523	5626	6999	7979	9095	10368	11314	12347	13474

69	1220	2349	3636	4725	5877	7311	8335	9501	10831	11819	12898	14075
70	1275	2454	3798	4935	6140	7638	8707	9925	11314	12347	13474	14703
71	1331	2564	3967	5156	6414	7979	9095	10368	11819	12898	14075	15360
72	1391	2678	4144	5386	6700	8335	9501	10831	12347	13474	14703	16045
73	1453	2798	4329	5626	6999	8707	9925	11314	12898	14075	15360	16761
74	1518	2922	4523	5877	7311	9095	10368	11819	13474	14703	16045	17509
75	1586	3053	4725	6140	7638	9501	10831	12347	14075	15360	16761	18291
76	1656	3189	4935	6414	7979	9925	11314	12898	14703	16045	17509	19107
77	1730	3331	5156	6700	8335	10368	11819	13474	15360	16761	18291	19960
78	1808	3480	5386	6999	8707	10831	12347	14075	16045	17509	19107	20851
79	1888	3636	5626	7311	9095	11314	12898	14703	16761	18291	19960	21781
80	1973	3798	5877	7638	9501	11819	13474	15360	17509	19107	20851	22753
81	2061	3967	6140	7979	9925	12347	14075	16045	18291	19960	21781	23769
82	2153	4144	6414	8335	10368	12898	14703	16761	19107	20851	22753	24830
83	2249	4329	6700	8707	10831	13474	15360	17509	19960	21781	23769	25938
84	2349	4523	6999	9095	11314	14075	16045	18291	20851	22753	24830	27095
85	2454	4725	7311	9501	11819	14703	16761	19107	21781	23769	25938	28305
86	2564	4935	7638	9925	12347	15360	17509	19960	22753	24830	27095	29568
87	2678	5156	7979	10368	12898	16045	18291	20851	23769	25938	28305	30888
88	2798	5386	8335	10831	13474	16761	19107	21781	24830	27095	29568	32266
89	2922	5626	8707	11314	14075	17509	19960	22753	25938	28305	30888	33706
90	3053	5877	9095	11819	14703	18291	20851	23769	27095	29568	32266	35211
91	3189	6140	9501	12347	15360	19107	21781	24830	28305	30888	33706	36782
92	3331	6414	9925	12898	16045	19960	22753	25938	29568	32266	35211	38424
93	3480	6700	10368	13474	16761	20851	23769	27095	30888	33706	36782	40139
94	3636	6999	10831	14075	17509	21781	24830	28305	32266	35211	38424	41930
95	3798	7311	11314	14703	18291	22753	25938	29568	33706	36782	40139	43801
96	3967	7638	11819	15360	19107	23769	27095	30888	35211	38424	41930	45756
97	4144	7979	12347	16045	19960	24830	28305	32266	36782	40139	43801	47798
98	4329	8335	12898	16761	20851	25938	29568	33706	38424	41930	45756	49932
99	4523	8707	13474	17509	21781	27095	30888	35211	40139	43801	47798	52160
100	4725	9095	14075	18291	22753	28305	32266	36782	41930	45756	49932	54488
101	4935	9501	14703	19107	23769	29568	33706	38424	43801	47798	52160	56920
102	5156	9925	15360	19960	24830	30888	35211	40139	45756	49932	54488	59460
103	5386	10368	16045	20851	25938	32266	36782	41930	47798	52160	56920	62114
104	5626	10831	16761	21781	27095	33706	38424	43801	49932	54488	59460	64886
105	5877	11314	17509	22753	28305	35211	40139	45756	52160	56920	62114	67782

106	6140	11819	18291	23769	29568	36782	41930	47798	54488	59460	64886	70807
107	6414	12347	19107	24830	30888	38424	43801	49932	56920	62114	67782	73967
108	6700	12898	19960	25938	32266	40139	45756	52160	59460	64886	70807	77268
109	6999	13474	20851	27095	33706	41930	47798	54488	62114	67782	73967	80717
110	7311	14075	21781	28305	35211	43801	49932	56920	64886	70807	77268	84319
111	7638	14703	22753	29568	36782	45756	52160	59460	67782	73967	80717	88082
112	7979	15360	23769	30888	38424	47798	54488	62114	70807	77268	84319	92014
113	8335	16045	24830	32266	40139	49932	56920	64886	73967	80717	88082	96120
114	8707	16761	25938	33706	41930	52160	59460	67782	77268	84319	92014	100410
115	9095	17509	27095	35211	43801	54488	62114	70807	80717	88082	96120	104891
116	9501	18291	28305	36782	45756	56920	64886	73967	84319	92014	100410	109573
117	9925	19107	29568	38424	47798	59460	67782	77268	88082	96120	104891	114463
118	10368	19960	30888	40139	49932	62114	70807	80717	92014	100410	109573	119572
119	10831	20851	32266	41930	52160	64886	73967	84319	96120	104891	114463	124908
120	11314	21781	33706	43801	54488	67782	77268	88082	100410	109573	119572	130483
121	11819	22753	35211	45756	56920	70807	80717	92014	104891	114463	124908	136306
122	12347	23769	36782	47798	59460	73967	84319	96120	109573	119572	130483	142390
123	12898	24830	38424	49932	62114	77268	88082	100410	114463	124908	136306	148744
124	13474	25938	40139	52160	64886	80717	92014	104891	119572	130483	142390	155383
125	14075	27095	41930	54488	67782	84319	96120	109573	124908	136306	148744	162318
126	14703	28305	43801	56920	70807	88082	100410	114463	130483	142390	155383	169562
127	15360	29568	45756	59460	73967	92014	104891	119572	136306	148744	162318	177130

Table 7.1.6a.3.4 Applicable E-TFS indexes for sub-tests 1 to 3 and UE E-DCH categories 1 to 7 for 3.84Mcps.

			Applicable E-TFS indexes						
Sub-test	N_{slots}	E-DCH Transport Block Size Table	Category 1	Category 2	Category 3	Category 4	Category 5	Category 6	Category 7
1	**12**	**Table 7.1.6a.3.3**	**0..66**	**0..82**	**0..91**	**0..100**	**0..107**	**0..115**	**0..127**
2	**6**	**Table 7.1.6a.3.3**	**0..81**	**0..97**	**0.106**	**0..115**	**0..127**	**0..127**	**0..127**
3	**1**	**Table 7.1.6a.3.3**	**0..122**	**0..127**	**0..127**	**0..127**	**0..127**	**0..127**	**0..127**
NOTE 1: Applicable indexes depends on the UE capability of “Maximum number of bits of an E-DCH transport block transmitted within a 10 ms E-DCH TTI” as specified in TS 25.306 clause 5.1.									

Test procedure

a) The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.10.3.4.7.1 for 3.84Mcps and clause 6.11.6.4.7.1 for 7.68Mcps using condition A12 as specified in clause 9.1 of TS 34.108.. See note 1.

b) The SS closes the test loop using UE test loop mode 1 and configuring the UL RLC SDU size to be equal to the received DL SDU size (i.e. not setting the UL RLC SDU size parameter).

c) SS sets RLC SDU size = 312 bits which corresponds to maximum AM payload size for 1 MAC-d PDU of size 336 bits.

d) The SS removes the scheduling grant for E-DCH for the UE.

e) If N_{PDUs} is less than 36 the SS transmits one RLC SDU with size (($NPDUs$ – 1) * 320 + 312) else the SS transmits two SDUs with size ((N_{PDUs} – 2) * 320 + 2 * 312) / 2. See note 2.

f) The SS waits for an SI to be received that indicates that there is data available for transmission (can be identified from the content of the SI). See Note 3. The SS checks that TEBS and HLBS have the correct values.

g) The SS issues an absolute grant that allows the UE to which specifies the maximum absolute grant value (signalled value 31) together with a physical resource allocation of the whole code space (signalled value 0) and TS allocation limited to the number of timeslots defined in Table 7.1.6a.3.2 for 3.84Mcps and in Table 7.1.6a.3.4 for 7.68Mcps for the sub-test. The resource duration takes the default value of 1 TTI.

h) The SS waits until data is received and verifies that the looped back SDU data has the correct content and is sent in the same TTI.

i) The SS verifies that the received E-TFC used by the UE is correct. For Rel-7 and later release UE the SS checks that the UE has not used the transport block sizes correspondent to the E-TFCI values as listed in table 7.1.6.3.2.6, but instead used the transport block size correspondent to the next possible larger E-TFCI value.

j) The SS increments the RLC SDU payload size by 320 bits. For the case of 2 SDUs transmitted by the SS, each of the payload sizes are incremented by 320 bits. The SS calculates the new E-TFC transport block size from the relevant Transport Block Size Table. If this transport block size is supported by the UE under test, according to Table 7.1.6.3.2.5, then continue with step d else continue with step k.

k) The SS opens the UE test loop.

l) The SS release the radio bearer.

m) The SS may optionally deactivate the radio bearer test mode.

NOTE 1: The SS configures the physical channel parameters according to the actual UE category under test.

NOTE 2: Calculation of Downlink (DL) RLC SDU size:

DL SDU size = N_{PDUs} * 336 bits RLC PDU – headers associated with MAC and RLC.

RLC PDU = RLC 16 bits Sequence Number + 8 bits for the Optional Length Indicators + RLC pay load size. The Optional Length Indicator is present only in the delivery of the last RLC PDU.

The Optional Length Indicators consists of a 7 bits Length Indicator + 1 bit Extension Field of binary value = “0”. The 7 bit length indicator indicates the number of octets between the end of the RLC header up to and including the last octet of the (DL) RLC SDU ending within the PDU.

Therefore, the RLC payload has two different sizes of 320 bits (336 – 16 bits Sequence Number) and 312 bits (336 – 16 bits sequence Number - (7 bits Length Indicator + 1 bit extension field)).

N_{PDUs} = FLOOR ((TBS size – MAC-e header size – MAC-es header size) / MAC-d PDU size) = FLOOR ((TBS size -18) / 336).

For N_{PDUs} = 1

DL RLC SDU payload has size 312 bits

For $1 < N_{PDUs} < 36$

There are (N_{PDUs} – 1) RLC payloads of size 320 bits with the last RLC payload size 312 bits

DL RLC SDU payload size = (N_{PDUs} -1) * 320 + 312

For $N_{PDUs} \geq 36$

The test data for transport channels on HS-DSCH and E-DCH is divided into 2 RLC SDUs so that the SDU size does not exceed 1500 octets (limit of SDU size in SM)

The payload data of the MAC-d PDUs contains 2 RLC SDUs of size

((N_{PDUs} – 2) * 320 + 2 * 312) / 2

$N_{PDU} = N_{PDUs} + 2$

Calculation of E-TFC TB Size:

Select the E-TFC Index/TB Size = Number of MAC-d PDU * 336 bits RLC PDU + 336 bits UL AM ACK (status) PDU + 18 bits MAC-es and MAC-e headers (6 bits N + 6 bits TSN + 6 bits DDI) according to the E-DCH Transport Block Size Tables for FDD per 25.321 Annex B, .

As an example TBS value of 716 bits is used by the UE in the 10mS Index 0 subtest to deliver UL RLC SDU size o f 84 bytes = 672bit + 18 bits MAC headers = 690 bits

NOTE 3: Calculation of TEBS value:

Using the E-TFC TB size determined in Note 2 above, select the TEBS index according to 25.321 Table 9.2.5.3.2-1.

Expected sequence

Step	Direction UE SS	Message	Comments
1	<--	SYSTEM INFORMATION (BCCH)	Broadcast
2	<--	PAGING TYPE 1 (PCCH)	Paging (PS domain, P-TMSI)
3	-->	RRC CONNECTION REQUEST (CCCH)	RRC
4	<--	RRC CONNECTION SETUP (CCCH)	RRC
5	-->	RRC CONNECTION SETUP COMPLETE (DCCH)	RRC
6	-->	SERVICE REQUEST (DCCH)	GMM
7	<--	SECURITY MODE COMMAND	RRC see note 1
8	-->	SECURITY MODE COMPLETE	RRC see note 1
9	<--	ACTIVATE RB TEST MODE (DCCH)	TC
10	-->	ACTIVATE RB TEST MODE COMPLETE (DCCH)	TC
11	<--	RADIO BEARER SETUP (DCCH)	RRC. For the PS radio bearer the 'pdcp info' IE shall be omitted.
12	-->	RADIO BEARER SETUP COMPLETE (DCCH)	RRC
13	<--	CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 with no "LB Setup RB IE#k" parameter set (UE shall return an UL RLC SDU with the same size as the received RLC SDU in downlink)
14	-->	CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
15	SS		The SS creates two RLC SDUs according to the E-TFC under test
16	←	Removal of absolute grant	Signalling value 1
17	<--	DOWNLINK RLC SDU#1 DOWNLINK RLC SDU#2	Send test data. The MAC-hs PDU contains 4 RLC SDUs
18	→	SI indicating 2 RLC SDUs	This can be verified from the indicated Total E-DCH Buffer Status (TEBS)
19	<--	Absolute grant allowing the UE to transmit at maximum bit rate.	Signalling value 31
20	-->	UPLINK RLC SDUs	The SS checks that the content of the received UL RLC SDUs are correct
21	SS		The SS calculates test data for next E-TFC index and repeat steps 16 to 19 until all applicable E-TFC indexes have been tested.
22	<--	OPEN UE TEST LOOP (DCCH)	TC
23	-->	OPEN UE TEST LOOP COMPLETE (DCCH)	TC
24		RB RELEASE	RRC
25	<--	DEACTIVATE RB TEST MODE	TC Optional step
26	-->	DEACTIVATE RB TEST MODE COMPLETE	TC Optional step
Note 1	In addition to activate integrity protection Step 6 and Step 7 are inserted in order to stop T3317 timer in the UE, which starts after transmitting SERVICE REQUEST message.		

7.1.6a.3.2.5 Test requirements

1. In step 20, the SS verifies that the received E-TFC has the correct size
2. In step 20, the SS shall receive 2 RLC SDUs with the same content as sent in downlink.

7.1.6a.4 MAC-es/e - E-DCH retransmissions

7.1.6a.4.1 MAC-es/e process handling

7.1.6a.4.1.1 Definition and applicability

All UEs which support E-DCH.

7.1.6a.4.1.2 Conformance requirement

Extract from 25.331:

1> for TDD:

2> if the IE "Non-scheduled transmission grant info" is included:

3> MAC-d PDU's for logical channels belonging to this MAC-d flow shall only be included in a MAC-e or MAC-i PDU transmitted by HARQ processes designated as non scheduled (Ids 4 – 7) in the TTIs indicated (for 3.84 Mcps TDD and 7.68 Mcps TDD, as determined from the IEs "Activation Time", "Resource Duration" and "Resource Periodicity"; for 1.28 Mcps TDD, as determined from the IEs "Activation Time", "Subframe number", "Resource Duration" and "Resource Periodicity", and the calculation of assigned Non-scheduled transmission grant is specified in subclause 8.6.6.16a).

[…]

When the variable E_DCH_TRANSMISSION is set to TRUE the UE shall:

[…]

1> for TDD:

2> configure the E-RUCCH with the stored E-RUCCH configuration;

2> configure the MAC with the stored E-PUCH configuration.

Extract From 25.321 clause 11.9.1.4:

RRC can allocate non-scheduled transmission grants to individual MAC-d flows in order to reduce the transmission delays.

The UE shall determine whether to take scheduled or non-scheduled grants into account in the upcoming transmission. If neither are supposed to be taken into account (i.e. the TTI is not available for non-scheduled transmission and no Grant for scheduled transmission has been received) then no grant shall be assumed to exist. If a grant exists then the transmission format and data allocation shall follow the requirements below.

Reference(s)

TS 25.321 clauses 11.9.1.4,. TS 25.331 clauses 8.6.5.18 and 8.6.6.37

7.1.6a.4.1.3 Test purpose

To verify that the UE performs transmissions and retransmissions in the correct MAC-es process.

To verify that the UE uses only the allowed HARQ processes for scheduled and non-scheduled transmissions.

7.1.6a.4.1.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4h using condition A15 as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	1	RB25
8 (LCH2)	3	2	RB17
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the test case			

The following parameters are specific for this test case:

Parameter	Value
Periodicity for scheduling info	No periodic scheduling info
HARQ RV Configuration	rv0

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets.

Test procedure

In this test procedure the UE is configured with two logical channels, with Id 7 (LCH 1) and 8 (LCH2). LCH 1 is mapped to MAC-d flow 2 and LCH 2 is mapped to MAC-d flow3. The MAC-d flow 2 has been configured with non-scheduled transmissions allowed in HARQ process 4, with a rate exceeding 1 SDU/TTI and the value of the "Max MAC-e PDU contents size" is 500 bits. MAC-d flow 3 has been configured with a scheduled transmission allowed in HARQ process 2.

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS transmits 1 SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1

c) The SS waits until data is received and checks that the data is received in HARQ process 4

d) The SS sends a HARQ NACK

e) The SS waits until the retransmission is received and checks that the data is received in HARQ process 4

f) The SS transmits 8 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH 2

g) The SS waits until an SI is received.

h) The SS issues absolute grant corresponding to 1 RLC PDU of size 41 octets per TTI.

i) The SS waits until data is received and checks that the data is received in HARQ process 2

j) The SS transmits 8 SDU's of size 40 bytes (plus 1 byte RLC length indicator) on LCH 1

k) The SS waits until data is received and checks that the data is received in HARQ process 4

Expected sequence

Step	Direction	Message	Comments
	UE SS		
1	←	1 RLC PDU on LCH 1	
2	→	MAC-es PDU containing 1 RLC PDU	
3	←	HARQ NACK	
4	→	MAC-es PDU containing 1 RLC PDU	
5	←	8 RLC SDU's on LCH 2	
6	→	SI indicating data on LCH 2	
7	←	Primary Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 4
8	→	MAC-es PDU containing 1 RLC PDU	PDU shall be received in HARQ process 2. This step is repeated until all 8 RLC SDU's are received on LCH2.
9	←	8 RLC SDU's on LCH 1	
10	→	MAC-es PDU containing 1 RLC PDU	PDU shall be received in HARQ process 4. This step is repeated until all 8 RLC SDU's are received on LCH1.

Specific Message Contents

None

7.1.6a.4.1.5 Test requirements

1. In step 2 the SS shall receive a MAC-es PDU in HARQ process 4
2. In step 4 the SS shall receive a MAC-es PDU in HARQ process 4
3. In step 8 the SS shall receive all MAC-es PDUs in HARQ process 2
4. In step 10 the SS shall receive all MAC-es PDUs in HARQ process 4

7.1.6a.4.2 MAC-es/e maximum number of retransmissions

7.1.6a.4.2.1 Definition and applicability

All UEs which support E-DCH.

7.1.6a.4.2.2 Conformance requirement

Extract From 25.321 clause 11.9.1.4:

[..]

For each MAC-d flow, RRC configures MAC-e with a HARQ profile and multiplexing list. Additionally, RRC configures MAC with a power offset in case the Scheduling Information needs to be transmitted without any higher-layer data. The HARQ profile includes the power offset and maximum number of HARQ transmissions to use for this MAC-d flow. For 1.28 Mcps TDD, the HARQ profile also includes a retransmission timer attribute. The multiplexing list identifies for each MAC-d flow(s), the other MAC-d flows for which data can be multiplexed in a transmission that uses the power offset included in its HARQ profile.

[..]

The E-TFC selection function shall provide this MAC-e PDU and transmission HARQ profile to the HARQ entity. The selected E-TFC is also provided (Note: for 1.28Mcps TDD, the signalled transport block size index, i.e. E-TFCI, is the index of the selected E-TFC in the candidate set.). The maximum number of HARQ transmissions and the power offset in this profile shall be set respectively to the maximum of both the Max Number of HARQ Transmissions and of the power offset of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission. For 1.28 Mcps TDD, the retransmission timer shall be set to the maximum of the retransmission timer value of the HARQ profiles that are permitted to be multiplexed into the transmission. Each HARQ process which is associated with a buffer holding a MAC-e PDU for potential retransmission shall maintain the HARQ profile and the number of re-transmissions that have occurred. For 1.28 Mcps TDD, the HARQ process shall also maintain the value of RTX_TIMER.

Reference(s)

TS 25.321 clause 11.9.1.4

7.1.6a.4.2.3 Test purpose

To verify that the UE, when 2 MAC d flows are multiplexed, follows the maximum number of retransmissions according to the HARQ profiles (different values configured for maximum number of retransmissions for each HARQ profile).

7.1.6a.4.2.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4h using condition A15 as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Max. retransmissions	Comment
7 (LCH1)	2	1	2	RB25
8 (LCH2)	3	2	4	RB17
NOTE: The RAB combination also includes SRBs on E-DCH which are not used in the testcase				

The following parameters are specific for this test case:

Parameter	Value
T-RUCCH	200 ms (see 25.331 10.3.6.103
E-DCH MAC-d flow multiplexing list	11111111 (See 25.331 10.3.5.1b) Note 1
HARQ RV Configuration	rv0
Note 1: This configuration means that all MAC-d flows can be multiplexed in the same TTI	

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB25 and RB17.

Test procedure

The UE is configured with two logical channels, LCH1 (with priority 1) and LCH2 (with priority 2). LCH1 is mapped to MAC-d flow 2 and LCH2 is mapped to MAC-d flow 3. The UE is not given any grant to transmit on E-DCH.

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

c) The SS waits for an SI to be received that indicates that data is available

d) The SS issues an absolute grant that allows the UE to send with a rate sufficient to accommodate one RLC PDU per TTI

e) For each received transmission, the SS sends a negative HARQ acknowledgement and verifies that exactly 2 retransmissions are made by the UE.

f) The SS stops issuing absolute grants

g) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

h) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

i) The SS waits for an SI to be received that indicates that data is available on both LCHs.

j) The SS issues an absolute grant that allows the UE to send with a rate sufficient to accommodate two RLC PDUs per TTI (signalling value 5)

k) For each received transmission, the SS sends a negative HARQ acknowledgement and verifies that exactly 4 retransmissions are made by the UE (maximum from the HARQ profiles for LCH1 and LCH2).

NOTE: The UE may send an SI after step g but this SI would only indicate data on LCH2. This SI will be ignored.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		

1	←	1 RLC PDUs on LCH 1	
2	→	SI showing that data is available for LCH 1	
3	←	Absolute grant allowing the UE to transmit 1 RLC PDU per TTI	Signalling value 4
4	→	MAC es PDU containing 1 RLC PDU from LCH 1	
5	←	HARQ NACK	
6	SS		SS sends a HARQ NACK for each received retransmission. After the second retransmission the SS waits 1 s to verify that no further retransmissions occur.
7	←	1 RLC PDUs on LCH 2	
8	←	1 RLC PDUs on LCH 1	
9	→	Potential SI indicating data on LCH 2	This SI is ignored by the SS
10	→	SI showing that data is available for LCH 1 and LCH 2	
11	←	Absolute grant allowing the UE to transmit 2 RLC PDUs per TTI	Signalling value 5
12	→	MAC es PDU containing 1 RLC PDU from LCH 1 and 1 RLC PDU from LCH 2	
13	←	HARQ NACK	
14	SS		SS sends a HARQ NACK for each received retransmission. After the fourth retransmission the SS waits 1 s to verify that no further retransmissions occur.

Specific Message Contents

None

7.1.6a.4.2.5 Test requirements

1. In step 6, exactly 2 retransmissions shall be performed by the UE.
2. In step 15, exactly 4 retransmissions shall be performed by the UE.

7.1.7 E-DCH MAC-i/is

7.1.7.1 MAC-i/is multiplexing (multiple PDUs from different LC in one TTI)

7.1.7.1.1 Definition and applicability

Applicable for all UEs supporting MAC-i/is.

7.1.7.1.2 Conformance Requirement

From 25.321 clause 9.1.5:

When MAC-i/is is configured, there are two MAC sublayers, MAC-i and MAC-is. MAC-is sits on top of MAC-i and receives PDUs directly from MAC-d. When MAC-i/is is configured, a MAC PDU for E-DCH consists of one MAC-i header and one or more MAC-is PDUs. Each MAC-is PDU consists of one or more MAC-is SDUs belonging to the same logical channel. Each MAC-is SDU equals a complete or a segment of a MAC-d PDU. The MAC-is SDUs can have different sizes. The LCH-ID and L fields are repeated per MAC-is SDU. The TSN and SS fields are repeated per MAC-is PDU. Multiple MAC-is PDUs from multiple logical channels, but only one MAC-i PDU can be transmitted in a TTI. In case sufficient space is left in the E-DCH transport block or if Scheduling Information needs to be transmitted, an SI will be included at the end of the MAC-i PDU (see subclause 9.2.4.2).

[…]

From 25.331 clause 8.6.5.18:

1> if the IE "E-DCH MAC-d flow multiplexing list" is included:

- 2> only multiplex MAC-d PDU's from the E-DCH MAC-d flow indicated in the IE "E-DCH MAC-d flow identity" with MAC-d PDU's from E-DCH MAC-d flows with which multiplexing in the same MAC-e or MAC-i PDU is allowed in accordance to the IE "E-DCH MAC-d flow multiplexing list".

Reference(s)

TS 25.321 clause 9.1.5, TS 25.331 clause 8.6.5.18

7.1.7.1.3 Test purpose

1. To verify that the UE multiplexes data from multiple PDUs from different logical channels in the same TTI

7.1.7.1.4 Method of test

Initial conditions

System Simulator:

1 cells, default parameters, Ciphering Off

User Equipment:

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed with all the parameters as specified in the procedure, with the exception that the default Radio Bearer is replaced with the Radio Bearers according to clause 6.11.4k.4 (FDD) / 6.11.5.4.9.4(1.28Mcps TDD) (Flexible RLC + MAC-i/is + MAC-ehs) using condition A26 (FDD) / A22(1.28Mcps TDD). The MAC-d flows are configured for scheduled transmissions. The following parameters are specific for this test case with the logical channel, transport channel and queue identities set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	6	RB26
8 (LCH2)	3	7	RB27
9 (LCH3)	4	8	RB21
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the test case			

The following parameters are specific for this test case

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99) (FDD)
E-DCH MAC-d flow multiplexing list	Flow 2 = 00101000 Flow 3 = 00010000 Flow 4 = 00101000 See 25.331 10.3.5.1b

The UE is placed into UE test loop mode 1 with the UL SDU size for LCH 1 and LCH2 set to 40 octets.

Test procedure

The UE is configured with three logical channels, LCH1 (with priority 6), LCH2 (with priority 7) and LCH3 (with priority 8). LCH1 is mapped to MAC-d flow 2, LCH2 is mapped to MAC-d flow 3 and LCH3 is mapped to MAC-d flow 4.

a) The SS has not issued any scheduling grants for E-DCH to the UE

b) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH3

c) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH2

d) The SS transmits one SDU of size 40 bytes (plus 1 byte RLC length indicator) on LCH1

e) The SS waits for an SI to be received that indicates that data is available on all three logical channels (can be identified from the content of the SI)

e) The SS issues an absolute grant that allows the UE to send with a high rate (signalling value 10 (FDD only), allowing a rate well above 3 SDUs/TTI)

f) The SS waits until data is received and verifies that data from LCH1 and LCH3 are received in the same TTI and data from LCH2 is received in the next TTI

NOTE: The UE may send an SI after step 1 or step 2 but these SI's would only indicate data on LCH3, LCH2 or LCH2 and LCH3. These will be ignored.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		1 RLC PDU on LCH 3	
2	←		1 RLC PDU on LCH 2	
3	←		1 RLC PDU on LCH 1	
4	→		Potential SI indicating data on LCH3, LCH2 or LCH2 and LCH3	These SI are ignored by the SS
5	→		SI indicating data on LCH 1 LCH 2 and LCH3	This can be verified from the indicated fraction of data on LCH1, LCH2 and LCH3
6	←		Absolute grant allowing UE to transmit on E-DCH	This grant must be sufficiently high to allow a rate corresponding to at least 3 RLC PDUs/TTI, signalling value 10 for FDD
7	→		MAC-i PDU containing 1 RLC PDU on LCH 1 and 1 RLC PDU on LCH 3	Data on LCH1 and LCH2 should be received in the same TTI
8	→		MAC-i PDU containing 1 RLC PDU on LCH 2	Data on LCH2 in the next TTI

Specific Message Contents

None.

7.1.7.1.5 Test requirements

1. After step 3 the SS shall receive an SI indicating that data is available on LCH 1, LCH 2 and LCH3 but no RLC PDUs shall be received

2. In step 7, the SS shall receive 1 RLC PDU on LCH 1 and 1 RLC PDU on LCH 3 in the same TTI

3. In step 8, the SS shall receive 1 RLC PDU on LCH2 in the next TTI

7.1.7.2 MAC-i/is segmentation / Correct Usage of Segmentation Status Field

7.1.7.2.1 Definition and applicability

Applicable for all UEs supporting MAC-i/is.

7.1.7.2.2 Conformance requirement

The transmitting UM RLC entity segments the RLC SDU into UMD PDUs of appropriate size, if the RLC SDU is larger than the length of available space in the UMD PDU. The size of the UMD PDUs after segmentation and/or concatenation shall be smaller than or equal to the largest UL UMD PDU size. If MAC-i/is has been configured and the RLC PDU size is set to "flexible size", the size of the UMD PDUs after segmentation and/or concatenation shall be larger than or equal to the Minimum UL RLC PDU size. If data to be transmitted is not enough to create a UMD PDU of the minimum size, it is allowed to create a UMD PDU including all data to be transmitted, even if the resulting size is smaller than the Minimum UL RLC PDU size. The UMD PDU may contain segmented and/or concatenated RLC SDUs. UMD PDU may also contain padding to ensure that it is of a valid length. Length Indicators are used to define boundaries between RLC SDUs within UMD PDUs unless the "Extension bit" already indicates that a UMD PDU contains exactly one complete SDU. Length Indicators are also used to define whether Padding is included in the UMD PDU.

…

- in uplink, the last segment of an RLC SDU shall be concatenated with the first segment of the next RLC SDU in order to fill the data field at least up to the Minimum UL RLC PDU size. It is allowed to concatenate up to the largest UL AMD PDU size for Acknowledged mode data and largest UMD PDU size for Unacknowledged mode data. The "Length Indicator" field is used to point the borders between RLC SDUs (see subclause 9.2.2.8). If data to be transmitted is not enough to create a UMD PDU of the minimum size, it is allowed to create a UMD PDU including all data to be transmitted, even if the resulting size is smaller than the Minimum UL RLC PDU size.
- in uplink, if MAC-i/is has been configured:
  - if the UE pre-generates RLC PDUs for transmission in a later TTI:
    - provided that the UE has sufficient amount of data available for transmission, the size of the data field of the RLC PDU shall be chosen so that each RLC PDU to be multiplexed to the MAC-i/is PDU matches the maximum amount of data allowed to be transmitted by the applicable current grant (scheduled or non-scheduled) for the current TTI.
    - RLC PDUs may only be pre-generated if the amount of data in outstanding pre-generated RLC PDUs for this logical channel is less than or equal to four times the maximum amount of data allowed to be transmitted by the applicable current grant (scheduled or non-scheduled) for the current TTI.
  - if the UE generates RLC PDUs for transmission in the current TTI:
    - the size of the data field of the RLC PDU shall be chosen so that the RLC PDU size matches the data requested for this logical channel by the current E-TFC selection.

…

There are two different MAC PDU formats for E-DCH. Depending on configuration by upper layers the format is either MAC-e/es or MAC-i/is. The MAC PDU format is determined by upper layer signalling [7].

…

- Segmentation Status (SS):
  The Segmentation Status (SS) field provides indication of the segmentation status of the MAC SDU or segment of MAC SDU belonging to the logical channel identified by the LCH-ID field. The length of the SS field is 2 bits.

Table 9.2.4.3-1: Structure of the SS field

SI Field	Segmentation indication
00	The first MAC-is SDU of the MAC-is PDU is a complete MAC-d PDU. The last MAC-is SDU of the MAC-is PDU is a complete MAC-d PDU.
01	If there are more than one MAC-is SDUs in the MAC-is PDU, the last MAC-is SDU of the MAC-is PDU is a complete MAC-d PDU. The first MAC-is SDU of the MAC-is PDU is the last segment of a MAC-d PDU.
10	If there are more than one MAC-is SDUs in the MAC-is PDU, the first MAC-is SDU of the MAC-is PDU is a complete MAC-d PDU. The last MAC-is SDU of the MAC-is PDU is the first segment of a MAC-d PDU.
11	If there are more than one MAC-is SDUs in the MAC-is PDU, the first MAC-is SDU of the MAC-is PDU is the last segment of a MAC-d PDU and the last MAC-is SDU of MAC-is PDU is the first segment of a MAC-d PDU. If there is only one MAC-is SDU in the MAC-is PDU, the MAC-is SDU is a middle segment of a MAC-d PDU.

[…]

There is one segmentation entity per logical channel in the UE.

When the MAC-d PDU size, the untransmitted part of the MAC-d PDU, the MAC-c PDU size (FDD only) or the untransmitted part of the MAC-c PDU (FDD only) exceeds available space in the transport block according to the E-TFC selection, the segmentation entity shall:

- segment the MAC-d PDU, the untransmitted part of the MAC-d PDU, the MAC-c PDU or the untransmitted part of the MAC-c PDU to fit the available space in the transport block according to the E-TFC selection and store the untransmitted part of the MAC-d PDU or MAC-c PDU;

- set the segmentation status (SS) field of the transmission to indicate the segmentation status as described in subclause 9.2.4.3.

Reference(s)

TS 25.322 clause 4.2.1.2.1, 9.2.2.9

TS 25.321 clauses 9.1.5, 9.2.4.3, 11.8.1.2a

7.1.7.2.3 Test purpose

To test UE is able to segment data at MAC layer and use all 4 SS values in MAC-is header.

7.1.7.2.4 Method of test

Initial conditions

Downlink length indicators of size 15 shall be used

Uplink length indicator of size 15 shall be used

Test procedure

The following parameters are specific for this test case:

Parameter	Value
Minimum UL RLC PDU	1600 bits
Largest UL RLC PDU size	1600 bits
Max_RLC_PDU_size	200 octets
Periodicity for scheduling info	No periodic scheduling info
E-TFCI table	Table 0 for 10 ms TTI (FDD), 5ms TTI E-DCH Transport Block Size Table 0(1.28Mcps TDD)

In this test procedure the UE is configured with one logical channel with Id 7 (LCH1).

a) The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed with all the parameters as specified in the procedure, with the exception that the default Radio Bearer is replaced with the RB according to clause 6.11.4k.2 (FDD) /6.11.5.4.9.2 (1.28Mcps TDD) (UM Flexible RLC + MAC-i/is + MAC-ehs) using condition A27 (FDD) /A23 (1.28Mcps TDD) with RB mapping to HS-DSCH and E-DCH. The MAC-d flow of the RB is configured for scheduled transmissions.

b) The radio bearer is placed into UE test loop mode 1 and configured to return UL RLC SDUs of the same size as received in DL.

c) The SS transmits two RLC SDUs (SDU1, SDU2) of size 40 and 60 octets respectively. The SDUs are concatenated into a single RLC PDU. Length indicators are used to indicate the end of each SDU.

d) The SS waits for an SI to be received that indicates that data is available (can be identified from the content of the SI).

e) The SS issues a scheduled grant that allows the UE to transmit SDU1 and the first segment of the SDU2.

f) UE loops back SDU1 and a segment of SDU2 in first TTI and the remainder of SDU2 in the next TTI.

TSN = 0, SS = 10, for MAC-is header in first TTI, TSN = 1, SS = 01 for MAC-is header in the next TTI.

g) The SS removes the scheduling grant for the UE.

h) The SS transmits three RLC SDUs (SDU3, SDU4, SDU5) of size 20, 30, 10 octets, respectively. The SDUs are concatenated into a single RLC PDU. Length indicators are used to indicate the end of each SDU.

i) The SS waits for an SI to be received that indicates that data is available.

j) The SS issues a scheduled grant that allows the UE to transmit the 3 SDUs.

k) UE loops back SDU3, SDU4, SDU5 in the same TTI.

TSN = 2, SS = 00, for MAC-is header.

l) The SS removes the scheduling grant for the UE.

m) SS transmits one RLC (SDU6) of size 198 octets with no Length Indicator and Alternative E-bit interpretation (bit value 0) in the UM header.

n) The SS waits for an SI to be received that indicates that data is available.

o) The SS issues an absolute grant (grant value 5) which restricts the UE to transmit less than 300 bits per TTI. The current grant is less than the minimum UL RLC PDU size.

p) UE loops back the contents of SDU6 in consecutive MAC-i PDUs.

SS = 10, and MAC-is PDU4 containing first segment of SDU6.

SS = 11, and MAC-is PDUs containing the middle segments of SDU6.

SS = 01, and MAC-is PDU containing the last segment of SDU6.

All MAC-is PDUs should have sequential sequence numbers starting from TSN = 3 for MAC-is PDU4

Expected sequence

Step	Direction UE SS	Message	Comments
1		RB ESTABLISHMENT	See generic procedures
2		Close UE test loop	
3	←	DOWNLINK RLC SDUs (SDU1, SDU2)	SDU1 = 40 octets, SDU2 = 60 octets
4	→	SI indicating data	
5	←	Absolute grant allowing the UE to transmit SDU1 and a segment of SDU2	Grant value 4 for FDD
6	→	MAC-is PDU1, TSN = 0	TSN = 0, SS = 10 MAC-is PDU consisting of SDU1 and the first segment of SDU2
7	→	MAC-is PDU2, TSN = 1	TSN = 1, SS = 01 MAC-is PDU consisting of last segment of SDU2
8	←	Removal of absolute grant	Signalling value 1 (FDD only)
9	←	DOWNLINK RLC SDUs (SDU3, SDU4, SDU5)	SDU3 size = 20, SDU4 size = 30, SDU5 size = 10
10	→	SI indicating data	
11	←	Absolute grant of sufficient value to allow the UE to transmit SDU3, SDU4 and SDU5	Grant value 10 for FDD
12	→	MAC-is PDU3, TSN = 2	TSN=2, SS=00, MAC-is PDU consisting of SDU3, SDU4, SDU5.
	←	Removal of absolute grant	Signalling value 1 (FDD only)
13	←	DOWNLINK RLC SDU6	DL RLC SDU size = 198 Octets
14	→	SI indicating data	
15	←	Absolute grant allowing the UE to transmit segments of SDU6.	Grant value 5 for FDD The current grant is less than the minimum UL PDU size
16	→	UPLINK MACis PDUs	TSN = 3, SS = 10 for MAC-is PDU 4 contains first segment of SDU6. The last MAC-is PDU contains the final segment of SDU6, SS = 01. The other MAC-is PDUs contain the middle segments of SDU6, SS = 11.
17		Open UE test loop	
18		RB release	

7.1.7.2.5 Test requirements

a) In step 6, UE loop backs RLC SDU1 and first segment of RLC SDU2 in MAC-i PDU.

b) In step 7, UE loop backs the final segment of RLC SDU2 in MAC-i PDU.

c) In step 12, UE loops back RLC SDU3, SDU4, SDU5 in a single MAC-i PDU.

d) In step 16, UE loops back RLC SDU6 in several TTIs. In the first MAC-i PDU has SS = 10, containing the first segment of SDU6, the succeeding MAC-i PDUs contain the middle segments of SDU6, SS = 11 and the final MAC-i PDU contains the final segment of SDU6, SS = 01.

7.1.7.3 Correct settings of MAC-i/is header fields

7.1.7.3.1 Definition and applicability

Applicable for all UEs supporting MAC-i/is

7.1.7.3.2 Conformance requirement

Extract from 25.321:

[…]

When MAC-i/is is configured, there are two MAC sublayers, MAC-i and MAC-is. MAC-is sits on top of MAC-i and receives PDUs directly from MAC-d and MAC-c (FDD and 1.28 Mcps TDD only). When MAC-i/is is configured, a MAC PDU for E-DCH consists of one MAC-i header and one or more MAC-is PDUs. Each MAC-is PDU consists of one or more MAC-is SDUs belonging to the same logical channel. Each MAC-is SDU equals a complete or a segment of a MAC-d PDU or a MAC-c PDU (FDD and 1.28 Mcps TDD only). The MAC-is SDUs can have different sizes. The LCH-ID and L fields are repeated per MAC-is SDU. The TSN and SS fields are repeated per MAC-is PDU. Multiple MAC-is PDUs from multiple logical channels, but only one MAC-i PDU can be transmitted in a TTI. In case sufficient space is left in the E-DCH transport block or if Scheduling Information needs to be transmitted, an SI will be included at the end of the MAC-i PDU (see Figure 9.1.5.4a).

[…]

- Transmission Sequence Number (TSN):
  The TSN field provides the transmission sequence number for the MAC-is PDU. This information is used for reordering purposes to support in-sequence delivery to higher layers. The length of the TSN field is 6 bits.

- Segmentation Status (SS):
  The Segmentation Status (SS) field provides indication of the segmentation status of the MAC SDU or segment of MAC SDU belonging to the logical channel identified by the LCH-ID field. The length of the SS field is 2 bits.

[…]

- Length (L):
  The L field provides the length of the MAC-is SDU in octets. The size can vary for each SDU in the MAC-is PDU, and is set for each SDU individually. The length of the Length field is 11 bits.

- Logical channel identifier (LCH-ID):
  The LCH-ID field provides identification of the logical channel at the receiver and the re-ordering buffer destination of a MAC-is SDU. In FDD, one LCH-ID value is reserved to indicate that the UE's E-RNTI is included in the MAC-i header. The length of the LCH-ID is 4 bits.

Table 9.2.4.4-1: Structure of the LCH-ID field (FDD only)

LCH-ID Field	Designation
0000	Logical channel 1
0001	Logical channel 2
…	…
1101	Logical channel 14
1110	Identification of CCCH (SRB0)
1111	Identification of E-RNTI being included.

Table 9.2.4.4-2: Structure of the LCH-ID field (1.28 Mcps TDD only)

LCH-ID Field	Designation
0000	Logical channel 1
0001	Logical channel 2
…	…
1101	Logical channel 14
1110	Identification of CCCH (SRB0)
1111	Reserved

- Flag (F):
  The F field is a flag indicating if more fields are present in the MAC-i header or not. If the F field is set to "0" the F field is followed by an additional set of LCH-ID, L and F fields. If the F field is set to "1" the F field is followed by a MAC-is PDU. Each header extension corresponds to one MAC-is SDU.

Reference(s)

TS 25.321 clauses 9.1.5, 9.2.4.3, 9.2.4.4

7.1.7.3.3 Test purpose

The purpose of this test case is to verify that the UE sets the MAC-i/is header fields in the correct way for multiple logical channels on multiple flows mapped onto a single MAC-i PDU.

7.1.7.3.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4k.4 (FDD) / 6.11.5.4.9.4(1.28Mcps TDD) using condition A26 (FDD) /A22 (1.28Mcps TDD) in UM as specified in clause 9.1 of TS 34.108. The logical channel, transport channel and queue identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	6	RB26
8 (LCH2)	3	7	RB27
9 (LCH3)	4	8	RB21
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the testcase			

The following parameters are specific for this test case:

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99) (FDD)
E-DCH MAC-d flow multiplexing list	11111111 (See 25.331 10.3.5.1b) Note 1
Largest UL RLC PDU size	20 bytes (Note 2)
Note 1: This configuration means that all MAC-d flows can be multiplexed in the same TTI Note 2: The actual value is (IE value * 8) + 16	

The UE is placed into UE test loop mode 1 and the loopback is configured to return UL RLC SDUs of the same size as received the received DL RLC SDU for each radio bearer.

Test procedure

The UE is configured with three logical channels, LCH1 (with priority 6), LCH2 (with priority 7) and LCH3 (with priority 8). LCH1 is mapped to MAC-d flow 2, LCH2 is mapped to MAC-d flow 3 and LCH3 is mapped to MAC-d flow 4.

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS transmits 4 SDUs of sizes 20, 60, 30, 40 bytes on LCH2 in the same TTI

c) The SS waits for an SI indicating data on LCH2

d) The SS issues an absolute grant that allows the UE to send with a high rate (signalling value 10, allowing rates well above 4 SDUs/TTI)

e) The SS waits until data is received and checks the values of the header parameters

f) The SS removes the scheduling grant for E-DCH for the UE

g) The SS transmits three SDUs of size 40, 30, 40 bytes respectively on LCH3 in the same TTI

h) The SS transmits two SDU of size 20, 15 bytes respectively on LCH2 in the same TTI

i) The SS transmits one SDU of size 50 bytes on LCH1

j) The SS waits for SI indicating data on the 3 logical channels

k) The SS issues an absolute grant that allows the UE to send with a high rate (signalling value 10, allowing rates well above 6 SDUs/TTI)

l) The SS waits until data is received and checks the values of the header parameters

m) The SS removes the scheduling grant for E-DCH for the UE

n) The SS transmits two SDUs of size 40 bytes, on LCH2 in the same TTI

o) The SS waits for SI indicating data on LCH2

p) The SS issues an absolute grant that allows the UE to send with a high rate (signalling value 10, allowing rates well above 2 SDUs/TTI)

q) The SS waits until data is received and checks the values of the header parameters

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	4 RLC SDUs on LCH 2 with sizes 20, 60, 30, 40 bytes respectively in the same TTI	
2	→	SI indicating data on LCH 2	
3	←	Absolute grant allowing UE to transmit on E-DCH	This grant must be sufficiently high to allow a rate corresponding to at least 4 RLC PDUs/TTI, signalling value 10 for FDD
4	→	1 MAC-is PDU containing 8 RLC PDUs on LCH 2	SS checks header fields
5	←	Removal of scheduling grant for UE	Grant value 1 (FDD only)
6	←	3 RLC SDUs on LCH 3, size 40, 30, 40 bytes respectively	Data sent in the same TTI
7	←	2 RLC SDUs on LCH 2, size 20 and 15 bytes respectively	Data sent in the same TTI
8	←	1 RLC SDUs on LCH 1, size 50 byes	
9	→	Potential SI indicating data on LCH 3, LCH2, LCH1 or any combination	SS waits for SI indicating data on all logical channels
10	←	Absolute grant allowing UE to transmit on E-DCH	This grant must be sufficiently high to allow a rate corresponding to at least 6 RLC PDUs/TTI, signalling value 10
11	→	3 MAC-is PDUs containing 3 RLC PDUs on LCH 1, 2 RLC PDUs on LCH 2 and 6 RLC PDUs on LCH3 respectively	SS checks header fields
12	←	Removal of scheduling grant for UE	Grant value 1 (FDD only)
13	←	2 RLC SDUs on LCH 2, size 40 bytes each	Data sent in the same TTI
14	→	SI indicating data on LCH 2	
15	←	Absolute grant allowing UE to transmit on E-DCH	This grant must be sufficiently high to allow a rate corresponding to at least 2 RLC PDUs/TTI, signalling value 10 for FDD
16	→	1 MAC-is PDU containing 4 RLC PDUs on LCH 2	SS checks header fields

Specific Message Contents

None

7.1.7.3.5 Test requirements

1. After step 4, the SS shall receive 1 MAC-is PDU shall be received where:

 - For MAC-is header content,, TSN = 0, SS = 00

 - The content of MAC-i headers received shall be set to :

LCH-ID = 0111'B, L = 22'D, F = 0 header for MAC-is SDU1

LCH-ID = 0111'B, L = 22'D, F = 0 header for MAC-is SDU2

LCH-ID = 0111'B, L = 22'D, F = 0 header for MAC-is SDU3

LCH-ID = 0111'B, L = 22'D, F = 1 header for MAC-is SDU4

LCH-ID = 0111'B, L = 22'D, F = 0 header for MAC-is SDU5

LCH-ID = 0111'B, L = 22'D, F = 0 header for MAC-is SDU6

LCH-ID = 0111'B, L = 22'D, F = 0 header for MAC-is SDU7

LCH-ID = 0111'B, L = 12'D, F = 1 header for MAC-is SDU8

2. After step 11, the SS shall receive 3 MAC-is PDUs where:

- For MAC-is PDU1:

  TSN = 0, SS = 00, for The Content of MAC-I Header received shall be set to

  LCH-ID = 0110'B, L = 22'D, F = 0

  LCH-ID = 0110'B, L = 22'D, F = 0

  LCH-ID = 0110'B, L = 12'D, F = 1

- FOR MAC-is PDU2

  TSN = 1, SS = 00, the content of MAC-i headers received shall be set to :

  LCH-ID = 0111'B, L = 22'D, F = 0

  LCH-ID = 0111'B, L = 17'D, F = 1

- FOR MAC-is PDU3

  TSN = 0, SS = 00, the content of MAC-i headers received shall be set to :

  LCH-ID = 1000'B, L = 22'D, F = 0

  LCH-ID = 1000'B, L = 22'D, F = 0

  LCH-ID = 1000'B, L = 22'D, F = 0

  LCH-ID = 1000'B, L = 22'D, F = 0

  LCH-ID = 1000'B, L = 22'D, F = 0

  LCH-ID = 1000'B, L = 12'D, F = 1

3. After step 16, the SS shall receive 1 MAC-is PDU where:

- The TSN is set to 2, SS = 00, the content of MAC-i headers received shall be set to :

  LCH-ID = 0111'B , L = 22'D, F = 0

  LCH-ID = 0111'B , L = 22'D, F = 0

  LCH-ID = 0111'B , L = 22'D, F = 0

  LCH-ID = 0111'B , L = 22'D, F = 1

7.1.7.4 MAC-is/i transport block size selection/ UL QPSK

7.1.7.4.1 Definition and applicability

Applicable for all UEs supporting MAC-i/is.

7.1.7.4.2 Conformance requirement

Extract from TS 25.321 clause 11.8.1.4

The transmission format and data allocation shall follow the requirements below:

- Only E-TFCs from the configured E-TFCS shall be considered for the transmission;

[…]

- The UE shall not use the following E-TFCIs;
  - If the UE is configured with E-TFCI table 0 (see [7]) and 2ms TTI, it shall not use E-TFCI 120 in the mapping defined in Annex B.1
  - If the UE is configured with E-TFCI table 1 (see [7]) and 2ms TTI, it shall not use E-TFCI 115 in the mapping defined in Annex B.2
  - If the UE is configured with E-TFCI table 2 (see [7]) and 2ms TTI, it shall not use E-TFCI 121 in the mapping defined in Annex B.2a
  - If the UE is configured with E-TFCI table 3 (see [7]) and 2ms TTI, it shall not use E-TFCIs 101 and 102 in the mapping defined in Annex B.2b

[…]

[…]

Extract from TS 25.321 clause 9.2.5.4

[…]

RRC can configure the MAC-e or MAC-i to use one of two Transport block size sets for the 10ms TTI duration and one of four Transport block size sets for the 2ms TTI duration. The normative description of the mapping between the E-TFCI and the corresponding transport block size is provided in Annex B:

- If the UE is configured with E-TFCI table 0 (see [7]) and 2ms TTI, it shall use the mapping defined in Annex B.1
- If the UE is configured with E-TFCI table 1 (see [7]) and 2ms TTI, it shall use the mapping defined in Annex B.2
- If the UE is configured with E-TFCI table 2 (see [7]) and 2ms TTI, it shall use the mapping defined in Annex B.2a
- If the UE is configured with E-TFCI table 3 (see [7]) and 2ms TTI, it shall use the mapping defined in Annex B.2b
- If the UE is configured with E-TFCI table 0 (see [7]) and 10ms TTI, it shall use the mapping defined in Annex B.3
- If the UE is configured with E-TFCI table 1 (see [7]) and 10ms TTI, it shall use the mapping defined in Annex B.4

[…]

Reference(s)

TS 25.321 clause 11.8.1.4, 9.2.5.4

7.1.7.4.3 Test purpose

To verify that the UE is able to transmit all possible transport block sizes when MAC-i/is is configured and within the UE capability.

7.1.7.4.4 Method of test

NOTE: The reference to E-DCH Category refers to the UE capability as signalled in the Rel-6 IE "E-DCH physical layer category". All UEs supporting E-DCH should signal a category between 1 and 6 for this IE even if the UE physical capability category is above 6.

NOTE: The reference to HS-DSCH Categories refers to the UE capability as signalled in the Rel-5 IE "HS-DSCH physical layer category" (1 to 12). All UEs supporting HS-DSCH should signal a category between 1 and 12 for this IE even if the UE physical capability category is above 12. This IE corresponds to the HS-DSCH category supported by the UE when MAC-ehs is not configured.

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

UE in idle mode

The following parameters are specific for this test case:

Common for all UE HS-DSCH categories:

Parameter	Value
MAC-d PDU size	336 bits
MAC-ehs receiver window size	16
Number of HARQ processes	1
Number of reordering queues	1

Common for all UE E-DCH categories:

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99)

Specific depending on E-DCH category:

Parameter	E-DCH Category	Value
RLC Transmission window size	1 to 5	512
	6	1536
E-TFCI table	1 to 6	See table 7.1.6.3.2.5

Specific depending on HS-DSCH category:

Parameter	HS-DSCH Category	Value
RLC Receiving window size	1 to 6	512
	7 and 8	1536
	9 and 10	2047
	11 and 12	1024

Definition of test variables:

$I_{E\text{-}TFCI}$	Index value used by SS to lock up the TB size used for the different test points

The mapping between the chosen E-TFC index and the corresponding E-DCH transport block size is given in the following tables:

Table 7.1.7.4.1: Test points for 2ms TTI E-DCH Transport Block Size Table 0

I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)
0	18	30	342	60	1015	90	3008	120	8913 Note
1	120	31	355	61	1053	91	3119	121	9241
2	124	32	368	62	1091	92	3234	122	9582
3	129	33	382	63	1132	93	3353	123	9935
4	133	34	396	64	1173	94	3477	124	10302
5	138	35	410	65	1217	95	3605	125	10681
6	143	36	426	66	1262	96	3738	126	11075
7	149	37	441	67	1308	97	3876	127	11484
8	154	38	458	68	1356	98	4019		
9	160	39	474	69	1406	99	4167		
10	166	40	492	70	1458	100	4321		
11	172	41	510	71	1512	101	4480		
12	178	42	529	72	1568	102	4645		
13	185	43	548	73	1626	103	4816		
14	192	44	569	74	1685	104	4994		
15	199	45	590	75	1748	105	5178		
16	206	46	611	76	1812	106	5369		
17	214	47	634	77	1879	107	5567		
18	222	48	657	78	1948	108	5772		
19	230	49	682	79	2020	109	5985		
20	238	50	707	80	2094	110	6206		
21	247	51	733	81	2172	111	6435		
22	256	52	760	82	2252	112	6672		
23	266	53	788	83	2335	113	6918		
24	275	54	817	84	2421	114	7173		
25	286	55	847	85	2510	115	7437		
26	296	56	878	86	2603	116	7711		
27	307	57	911	87	2699	117	7996		
28	318	58	944	88	2798	118	8290		
29	330	59	979	89	2901	119	8596		

Note: E-TFCI index 120 shall not be used by the UE (see TS 25.321 clause 11.8.1.4). The reason to include this test point is to verify that UE comply to this requirement and is not using E-TFCI index value 120.

Table 7.1.7.4.2: Test points for 2ms TTI E-DCH Transport Block Size Table 1

I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)
0	18	43	2724	86	7252
1	186	44	2742	87	7288
2	204	45	3042	88	7428
3	354	46	3060	89	7464
4	372	47	3078	90	7764
5	522	48	3298	91	7800
6	540	49	3316	92	7908
7	674	50	3334	93	7944
8	690	51	3378	94	8100
9	708	52	3396	95	8136
10	726	53	3414	96	8436
11	858	54	3732	97	8472
12	876	55	3750	98	8564
13	1026	56	3972	99	8600
14	1044	57	3990	100	8772
15	1062	58	4068	101	8808
16	1194	59	4086	102	9108
17	1212	60	4404	103	9144
18	1330	61	4422	104	9220
19	1348	62	4628	105	9256
20	1362	63	4646	106	9444
21	1380	64	4740	107	9480
22	1398	65	4758	108	9780
23	1530	66	5076	109	9816
24	1548	67	5094	110	9876
25	1698	68	5284	111	9912
26	1716	69	5302	112	10116
27	1734	70	5412	113	10152
28	1866	71	5430	114	10452
29	1884	72	5748	115	10488 Note
30	1986	73	5766	116	10532
31	2004	74	5940	117	10568
32	2022	75	5958	118	10788
33	2034	76	6084	119	10824
34	2052	77	6102	120	11124
35	2070	78	6420	121	11178
36	2370	79	6438	122	11188
37	2388	80	6596	123	11242
38	2406	81	6614	124	11460
39	2642	82	6756	125	11478
40	2660	83	6774		
41	2678	84	7092		
42	2706	85	7110		

Note: E-TFCI index 115 shall not be used by the UE (see TS 25.321 clause 11.8.1.4). The reason to include this test point is to verify that UE comply to this requirement and is not using E-TFCI index value 115.

Table 7.1.7.4.3: Test points for 10ms TTI E-DCH Transport Block Size Table 0

I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)
0	18	30	389	60	1316	90	4452	120	15051
1	120	31	405	61	1371	91	4636	121	15675
2	124	32	422	62	1428	92	4828	122	16325
3	130	33	440	63	1487	93	5029	123	17001
4	135	34	458	64	1549	94	5237	124	17706
5	141	35	477	65	1613	95	5454	125	18440
6	147	36	497	66	1680	96	5680	126	19204
7	153	37	517	67	1749	97	5915	127	20000
8	159	38	539	68	1822	98	6161		
9	166	39	561	69	1897	99	6416		
10	172	40	584	70	1976	100	6682		
11	180	41	608	71	2058	101	6959		
12	187	42	634	72	2143	102	7247		
13	195	43	660	73	2232	103	7547		
14	203	44	687	74	2325	104	7860		
15	211	45	716	75	2421	105	8186		
16	220	46	745	76	2521	106	8525		
17	229	47	776	77	2626	107	8878		
18	239	48	809	78	2735	108	9246		
19	249	49	842	79	2848	109	9629		
20	259	50	877	80	2966	110	10028		
21	270	51	913	81	3089	111	10444		
22	281	52	951	82	3217	112	10877		
23	293	53	991	83	3350	113	11328		
24	305	54	1032	84	3489	114	11797		
25	317	55	1074	85	3634	115	12286		
26	331	56	1119	86	3784	116	12795		
27	344	57	1165	87	3941	117	13325		
28	359	58	1214	88	4105	118	13877		
29	374	59	1264	89	4275	119	14453		

Table 7.1.7.4.4: Test points for 10ms TTI E-DCH Transport Block Size Table 1

I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)
0	18	41	5076	82	11850
1	186	42	5094	83	12132
2	204	43	5412	84	12186
3	354	44	5430	85	12468
4	372	45	5748	86	12522
5	522	46	5766	87	12804
6	540	47	6084	88	12858
7	690	48	6102	89	13140
8	708	49	6420	90	13194
9	858	50	6438	91	13476
10	876	51	6756	92	13530
11	1026	52	6774	93	13812
12	1044	53	7092	94	13866
13	1194	54	7110	95	14148
14	1212	55	7428	96	14202
15	1362	56	7464	97	14484

16	1380	57	7764	98	14556
17	1530	58	7800	99	14820
18	1548	59	8100	100	14892
19	1698	60	8136	101	15156
20	1716	61	8436	102	15228
21	1866	62	8472	103	15492
22	1884	63	8772	104	15564
23	2034	64	8808	105	15828
24	2052	65	9108	106	15900
25	2370	66	9144	107	16164
26	2388	67	9444	108	16236
27	2706	68	9480	109	16500
28	2724	69	9780	110	16572
29	3042	70	9816	111	17172
30	3060	71	10116	112	17244
31	3378	72	10152	113	17844
32	3396	73	10452	114	17916
33	3732	74	10488	115	18516
34	3750	75	10788	116	18606
35	4068	76	10824	117	19188
36	4086	77	11124	118	19278
37	4404	78	11178	119	19860
38	4422	79	11460	120	19950
39	4740	80	11514		
40	4758	81	11796		

Table 7.1.7.4.5: Applicable E-TFS indexes for sub-tests 1 to 4 and UE E-DCH categories 1 to 6.

			Applicable E-TFS indexes					
Sub-test	**E-DCH TTI**	**E-DCH Transport Block Size Table**	**Category 1**	**Category 2**	**Category 3**	**Category 4**	**Category 5**	**Category 6**
1	10ms	10ms TTI Table 0, Table 7.1.7.4.3	1..101	1..119	1..119	1..127	1..127	1..127
2	10ms	10ms TTI Table 1, Table 7.1.7.4.4	1..54	1..99	1..99	1..120	1..120	1..120
3	2ms	2ms TTI Table 0, Table 7.1.7.4.1	N/A	1..88	N/A	1..108	N/A	1..127
4	2ms	2ms TTI Table 1, Table 7.1.7.4.2	N/A	1..44	N/A	1..73	N/A	1..125
NOTE 1: Applicable indexes depends on the UE capability of "Maximum number of bits of an E-DCH transport block transmitted within a 10 ms E-DCH TTI" and "Maximum number of bits of an E-DCH transport block transmitted within a 2 ms E-DCH TTI" as specified in TS 25.306 clause 5 and Table 5.1g. E-TFCI index=0 not tested as TB size for this E-TFCI value is 18 bits, which would only fit the MAC-i/is header used by the SS in the test procedure 1. NOTE 2: For E-DCH categories beyond 6, E-TFS indices for category 6 are applicable.								

Table 7.1.7.4.6: E-TFCI values causing degradation due to turbo coder irregularities

E-DCH Transport Block Size Tables	E-TFCI	Reference
2 ms TTI, Table 0	120	[6], Annex B.1
2 ms TTI, Table 1	115	[6], Annex B.2

Test procedure

The following test specs shall be executed for each applicable sub-test in Table 7.1.7.4.5:

a) The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4k.2 (UM, Flexible RLC + MAC-i/is + MAC-ehs) using conditions A27 as specified in clause 9.1 of TS 34.108. See Note 1.

b) The SS closes the test loop using UE test loop mode 1 and configuring the UL RLC SDU size to be equal to the received DL SDU size (i.e. not setting the UL RLC SDU size parameter).

c) The SS sets $I_{E\text{-}TFCI}$ =1.

d) The SS look up the TB Size based on the $I_{E\text{-}TFCI}$ value in the table used for the sub-test according to Table 7.1.7.4.5.

e) The SS removes the scheduling grant for E-DCH for the UE.

f) If the transport block size TB_{size} is >12040 bits then SS creates 2 DL RLC SDUs of size 8*FLOOR ((TB_{size} – 56 bit)/16) (largest possible RLC SDU size considering octet alignment and MAC-i/is and minimum RLC UM headers). If the transport block size TB_{size} is ≤ 12040 bits the SS creates 1 DL RLC SDUs of size 8*FLOOR((TB_{size} – 32 bit)/8). The SS creates a DL RLC PDU for each DL RLC SDU using Alternative E-bit interpretation ('0') in the RLC PDU header and transmits in downlink. See note 2.

g) The SS waits for an SI to be received that indicates that there is data available for transmission (can be identified from the content of the SI). The SS checks that TEBS have the correct values. See Note 3.

h) The SS issues an absolute grant that allows the UE to send at maximum bit rate (signalling value 31)

i) The SS waits until data is received and verifies that the looped back SDU data has the correct content and is sent in the same TTI.

j) The SS verifies that the received E-TFC used by the UE is correct. The SS checks that the UE has not used the transport block sizes correspondent to the E-TFCI values as listed in table 7.1.7.4.6, but instead used the transport block size correspondent to the next possible larger E-TFCI value.

k) The SS increments the $I_{E\text{-}TFCI}$ by 1. If the $I_{E\text{-}TFCI}$ value is less than maximum value for the actual sub-test and UE category according to Table 7.1.7.4.5 then continue with step d else continue with step l.

l) The SS opens the UE test loop.

m) The SS release the radio bearer.

n) The SS may optionally deactivate the radio bearer test mode.

NOTE 1: The SS configures the physical channel parameters according to the actual UE category under test.

NOTE 2: The test data for DTCHs mapped on HS-DSCH is divided into 2 RLC SDUs to keep the maximum SDU size below or equal to 1500 octets (1500 octets is the limit of QoS parameter "Max SDU size" in SM). To allow for testing of the smallest TB sizes a single RLC PDU is used when the TB size is equal or below 12032 bits to reduce the L2 header overhead. 12032 bits corresponds to maximum RLC SDU size of 1500 octets (12000 bits) plus MAC-i/is header size of 24 bits and UMD PDU header size (8 bits).

The SS is using one RLC PDU per RLC SDU. The RLC SDU size is calculated as:
RLC SDU size = 8*FLOOR((TBsize - MAC-i/is header size)/N - UMD PDU header size)/8
= 8*FLOOR((TBsize – 24 - (N-1)*16)/N – 8)/8 bits.

For N=1 this gives RLC SDU size = 8*FLOOR(TB size – 32)/8 bits.
For N=2 this gives RLC SDU size = 8*FLOOR(TB size – 56)/16 bits

NOTE 3: The SS calculates the TEBS value using the E-TFC TB size determined by the E-TFCI value tested according to 25.321 Table 9.2.5.3.2-1.

Expected sequence

The expected sequence is repeated for each applicable sub-test in Table 7.1.7.4.5:

Step	Direction UE SS	Message	Comments
1	<--	SYSTEM INFORMATION (BCCH)	Broadcast
2	<--	PAGING TYPE 1 (PCCH)	Paging (PS domain, P-TMSI)
3	-->	RRC CONNECTION REQUEST (CCCH)	RRC
4	<--	RRC CONNECTION SETUP (CCCH)	RRC
5	-->	RRC CONNECTION SETUP COMPLETE (DCCH)	RRC
6	-->	SERVICE REQUEST (DCCH)	GMM
7	<--	SECURITY MODE COMMAND	RRC see note 1
8	-->	SECURITY MODE COMPLETE	RRC see note 1
9	<--	ACTIVATE RB TEST MODE (DCCH)	TC
10	-->	ACTIVATE RB TEST MODE COMPLETE (DCCH)	TC
11	<--	RADIO BEARER SETUP (DCCH)	RRC. For the PS radio bearer the 'pdcp info' IE shall be omitted.
12	-->	RADIO BEARER SETUP COMPLETE (DCCH)	RRC
13	<--	CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 with no "LB Setup RB IE#k" parameter set (UE shall return an UL RLC SDU with the same size as the received RLC SDU in downlink)
14	-->	CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
15	SS		The SS sets $I_{E\text{-}TFCI}$ = 1 and look up the transport block size from the relevant Transport Block Size Table for the sub-test.
16	←	Removal of absolute grant	Signalling value 1
17	<--	DOWNLINK RLC SDU(s)	The SS creates and transmit one or 2 RLC SDUs. The number of RLC SDUs and their size depends on TB size under test.
18	→	SI indicating data for transmission	This can be verified from the indicated Total E-DCH Buffer Status (TEBS)
19	<--	Absolute grant allowing the UE to transmit at maximum bit rate.	Signalling value 31
20	-->	UPLINK RLC SDU(s)	The SS checks E-TFC from the UE and checks that the content of the received UL RLC SDU(s) are correct and sent in the same TTI. The SS checks that the UE has not used the transport block sizes correspondent to the E-TFCI values as listed in table 7.1.7.4.6, but instead used the transport block size correspondent to the next possible larger E-TFCI value.
21	SS		The SS increments $I_{E\text{-}TFCI}$ by 1 and look up transport block size from the relevant Transport Block Size Table for the sub-test. If E-TFC TB size is supported by the E-DCH category then repeat steps 16 to 21 else continue with step 22.
22	<--	OPEN UE TEST LOOP (DCCH)	TC
23	-->	OPEN UE TEST LOOP COMPLETE (DCCH)	TC
24		RB RELEASE	RRC
25	<--	DEACTIVATE RB TEST MODE	TC Optional step
26	-->	DEACTIVATE RB TEST MODE COMPLETE	TC Optional step
Note 1: In addition to activate integrity protection Step 7 and Step 8 are inserted in order to stop T3317 timer in the UE, which starts after transmitting SERVICE REQUEST message.			

7.1.7.4.5 Test requirements

1. In step 20, the SS verifies that the received E-TFC has the correct size. The SS checks that the UE has not used the transport block sizes correspondent to the E-TFCI values as listed in table 7.1.7.4.6, but instead used the transport block size correspondent to the next possible larger E-TFCI value.

2. In step 20, the SS shall receive the RLC SDUs in the same TTI and with the same content as sent in downlink.

7.1.7.5 MAC-is/i transport block size selection/ UL 16QAM

7.1.7.5.1 Definition and applicability

Applicable for all UEs supporting MAC-i/is and UL 16QAM.

7.1.7.5.1 Conformance requirement

Extract from TS 25.321 clause 11.8.1.4

The transmission format and data allocation shall follow the requirements below:

- Only E-TFCs from the configured E-TFCS shall be considered for the transmission;

[…]

- The UE shall not use the following E-TFCIs;
  - If the UE is configured with E-TFCI table 0 (see [7]) and 2ms TTI, it shall not use E-TFCI 120 in the mapping defined in Annex B.1
  - If the UE is configured with E-TFCI table 1 (see [7]) and 2ms TTI, it shall not use E-TFCI 115 in the mapping defined in Annex B.2
  - If the UE is configured with E-TFCI table 2 (see [7]) and 2ms TTI, it shall not use E-TFCI 121 in the mapping defined in Annex B.2a
  - If the UE is configured with E-TFCI table 3 (see [7]) and 2ms TTI, it shall not use E-TFCIs 101 and 102 in the mapping defined in Annex B.2b

[…]

[…]

Extract from TS 25.321 clause 9.2.5.4

[…]

RRC can configure the MAC-e or MAC-i to use one of two Transport block size sets for the 10ms TTI duration and one of four Transport block size sets for the 2ms TTI duration. The normative description of the mapping between the E-TFCI and the corresponding transport block size is provided in Annex B:

- If the UE is configured with E-TFCI table 0 (see [7]) and 2ms TTI, it shall use the mapping defined in Annex B.1
- If the UE is configured with E-TFCI table 1 (see [7]) and 2ms TTI, it shall use the mapping defined in Annex B.2
- If the UE is configured with E-TFCI table 2 (see [7]) and 2ms TTI, it shall use the mapping defined in Annex B.2a
- If the UE is configured with E-TFCI table 3 (see [7]) and 2ms TTI, it shall use the mapping defined in Annex B.2b
- If the UE is configured with E-TFCI table 0 (see [7]) and 10ms TTI, it shall use the mapping defined in Annex B.3
- If the UE is configured with E-TFCI table 1 (see [7]) and 10ms TTI, it shall use the mapping defined in Annex B.4

[…]

Reference(s)

TS 25.321 clause 11.8.1.4, 9.2.5.4

7.1.7.5.3 Test purpose

To verify that the UE is able to transmit all possible transport block sizes when 16QAM uplink and MAC-i/is is configured.

7.1.7.5.4 Method of test

NOTE: The reference to E-DCH Category refers to the UE capability as signalled in the Rel-7 IE "E-DCH physical layer category extension".

NOTE: The reference to HS-DSCH Categories refers to the UE capability as signalled in the Rel-5 IE "HS-DSCH physical layer category" (1 to 12). All UEs supporting HS-DSCH should signal a category between 1 and 12 for this IE even if the UE physical capability category is above 12. This IE corresponds to the HS-DSCH category supported by the UE when MAC-ehs is not configured.

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

UE in idle mode

The following parameters are specific for this test case:

Common for all UE HS-DSCH categories:

Parameter	Value
MAC-d PDU size	336 bits
MAC-ehs receiver window size	16
Number of HARQ processes	1
Number of reordering queues	1

Common for all UE E-DCH categories:

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99)
RLC Poll Timer	1000ms
RLC Reset Timer	1000ms

Specific depending on E-DCH category:

Parameter	E-DCH Category	Value
RLC Transmission window size	**7**	**1536**
E-TFCI table	**7**	**See table 7.1.5.1.3**

Specific depending on HS-DSCH category:

Parameter	HS-DSCH Category	Value
RLC Receiving window size	1 to 6	512
	7 and 8	1536
	9 and 10	2047
	11 and 12	1024

Definition of test variables:

I_{E-TFCI}	Index value used by SS to lock up the TB size used for the different test points

The mapping between the chosen E-TFC index and the corresponding E-DCH transport block size is given in the following tables:

Table 7.1.7.5.1: Test points for 2ms TTI E-DCH Transport Block Size Table 2

I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)
0	18	30	402	60	1405	90	4913	120	17173
1	120	31	419	61	1465	91	5122	121	17904 Note
2	125	32	437	62	1528	92	5341	122	18667
3	130	33	455	63	1593	93	5568	123	19462
4	135	34	475	64	1661	94	5805	124	20291
5	141	35	495	65	1731	95	6053	125	21155
6	147	36	516	66	1805	96	6310	126	22056
7	154	37	538	67	1882	97	6579	127	22995
8	160	38	561	68	1962	98	6859		
9	167	39	585	69	2046	99	7152		
10	174	40	610	70	2133	100	7456		
11	182	41	636	71	2224	101	7774		
12	189	42	663	72	2319	102	8105		
13	197	43	691	73	2417	103	8450		
14	206	44	721	74	2520	104	8810		
15	215	45	752	75	2628	105	9185		
16	224	46	784	76	2740	106	9577		
17	233	47	817	77	2856	107	9985		
18	243	48	852	78	2978	108	10410		
19	254	49	888	79	3105	109	10853		
20	265	50	926	80	3237	110	11316		
21	276	51	965	81	3375	111	11798		
22	288	52	1007	82	3519	112	12300		
23	300	53	1049	83	3669	113	12824		
24	313	54	1094	84	3825	114	13370		
25	326	55	1141	85	3988	115	13940		
26	340	56	1189	86	4158	116	14534		
27	354	57	1240	87	4335	117	15153		
28	370	58	1293	88	4520	118	15798		
29	385	59	1348	89	4712	119	16471		
Note: E-TFCI index 121 shall not be used by the UE (see TS 25.321 clause 11.8.1.4). The reason to include this test point is to verify that UE comply to this requirement and is not using E-TFCI index value 121.									

Table 7.1.7.5.2: Test points for 2ms TTI E-DCH Transport Block Size Table 3

I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)	I_{E-TFCI}	TB Size (bits)
0	18	30	1902	60	6614	90	14184	120	21966
1	186	31	1986	61	6774	91	14538	121	22302
2	204	32	2004	62	7110	92	14874	122	22430
3	354	33	2034	63	7270	93	15210	123	22638
4	372	34	2052	64	7446	94	15546	124	22996
5	522	35	2370	65	7782	95	15882		
6	540	36	2388	66	7926	96	16218		
7	558	37	2642	67	8118	97	16554		
8	674	38	2660	68	8454	98	16890		
9	692	39	2706	69	8582	99	17226		
10	708	40	2724	70	8790	100	17562		
11	858	41	3042	71	9126	101	17802 Note		
12	876	42	3060	72	9238	102	17898 Note		
13	894	43	3298	73	9462	103	18252		
14	1026	44	3316	74	9798	104	18476		
15	1044	45	3378	75	9894	105	18588		
16	1194	46	3396	76	10134	106	18924		
17	1212	47	3750	77	10470	107	19132		
18	1230	48	3990	78	10550	108	19260		
19	1330	49	4086	79	10806	109	19596		
20	1348	50	4422	80	11160	110	19788		
21	1362	51	4646	81	11224	111	19932		
22	1380	52	4758	82	11496	112	20268		
23	1530	53	5094	83	11880	113	20444		
24	1548	54	5302	84	12168	114	20604		
25	1566	55	5430	85	12536	115	20940		
26	1698	56	5766	86	12840	116	21100		
27	1716	57	5958	87	13192	117	21276		
28	1866	58	6102	88	13512	118	21612		
29	1884	59	6438	89	13848	119	21774		
Note:	E-TFCI indices 101 and 102 shall not be used by the UE (see TS 25.321 clause 11.8.1.4). The reason to include this test point is to verify that UE comply to this requirement and is not using E-TFCI index values 101 and 102.								

Table 7.1.7.5.3: Applicable E-TFS indexes for sub-tests 1 to 2 and UE E-DCH category 7.

Sub-test	E-DCH TTI	E-DCH Transport Block Size Table	Applicable E-TFS indexes
1	2ms	2ms TTI Table 2, Table 7.1.7.4.2a	1..127
2	2ms	2ms TTI Table 3, Table 7.1.7.4.2b	1..124

Table 7.1.7.5.4: E-TFCI values causing degradation due to turbo coder irregularities

E-DCH Transport Block Size Tables	E-TFCI	Reference
2 ms TTI, Table 2	121	[6], Annex B.2a
2 ms TTI, Table 3	101	[6], Annex B.2b
2 ms TTI, Table 3	102	[6], Annex B.2b

Test procedure

The following test specs shall be executed for each applicable sub-test in Table 7.1.7.5.5:

a) The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.4k.2 (UM, Flexible RLC + MAC-i/is + MAC-ehs) using conditions A27a (16QAM) as specified in clause 9.1 of TS 34.108. See Note 1.

b) The SS closes the test loop using UE test loop mode 1 and configuring the UL RLC SDU size to be equal to the received DL SDU size (i.e. not setting the UL RLC SDU size parameter).

c) The SS sets $I_{E\text{-}TFCI}$ =1.

d) The SS look up the TB Size based on the $I_{E\text{-}TFCI}$ value in the table used for the sub-test according to Table 7.1.7.5.5.

e) The SS removes the scheduling grant for E-DCH for the UE.

f) If the transport block size TB_{size} is >12040 bits then SS creates 2 DL RLC SDUs of size 8*FLOOR ((TB_{size} – 56 bit)/16) (largest possible RLC SDU size considering octet alignment and MAC-i/is and minimum RLC UM headers). If the transport block size TB_{size} is ≤ 12040 bits the SS creates 1 DL RLC SDUs of size 8*FLOOR((TB_{size} – 32 bit)/8). The SS creates a DL RLC PDU for each DL RLC SDU using the special value of HE field (‘10’) in the RLC PDU header and transmits in downlink. See note 2.

g) The SS waits for an SI to be received that indicates that there is data available for transmission (can be identified from the content of the SI). The SS checks that TEBS have the correct values. See Note 3.

h) The SS issues an absolute grant that allows the UE to send at maximum bit rate (signalling value 31)

i) The SS waits until data is received and verifies that the looped back SDU data has the correct content and is sent in the same TTI.

j) The SS verifies that the received E-TFC used by the UE is correct. The SS checks that the UE has not used the transport block sizes correspondent to the E-TFCI values as listed in table 7.1.7.5.6, but instead used the transport block size correspondent to the next possible larger E-TFCI value.

k) The SS increments the $I_{E\text{-}TFCI}$ by 1. If the $I_{E\text{-}TFCI}$ value is less than maximum value for the actual sub-test and UE category according to Table 7.1.7.5.5 then continue with step d else continue with step l.

l) The SS opens the UE test loop.

m) The SS release the radio bearer.

n) The SS may optionally deactivate the radio bearer test mode.

NOTE 1: The SS configures the physical channel parameters according to the actual UE category under test.

NOTE 2: The test data for DTCHs mapped on HS-DSCH is divided into 2 RLC SDUs to keep the maximum SDU size below or equal to 1500 octets (1500 octets is the limit of QoS parameter "Max SDU size" in SM). To allow for testing of the smallest TB sizes a single RLC PDU is used when the TB size is equal or below 12032 bits to reduce the L2 header overhead. 12032 bits corresponds to maximum RLC SDU size of 1500 octets (12000 bits) plus MAC-i/is header size of 24 bits and UMD PDU header size (8 bits).

The SS is using one RLC PDU per RLC SDU. The RLC SDU size is calculated as:
RLC SDU size = 8*FLOOR((TBsize - MAC-i/is header size)/N - UMD PDU header size)/8
= 8*FLOOR((TBsize – 24 - (N-1)*16)/N – 8)/8 bits.

For N=1 this gives RLC SDU size = 8*FLOOR(TB size – 32)/8 bits.
For N=2 this gives RLC SDU size = 8*FLOOR(TB size – 56)/16 bits

NOTE 3: The SS calculates the TEBS value using the E-TFC TB size determined by the E-TFCI value tested according to 25.321 Table 9.2.5.3.2-1.

Expected sequence

The expected sequence is repeated for each applicable sub-test in Table 7.1.7.5.5:

Step	Direction UE SS	Message	Comments
1	<--	SYSTEM INFORMATION (BCCH)	Broadcast
2	<--	PAGING TYPE 1 (PCCH)	Paging (PS domain, P-TMSI)
3	-->	RRC CONNECTION REQUEST (CCCH)	RRC
4	<--	RRC CONNECTION SETUP (CCCH)	RRC
5	-->	RRC CONNECTION SETUP COMPLETE (DCCH)	RRC
6	-->	SERVICE REQUEST (DCCH)	GMM
7	<--	SECURITY MODE COMMAND	RRC see note 1
8	-->	SECURITY MODE COMPLETE	RRC see note 1
9	<--	ACTIVATE RB TEST MODE (DCCH)	TC
10	-->	ACTIVATE RB TEST MODE COMPLETE (DCCH)	TC
11	<--	RADIO BEARER SETUP (DCCH)	RRC. For the PS radio bearer the 'pdcp info' IE shall be omitted.
12	-->	RADIO BEARER SETUP COMPLETE (DCCH)	RRC
13	<--	CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 with no "LB Setup RB IE#k" parameter set (UE shall return an UL RLC SDU with the same size as the received RLC SDU in downlink)
14	-->	CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
15	SS		The SS sets $I_{E\text{-}TFCI}$ = 1 and look up the transport block size from the relevant Transport Block Size Table for the sub-test.
16	←	Removal of absolute grant	Signalling value 1
17	<--	DOWNLINK RLC SDU(s)	The SS creates and transmit one or 2 RLC SDUs. The number of RLC SDUs and their size depends on TB size under test.
18	→	SI indicating data for transmission	This can be verified from the indicated Total E-DCH Buffer Status (TEBS)
19	<--	Absolute grant allowing the UE to transmit at maximum bit rate.	Signalling value 31
20	-->	UPLINK RLC SDU(s)	The SS checks E-TFC from the UE and checks that the content of the received UL RLC SDU(s) are correct and sent in the same TTI. The SS checks that the UE has not used the transport block sizes correspondent to the E-TFCI values as listed in table 7.1.7.5.6, but instead used the transport block size correspondent to the next possible larger E-TFCI value.
21	SS		The SS increments $I_{E\text{-}TFCI}$ by 1 and look up transport block size from the relevant Transport Block Size Table for the sub-test. If E-TFC TB size is supported by the E-DCH category then repeat steps 16 to 21 else continue with step 22.
22	<--	OPEN UE TEST LOOP (DCCH)	TC
23	-->	OPEN UE TEST LOOP COMPLETE (DCCH)	TC
24		RB RELEASE	RRC
25	<--	DEACTIVATE RB TEST MODE	TC Optional step
26	-->	DEACTIVATE RB TEST MODE COMPLETE	TC Optional step
Note 1: In addition to activate integrity protection Step 7 and Step 8 are inserted in order to stop T3317 timer in the UE, which starts after transmitting SERVICE REQUEST message.			

7.1.7.5.5 Test requirements

1. In step 20, the SS verifies that the received E-TFC has the correct size. The SS checks that the UE has not used the transport block sizes correspondent to the E-TFCI values as listed in table 7.1.7.5.4, but instead used the transport block size correspondent to the next possible larger E-TFCI value.

2. In step 20, the SS shall receive the RLC SDUs in the same TTI and with the same content as sent in downlink.

7.1.7.6 MAC-is/i transport block size selection (1.28Mcps TDD)

7.1.7.6.1 Definition and applicability

Applicable for all UEs supporting 1.28Mcps TDD and MAC-i/is.

7.1.7.6.2 Conformance requirement

Extract from TS 25.321 clause 11.9.1.4

In TDD, rules for E-TFC selection shall be applied as provided below.

UEs shall apply E-TFC selection when invoked by the HARQ entity (see subclause 11.9.1.1.1).

For CELL-DCH state in TDD, for each MAC-d flow, RRC configures MAC-e with a HARQ profile and multiplexing list. Additionally, RRC configures MAC with a power offset in case the Scheduling Information needs to be transmitted without any higher- layer data. For 1.28 Mcps TDD, RRC also configures MAC with a retransmission timer and the maximum number of HARQ transmissions in case the Scheduling Information needs to be transmitted without any higher-layer data. The HARQ profile includes the power offset and maximum number of HARQ transmissions to use for this MAC-d flow. For 1.28 Mcps TDD, the HARQ profile also includes a retransmission timer attribute. The multiplexing list identifies for each MAC-d flow(s), the other MAC-d flows for which data can be multiplexed in a transmission that uses the power offset included in its HARQ profile.

For 1.28 Mcps TDD in CELL_FACH state and idle mode, for common MAC flows, RRC configures MAC with a HARQ profile and multiplexing list. The HARQ profile includes the power offset/maximum number of HARQ transmissions to use for this common MAC flows and a retransmission timer attribute.

RRC can control the scheduling of uplink data by giving each logical channel a priority between 1 and 8, where 1 is the highest priority and 8 the lowest. E-TFC selection in the UE shall be done in accordance with the priorities indicated by RRC. Logical channels have absolute priority, i.e. the UE shall maximise the transmission of higher priority data.

For 1.28 Mcps TDD in CELL_FACH state and idle mode, CCCH shall not be multiplexed with any other logical channel, and the CCCH data shall have higher priority than that of any other logical channel.

RRC can allocate non-scheduled transmission grants to individual MAC-d flows in order to reduce the transmission delays.

The UE shall determine whether to take scheduled or non-scheduled grants into account in the upcoming transmission. If neither are supposed to be taken into account (i.e. the TTI is not available for non-scheduled transmission and no Grant for scheduled transmission has been received) then no grant shall be assumed to exist. If a grant exists then the transmission format and data allocation shall follow the requirements below.

For each configured MAC-d flow or common flow (1.28 Mcps TDD only), a given E-TFC can be in any of the following states:

- Supported state;
- Blocked state.

The E-TFC states are derived according to the following:

- If the transmission is a retransmission then only the E-TFC with the same block size as the original transmission may be in the supported state.
- For 1.28Mcps TDD, only E-TFCs from the E-TFCS (the table of TB sizes) which are consistent with the UE's E-DCH capability category shall be considered for the transmission;
- Only E-TFCs from the E-TFCS (the table of TB sizes) which can be supported by (exactly) the number of slots assigned by the grant shall be considered for the transmission;
- Only E-TFCs which result (for the granted timeslot and code physical resources) in a code rate lying between the maximum and minimum (inclusive) allowable code rates set by RRC [7] shall be considered for the transmission {note: the definition of the term "code rate" as used here is the same as that provided by [18]}. This shall be evaluated for both QPSK and 16-QAM modulation;

- P_{HARQ}, the HARQ profile power offset is selected (for 3.84/7.68Mcps TDD the HARQ profile for the transmission shall be selected among the HARQ profiles of MAC-d flows on which the highest priority logical channels with available data are mapped, for 1.28Mcps TDD the HARQ power offset shall be set to the maximum of HARQ power offset of all the MAC-d flows or common flows mapped to the same type of resource (scheduled or non-scheduled resource); Scheduling Information power offset shall be used when Scheduling Information is transmitted without any higher-layer data.)

- Only E-TFCs whose calculated transmission power requirement $P_{E\text{-}PUCH}$ (see [18]) is less than or equal to both the available and the granted power shall be considered for the transmission (note: this requirement does not apply in the case of a retransmission on non-scheduled resources). For TDD, the smallest E-TFC is considered always in the supported state. The granted power is defined as the calculated E-PUCH transmission power of [18] with β_e = (Absolute Grant Value + α_e). The available power is the maximum UE transmission power.

- For 1.28Mcps TDD, if the E-PUCH coexists with other physical channel within one timeslot, the sum of calculated transmission power requirement $P_{E\text{-}PUCH}$ and the transmission power requirement for the other physical channel shall be less than or equal to the available power.

- If only scheduling information is included in MAC-e PDU, the transmission power shall be equal to the granted power (the available maximum E-PUCH power shall be considered too). And the UE shall select QPSK modulation. (1.28 Mcps TDD only);

From those E-TFCs in the supported state the UE determines the largest block size that it is permitted to transmit within the given constraints.

The UE shall select the modulation type associated with the determined E-TFC (note: if an E-TFC is supported by both QPSK and 16-QAM then 16-QAM modulation shall be used if its power requirement ($P_{E\text{-}PUCH}$) is lower than the power requirement for QPSK, otherwise QPSK modulation shall be used).

Data allocation shall then be performed in accordance with the following:

- For all logical channels, if the logical channel belongs to a non-scheduled MAC-d flow, its data shall be considered as available up to the largest block size determined for the corresponding non-scheduled grant. If the logical channel does not belong to a non-scheduled MAC-d flow, its data shall be considered as available up to the largest block size determined for the Serving Grant;

- The data allocation shall maximise the transmission of higher priority data;

- The UE shall select the E-TFC, SF and modulation which minimises the power used (3.84/7.68 Mcps TDD only);

- The UE shall select the E-TFC and modulation. QPSK shall be used in the case of E-PUCH allocated with other physical channel in the same timeslot of one TTI for one UE, otherwise modulation shall be selected, which minimises the power used (1.28 Mcps TDD only);

While respecting all the above listed requirements, for each logical channel using RLC-UM or RLC-AM when new data to be transmitted, at every TTI, the UE may select the RLC PDU size so as to maximise the amount of data of this logical channel that can be transmitted.

Once an appropriate E-TFC and data allocation are found according to the rules above, the "Multiplexing and TSN Setting" entity shall generate the corresponding MAC-e or MAC-i PDU.

In 1.28Mcps TDD, when Scheduling Information is triggered by timer per subclause 11.9.1.5, the E-TFC selection and data-allocation process shall assume that Scheduling Information has a priority higher than any other logical channel.

The E-TFC selection function shall provide this MAC-e or MAC-i PDU and transmission HARQ profile to the HARQ entity. The selected E-TFC is also provided. For 3.84Mcps TDD and 7.68Mcps TDD the maximum number of HARQ transmissions and the power offset in this profile shall be set respectively to the maximum of both the Max Number of HARQ Transmissions and of the power offset of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission. For 1.28 Mcps TDD, the maximum number of HARQ transmissions shall be set to the maximum of the Max Number of HARQ Transmissions of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission, the HARQ power offset shall be set to the maximum of HARQ power offset of all the MAC-d flows mapped to the same type of resource (scheduled or non-scheduled resource), and the retransmission timer shall be set to the maximum of the retransmission timer value of the HARQ profiles that are permitted to be multiplexed into the transmission. For 1.28Mcps TDD, when the Scheduling Information needs to be transmitted without any higher-layer data, the specific HARQ profile should be applied. Each HARQ process which is associated with a buffer holding a MAC-e or MAC-i PDU for potential retransmission shall maintain the HARQ profile and the number of re-transmissions that have occurred. For 1.28 Mcps TDD, the HARQ process shall also maintain the value of RTX_TIMER.

Further information on E-TFC selection is provided in Annex CA.

[…]

For 1.28 Mcps TDD, the mapping of transport block size L to TB index k (k = {0,1,…63};) (see Annex BC.1) is given by the formula:

Table 9.2.6.4.3: formula used to calculate the Transport Block Size

Category 1-2			Category 3-6			
1 Timeslot	**2 Timeslots**	**3 Timeslots**	**1 Timeslot**	**2 Timeslots**	**3 Timeslots**	**4&5 Timeslots**
$L_0 = 23, L_1 = 116, L_{\min} = 162, L_k = \left\lfloor L_{\min} p^{k-2} \right\rfloor, k \in [2,62]$						
$L_{63} = 1346,$ $p = \frac{7768}{7503}$	$L_{63} = 2754,$ $p = \frac{2578}{2461}$	$L_{63} = 4162,$ $p = \frac{8934}{8471}$	$L_{63} = 2720,$ $p = \frac{9781}{9339}$	$L_{63} = 5532,$ $p = \frac{2934}{2769}$	$L_{63} = 8348,$ $p = \frac{3052}{2861}$	$L_{63} = 11160,$ $p = \frac{9652}{9005}$

NOTE: When in CELL FACH state with E-DCH transmission, the formula used to calculate the Transport Block Size according to the E-DCH physical layer category 3 shall be used.

Reference(s)

TS 25.321 clause 11.9.1.4, 9.2.6.4.3

7.1.7.6.3 Test purpose

To verify that the UE is able to transmit all possible transport block sizes when MAC-i/is is configured and within the UE capability.

7.1.7.6.4 Method of test

Initial Condition

Same initial conditions as in clause 7.1.6.3.5.

Test Procedure

Same test procedure as in clause 7.1.6.3.5.

Expected sequence

Same expected sequence as in clause 7.1.6.3.5.

Specific Message Contents

Same specific message contents as in clause 7.1.6.3.5.

7.1.7.6.5 Test requirement

Same test requirements as in clause 7.1.6.3.5.

7.1.8 E-DCH MAC-is/i for RACH procedure

7.1.8.1 Release of common E-DCH resource when maximum resource allocation for E-DCH expires or uplink transmission ends for CCCH transmission

7.1.8.1.1 Definition and Applicability

All UEs which support E-DCH in CELL_FACH

7.1.8.1.2 Conformance Requirement

Extract from 25.321 11.2.2A:

The allocated common E-DCH resource shall be used by MAC to carry either only CCCH transmission or only DTCH/DCCH transmission, but not both.

The E-DCH enhanced physical random access transmission procedure is completed with release of the allocated common E-DCH resource, if one of the following conditions is fulfilled:

- If the UE according to subclause 8.5.4A in [7] failed to establish the physical channels, or if the criteria for radio link failure are met as specified in subclause 8.5.6 in [7], then the timer T_2 is started. After the expiry of T_2 a back off timer T_{BO1} is started. Back off timer T_{BO1} is set to an integer number N_{BO1} of 10 ms time intervals, randomly drawn within an interval $0 \leq N_{BO1min} \leq N_{BO1} \leq N_{BO1max}$ (with uniform distribution). N_{BO1min} and N_{BO1max} may be set equal when a fixed delay is desired, and even to zero when no delay other than the one due to persistency is desired. The procedure ends if timer TBO1 expires or the UE performs cell reselection while timer TBO1 is running, whatever occurs first. In case of a cell reselection, the timer TBO1 is stopped.

- In case of CCCH transmission, if the maximum E-DCH resource allocation for CCCH has been reached, then this triggers a CMAC-STATUS which informs the RRC about end of the Enhanced Uplink for CELL_FACH state and Idle mode.

- In case of CCCH transmission, if the transmission E-DCH Buffer status is 0 bytes, then the MAC-STATUS-Ind primitive indicates to RLC for each logical channel that no PDU shall be transferred to MAC. If the transmission E-DCH Buffer status is 0 bytes and no MAC-i PDUs are left for (re-)transmission in MAC, then this triggers a CMAC-STATUS which informs the RRC about the end of the Enhanced Uplink for CELL_FACH state and Idle mode.

- In case of DTCH/DCCH transmission, if no E-AGCH with UE's E-RNTI has been received (through an E-RNTI-specific CRC attachment) within the maximum period for collision resolution phase, then this triggers a CMAC-STATUS which informs the RRC about the end of the Enhanced Uplink for CELL_FACH state and Idle mode. Then the timer T_2 is started. After the expiry of T_2 a back off timer T_{BO1} is started. Back off timer T_{BO1} is set to an integer number N_{BO1} of 10 ms time intervals, randomly drawn within an interval $0 \leq N_{BO1min} \leq N_{BO1} \leq N_{BO1max}$ (with uniform distribution). N_{BO1min} and N_{BO1max} may be set equal when a fixed delay is desired, and even to zero when no delay other than the one due to persistency is desired. The procedure ends when T_{BO1} expires.

- Explicit common E-DCH resource release:
  In case of DTCH/DCCH transmission, if an E-AGCH with UE's E-RNTI has been received (through an E-RNTI-specific CRC attachment) with absolute grant value set to 'INACTIVE', then this triggers a CMAC-STATUS which informs the RRC about end of the Enhanced Uplink for CELL_FACH state and Idle mode.

- Implicit release with E-DCH transmission continuation back off
  Implicit resource release is enabled only if "E-DCH transmission continuation back off" is not set to "infinity".
  If implicit resource release is enabled, then in case of DTCH/DCCH transmission, the timer Tb is set to "E-DCH transmission continuation back off" value, when TEBS is 0 byte and the last generated MAC-i PDU with higher layer data is provided with the PHY-data-REQ primitive to the physical layer for transmission.
  If TEBS <> 0 byte is detected while timer Tb is running, then the timer is stopped and uplink data transmission on the common E-DCH resource continues.
  If a MAC-ehs PDU is received while timer Tb is running, then the timer is re-started.
  At expiry of timer Tb the MAC-STATUS-Ind primitive indicates to RLC for each logical channel that no PDUs shall be transferred to MAC. TEBS = 0 byte is reported to the Node B MAC as SI in a MAC-i PDU. If the "E-DCH transmission continuation back off" value is set to "0", then the SI should be transmitted with the MAC-i PDU carrying the last DCCH/DTCH data, given the serving grant is sufficient to carry the SI in the same MAC-i PDU together with the remaining DCCH/DTCH data. Otherwise, the empty buffer status report is transmitted separately with the next MAC-i PDU.
  If after the expiry of timer Tb no MAC-i PDU is left in a HARQ process for (re-)transmission, then this triggers a CMAC-STATUS which informs the RRC about end of the Enhanced Uplink for CELL_FACH state and Idle mode.

Extract from 25.321 clause 11.8.1.4:

For each MAC-d flow, RRC configures MAC with a HARQ profile and a multiplexing list. Additionally, RRC configures MAC with a power offset for "Control-only" transmissions. This power offset and a maximum number of HARQ transmissions of 8 will be used to define a HARQ profile for "Control-only" transmissions which will be used, in case the Scheduling Information needs to be transmitted without any higher-layer data. The HARQ profile includes the power offset and maximum number of HARQ transmissions to use for this MAC-d flow. The multiplexing list identifies for each MAC-d flow(s), the other MAC-d flows from which data can be multiplexed in a transmission that uses the power offset included in its HARQ profile.

[..]

The E-TFC selection function shall provide this MAC-e PDU and transmission HARQ profile to the HARQ entity. The maximum number of HARQ transmissions and the power offset in this profile, shall be set respectively to the maximum of the Max Number of HARQ Transmissions of the HARQ profiles from all the MAC-d flows from which data is multiplexed into the transmission and to the Nominal Power Offset. The HARQ entity shall also be informed of whether the transmission includes Scheduling Information and whether this information is sent by itself or with higher-layer data.

[...]

if expiry of timer T300 occurs:

the UE shall:

1> check the value of V300; and

2> if V300 is equal to or smaller than N300:

…

3> set the IEs in the RRC CONNECTION REQUEST message according to TS 25.331 subclause 8.1.3.3;

…

3> submit a new RRC CONNECTION REQUEST message to lower layers for transmission on the uplink CCCH;

3> increment counter V300;

3> restart timer T300 when the MAC layer indicates success or failure to transmit the message.

…

2> if V300 is greater than N300:

3> enter idle mode.

3> consider the procedure to be unsuccessful;

3> Other actions the UE shall perform when entering idle mode from connected mode are specified in TS 25.331 subclause 8.5.2;

3> the procedure ends.

References(s)

TS 25.321 clause 11.2.2A , 11.8.1.4,

3GPP TS 25.331 clause 8.1.3.

7.1.8.1.3 Test purpose

1. To verify that UE releases common E-DCH resource when max resource allocation timer of E-DCH expires for CCCH transmission.

2. To verify that UE releases common E-DCH resource when uplink transmission ends for CCCH transmission.

7.1.8.1.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

UE: Idle state (state 3 or state 7) as specified in clause 7.4 of TS 34.108 with a CN UE identity, depending on the CN domain(s) supported by the UE.

Test procedure

a) SS transmits the PAGING TYPE 1 with cause BCCH modification.

b) SS transmits the changed system information SIB 1 and SIB5 / SIB5 bis. UE updates the stored SIBs. The new SIB 5 / SIB5-bis contains the common E-DCH related information.

c) SS transmits the PAGING TYPE 1 with cause terminating conversational call.

d) SS receives RRC CONNECTION REQ on common E-DCH resource.

e) SS transmits a negative HARQ acknowledgement.

f) SS transmits a HARQ NACK for each received retransmission.

g) The E-DCH resource allocation timer shall expire in UE side which would lead to release of the common E-DCH resource before the specified number of retransmissions.

h) SS receives the RRC CONNECTION REQ sent by UE after the expiry of T300

i) SS transmits a HARQ ACK for the received transmission.

j) UE does not have to send any data (MAC buffer empty) which leads to release of the common E-DCH resource. As RRC CONNECTION SETUP is not sent by SS, the UE acquires a common E-DCH resource to transmit RRC CONNECTION REQUEST after expiry of T300.

NOTE 1: There should not be any transmission from UE for the period of T300 after the expiry of E-DCH resource allocation timer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		

1	←	Paging Type 1	BCCH change ind
2	←	SIB1 and SIB 5/ SIB5 bis	SS transmits E-DCH common information to UE
3			SS waits 5s (to ensure that the UE has time to read the new system information)
4	←	Paging Type 1	SS starts to transmit this message on the PCCH at the correct paging occasion with cause "Terminating conversational call"
5	→	RRC CONNECTION REQ	UE starts the timer max-CCH-ResourceAllocation. SS starts (max CCCH ResourceAllocation timer) + 10%
6	←	HARQ NACK	
7	SS		SS sends a HARQ NACK for each received retransmission. Max – CCH Resource Allocation Timer in UE shall expire. SS checks that the number of UL HARQ re-transmissions shall be less than the mac-d-FlowMaxRetrans (as specified in the test case). This is due to max-CCCH-ResourceAllocation timer < (No of mac-d-FlowMaxRetrans * E-DCH TTI). SS check that the last retransmitted RRC CONNECTION REQUEST is sent before expiry of the timer (max CCCH ResourceAllocation timer) + 10% started in step 5.
8	→	RRC CONNECTION REQ	UE re-transmits after the expiry of T300. UE re-transmits after the expiry of T300. SS checks that UE perform Prach Preamble and Acquisition Indication reception procedure prior to acquiring common E-DCH resource and sending RRC CONNECTION REQ
9	←	HARQ ACK	
10	SS		SS does not respond with RRC CONNECTION SETUP
11	→	RRC CONNECTION REQ	UE re-transmits after the expiry of T300. SS checks that UE perform Prach Preamble and Acquisition Indication reception procedure prior to acquiring common E-DCH resource and sending RRC CONNECTION REQ

Specific Message Contents

PAGING TYPE 1 (Step 1)

Information Element	Value/remark
Message Type	
Paging record list	Not Present
BCCH modification info	
MIB Value Tag	Set to (Current MIB value tag + 1)
BCCH Modification time	Not Present

SYSTEM INFORMATION TYPE 1 (Step 2)

Use the default parameter values for the system information block with the same type specified in clause 6.1.0b of TS 34.108, with the following exceptions:

- UE Timers and constants in idle mode	
-T300	8000 milliseconds
-N300	3
-T312	10 seconds
- N312	1

SYSTEM INFORMATION BLOCK TYPE 5 / SYSTEM INFORMATION BLOCK TYPE 5bis (Step 2) (FDD)

Use the same message type found in clause 6.1 of TS 34.108, with condition B3 "Only for cells which configure common E-DCH and HS-DSCH reception in CELL_FACH", with the following exception.

Information Element	Value/remark
- Common EDCH system information	
- common-E-DCH-MAC-d-FlowList	
- mac-d-FlowMaxRetrans	15
-CHOICE mode	FDD
- max-CCCH-ResourceAllocation	8 TTI (in the case of 10ms E-DCH TTI). 12 TTI (in the case of 2ms E-DCH TTI).

PAGING TYPE 1 (Step 4)

Information Element	Value/remark
Message Type	
Paging record list	Only 1 entry
Paging record	
- CHOICE Used paging identity	CN identity
- Paging Cause	Terminating Call with one of the supported services
- CN Domain Identity	PS Domain
- CHOICE UE Identity	Local P-TMSI
- Routing parameter	Same as registered P-TMSI
BCCH modification info	Not Present

7.1.8.1.5 Test requirements

1. At step 7 , SS checks that the number of UL HARQ retransmissions for RRC CONNECTION REQUEST is less than mac-d flow max number of retransmissions, specified in SIB5 due to expiry of CCCH resource allocation timer.

2. At step 11 , SS shall check the use of PRACH Preamble and Acquisition Indication procedure to acquire common E-DCH resource to send RRC CONNECTION REQUEST.

7.1.8.2 Activation of HS-DPCCH based on the received SIB5/SIB5bis information

7.1.8.2.1 Definition and Applicability

All UEs which support E-DCH in CELL_FACH

7.1.8.2.2 Conformance requirement

25.331 section 8.5.45

If variable READY_FOR_COMMON_EDCH is set to TRUE, then after selection of a common E-DCH resource configuration, the RRC in the UE shall configure MAC and the physical layer for E-DCH and HSDPA transmission, and the UE shall:

1> configure Uplink DPCH in accordance with the uplink DPCCH slot format 1 [26], the IE "Uplink DPCH code info" and IE "Uplink DPCH power control info";

1> if IE "ACK/NACK support on HS-DPCCH" is set to TRUE:

2> configure the HS-DPCCH in accordance with HS-DPCCH slot format [26], the HS-DPCCH code [28] and IE "Uplink DPCH power control info".

1> configure the common E-DCH MAC-d flows as described in subclause 8.6.5.24;

1> configure the UL E-DPCCH in accordance with the IE "E-DPCCH" configuration;

1> apply the TTI as signalled in the IE "E-DCH Transmission Time Interval" on the E-DPDCH;

1> use a redundancy version for each HARQ transmission as configured by the IE "HARQ RV Configuration";

1> use the same scrambling code for F-DPCH, E-RGCH, E-HICH and E-AGCH reception as configured for the Primary CPICH;

1> use a channelization code for F-DPCH reception as configured by IE "F-DPCH Code number";

1> configure F-DPCH in accordance with the F-DPCH slot format #0 [26];

1> apply the DPC_Mode=0 for F-DPCH according to [29];

1> configure the MAC with the stored IE "E-DPDCH" configuration and/or the information contained in IE "Scheduled Transmission configuration";

1> configure the E-HICH in accordance with the IE "E-HICH info" configuration;

1> configure the E-AGCH in accordance with the IE "E-AGCH info" configuration;

1> configure the E-RGCH in accordance with the IE "E-RGCH info" configuration if an E-RGCH configuration has been provided with the system information;

1> configure the radio link as the serving E-DCH radio link;

1> determine the value for the COMMON_E_DCH_TRANSMISSION variable and take the corresponding actions as described in subclause 8.5.46.

25.331 section 8.5.46

The variable COMMON_E_DCH_TRANSMISSION shall be set to TRUE only when all the following conditions are met:

1> the UE is in CELL_FACH state or Idle mode;

1> one radio link is configured as the serving E-DCH radio link, and for this radio link the UTRAN has configured the IE "E-HICH info" and the IE "E-AGCH info", and for 1.28Mcps TDD the IE "E-RUCCH Info" and "E-PUCH Info";

1> all logical channels are mapped to E-DCH, and for each of which there is:

- 2> one E-DCH MAC-d flow is configured, i.e. the IEs "E-DCH MAC-d flow power offset", "E-DCH MAC-d flow maximum number of retransmissions", and for 1.28 Mcps TDD, the IEs "E-DCH MAC-d flow retransmission timer".

…..

For FDD, whenever the variable COMMON_E_DCH_TRANSMISSION is set to TRUE, the UE shall:

…..

1> if transmitting DCCH or DTCH data:

- 2> if IE "ACK/NACK support on HS-DPCCH" is set to TRUE:
  - 3> after collision resolution provide ACK/NACK feedback in accordance with [29] in the physical layer on the serving HS-DSCH radio link, using the information in the IE "Uplink DPCH power control info";

- 3> after collision resolution use the information for the channel quality indication (CQI) procedure in the physical layer on the serving HS-DSCH radio link if the IE "Measurement Feedback Info" has been provided with the common E-DCH resource.

25.321 clauses 11.6.22

[...]

The UE shall:

- if the New Data Indicator has been incremented compared to the value in the previous received transmission in this HARQ process or this is the first received transmission in the HARQ process:
  - replace the data currently in the soft buffer for this HARQ process with the received data.
  - if the Transport Block Size index value is equal to 111111 (FDD only):
    - generate a positive acknowledgement (ACK) of the data in this HARQ process;
    - discard the received data;
    - assume that the data has been successfully decoded.
- if the New Data Indicator is identical to the value used in the previous received transmission in the HARQ process:
  - if the Transport Block Size index value is equal to 111111 (FDD only):
    - assume that the transport block size is identical to the last valid transport block size signalled for this HARQ process.
  - if the data has not yet been successfully decoded:
    - combine the received data with the data currently in the soft buffer for this HARQ process.
- if the data in the soft buffer has been successfully decoded and no error was detected:
  - deliver the decoded MAC-hs PDU to the reordering entity;
  - generate a positive acknowledgement (ACK) of the data in this HARQ process.
- else:
  - generate a negative acknowledgement (NAK) of the data in this HARQ process;
- schedule the generated positive or negative acknowledgement for transmission and the time of transmission relative to the reception of data in a HARQ process is configured by upper layer.

Reference(s)

TS 25.331 section 8.5.45, section 8.5.46

TS 25.321 clauses 11.6.22

7.1.8.2.3 Test purpose

The purpose of the test case is to verify that UE configures the HS-DPCCH based on the common E-DCH information received in SIB5/SIB5bis .

7.1.8.2.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

UE: Idle state (state 3 or state 7) as specified in clause 7.4 of TS 34.108 with a CN UE identity, depending on the CN domain(s) supported by the UE.

UE shall receive SIB5/SIB5bis with condition B3 “Only for cells which configure common E-DCH and HS-DSCH reception in CELL_FACH”.

Test Procedure

a) SS sends the PAGING TYPE 1 with cause “Terminating conversational call”

b) SS waits for RRC CONNECTION REQ message to arrive on E-DCH/CCCH.

c) SS transmits RRC CONNECTION SETUP

d) SS receives RRC CONNECTION SETUP COMPLETE message from UE

e) SS sends E- AGCH with UE specific E-RNTI to end collision resolution phase.

f) SS transmits UE CAPABILITY ENQUIRY message with CRC error

g) SS checks HARQ NACK on HS DPCCH for the message received at step g

h) SS transmits UE CAPABILITY ENQUIRY message without CRC error

i) SS checks HARQ ACK on HS DPCCH for the message received at step i

j) SS receives UE CAPABILITY INFORMATION

k) SS transmits UE CAPABILITY INFORMATION CONFIRM

Expected Sequence

Step	Direction	Message	Comments
	UE SS		
1	←	Paging Type 1	SS starts to transmit this message continuously on the PCCH at the correct paging occasion with cause “Terminating conversational call”
2	→	RRC CONNECTION REQ	
3	←	RRC CONNECTION SETUP	
4	→	RRC CONNECTION SETUP COMPLETE	
5	←	Absolute Grant	SS sends E-AGCH with serving grant 4 and with UE specific E-RNTI to end the collision resolution phase.
6	←	UE CAPABILITY ENQUIRY	The SS sends this message over HS-DSCH with CRC error.
7		MAC-ehs negative acknowledgement.	UE sends a HARQ NACK for each received data on HS-DSCH on HS_DPCCH
8	←	UE CAPABILITY ENQUIRY	Message sent on HS-DSCH with correct CRC.
9		MAC-ehs positive acknowledgement.	UE sends a HARQ ACK for each received data on HS-DSCH on HS_DPCCH
10	→	UE CAPABILITY INFORMATION	
11	←	UE CAPABILITY INFORMATION CONFIRM	

Specific Message Contents

PAGING TYPE 1 (Step 1)

Information Element	Value/remark
Message Type	
Paging record list	Only 1 entry
Paging record	
- CHOICE Used paging identity	CN identity
- Paging Cause	Terminating Call with one of the supported services
- CN Domain Identity	PS Domain or CS Domain
- CHOICE UE Identity	Local (P)TMSI
- Routing parameter	Same as registered P-TMSI
BCCH modification info	Not Present

RRC CONNECTION REQUEST (Step 2)

Information Element	Value/remark
Message Type	
Initial UE Identity	Same as the IMSI stored in the TEST USIM card, or the registered P-TMSI
Establishment Cause	Checked to see if set to one of the supported originating call types
Protocol Error Indicator	Checked to see if set to "FALSE"
Measured Results on RACH	Checked to see if it is absent

7.1.8.2.5 Test Requirement

1. At step 6 and step 8 , SS checks the Nack/Ack on HS-DPCCH channel

7.1.8.3 DTCH/DCCH transmission - implicit common E-DCH resource release without receiving E-AGCH

7.1.8.3.1 Definition and applicability

Applicable for all UEs supporting Enhanced UL in Cell_FACH.

7.1.8.3.2 Conformance Requirement

[..]

- In case of DTCH/DCCH transmission, if no E-AGCH with UE's E-RNTI has been received (through an E-RNTI-specific CRC attachment) within the maximum period for collision resolution phase, then this triggers a CMAC-STATUS which informs the RRC about the end of the Enhanced Uplink for CELL_FACH state and Idle mode.

[..]

- If the UE is sending DTCH or DCCH data, the UE shall release the common E-DCH resource under following conditions:

  - the maximum period for collision resolution is reached and no E-AGCH with the UE's E-RNTI (through an E-RNTI specific CRC attachment) has been reached;

[..]

Reference(s)

TS 25.321 clause 11.2.2A, 11.8.1.9

7.1.8.3.3 Test purpose

1. To verify that the UE releases E-DCH resources when no valid E-AGCH is received and allocates E-DCH resources when a valid E-AGCH is received.

7.1.8.3.4 Method of test

Initial conditions

UE is in Enhanced CELL_FACH state with DTCH/DCCH on common E-DCH / HS-DSCH.

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 9.1 using condition "AM Packet to Enhanced CELL_FACH from Enhanced CELL_FACH in PS with SRBs mapped on common E-DCH/HS-DSCH".

The radio bearer is placed in UE loop-back mode 1 with the UL SDU size set to 40 bytes.

System Simulator

1 cell, default parameters, Ciphering Off

Test procedure

a) Void

b) The SS sends 15 RLC SDU of size 40 bytes on the downlink.

c) The SS allocates common E-DCH resource.

d) The SS does not transmit a grant on the E-AGCH thereby causing the UE to implicitly release the allocated E-DCH resources after expiry of collision resolution phase.

e) The SS checks that UE initiates a PRACH preamble and Acquisition Indication for a new common E-DCH channel which is used to loop back the data. SS checks the loop back data.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			Void	
1a			Void	
2	←		RLC SDU	SS sends 15 RLC SDU of size 40 bytes on the downlink
3			UE acquires common E-DCH resource	Preamble transmission to use common E-DCH resource and SS acknowledges the RACH transmission
4				SS does not send E-AGCH
5			Wait for T = 15TTI	SS monitors data transmissions while waiting for the collision resolution phase to end.
6			UE acquires common E-DCH resource	UE initiates a PRACH preamble and Acquisition Indication for a new common E-DCH channel which is used to loop back the data
7	←		Absolute Grant	SS sends E-AGCH with serving grant 4
8	→		RLC SDU	SS receives and checks loop back data on common E-DCH

Specific Message Contents

Use the default parameter values for the system information block with the same type specified in clause 6.1.0b of TS 34.108, with the following exceptions

Contents of System Information Block type 1

Information Element	Value/Remark
- UE Timers and constants in connected mode -N300	 0

PRACH power offset info, PRACH info, and PRACH partitioning in System Information Block type 5/System Information Block type 5bis

System Information Block type 5/System Information Block type 5bis

Information Element	Value/Remark
- Primary CCPCH info	Not Present
- PRACH system information list	
- PRACH system information	
-PRACH info - CHOICE mode - Available Sub Channel number -PRACH partitioning - Access Service Class - ASC Setting - CHOICE mode - Available signature Start Index - Available signature End Index - Assigned Sub-channel Number - ASC Setting - CHOICE mode - Available signature Start Index - Available signature End Index - Assigned Sub-channel Number -PRACH power offset - Preamble Retrans Max - RACH transmission parameters - Mmax - Common EDCH System Info - Maximum period for collision resolution phase - E-DCH transmission continuation back off - Initial serving grant value	 FDD '1111 1111 1111'B 2 Access Service Classes FDD 0 (ASC#0) 7 (ASC#0) '0001'B The first/ leftmost bit of the bit string contains the most significant bit of the Assigned Sub-Channel Number FDD 0 (ASC#1) 7 (ASC#1) '0010'B The first/ leftmost bit of the bit string contains the most significant bit of the Assigned Sub-Channel Number 5 1 8TTI infinity 4

7.1.8.3.5 Test requirements

1. At step 6, the UE initiate a PRACH preamble and Acquisition Indication.
2. At step 8, the SS shall receive at least one loopback RLC PDU.

7.1.8.4 DTCH/DCCH transmission – explicit common E-DCH resource release by E-AGCH

7.1.8.4.1 Definition and applicability

Applicable for all UEs supporting Enhanced UL in Cell_FACH.

7.1.8.4.2 Conformance Requirement

[..]

- Explicit common E-DCH resource release:
  In case of DTCH/DCCH transmission, if an E-AGCH with UE's E-RNTI has been received (through an E-

RNTI-specific CRC attachment) with absolute grant value set to 'INACTIVE', then this triggers a CMAC-STATUS which informs the RRC about end of the Enhanced Uplink for CELL_FACH state and Idle mode.

[..]

- If the UE is sending DTCH or DCCH data, the UE shall release the common E-DCH resource under following conditions:
  - an E-AGCH is received with a common E-DCH resource release command (INACTIVE) (explicit common E-DCH resource release);

[..]

Reference(s)

TS 25.321 clause 11.2.2A, 11.8.1.9

7.1.8.4.3 Test purpose

1. To verify that the UE releases E-DCH resources when a valid E-AGCH is received with a common E-DCH resource release command (INACTIVE).

7.1.8.4.4 Method of test

Initial conditions

UE is in Enhanced CELL_FACH state with DTCH/DCCH on common E-DCH / HS-DSCH.

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 9.1 using condition “AM Packet to Enhanced CELL_FACH from Enhanced CELL_FACH in PS with SRBs mapped on common E-DCH/HS-DSCH”.

The radio bearer is placed in UE loop-back mode 1 with the UL SDU size set to 10 bytes.

System Simulator

1 cell, default parameters, Ciphering Off

Test procedure

a) UE has common E-DCH resource and allocated E-RNTI to allow data transmission on DTCH. SS sends absolute grant with value of 4 which is sufficient for the UE to transmit data.

b) The SS sends 1 RLC SDU of size 10 bytes on the downlink.

c) The SS receives looped back data on the common E-DCH channel.

d) SS sends Explicit Release on E-AGCH to release the common E-DCH resource.

e) The SS sends 1 RLC SDU of size 10 bytes on the downlink.

f) The SS checks that original common E-DCH channel has been explicitly released by checking that UE initiates a PRACH preamble and Acquisition Indication for a new common E-DCH channel which is used to loop back the data. SS checks the loop back data.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		

1	←		UE has common E-DCH with E-RNTI allocated. The user plane RAB uses DTCH transmission.
1a	←	Absolute Grant	Serving Grant value 4
2	←	RLC SDU	SS sends 1 RLC SDU of size 10 bytes on the downlink
3	→	RLC SDU	SS receives and checks loop back data on common E-DCH
4	←	Absolute grant set to INACTIVE	The SS explicitly instructs the UE to release the E-DCH resources
5	←	RLC SDU	SS sends 1 RLC SDU of size 10 bytes on the downlink
6	<->	UE acquires common E-DCH resource	SS first checks that UE perform Prach Preamble prior to acquiring common E-DCH resource. UE shall then loop back the data using DTCH transmission on common E-DCH
7	→	RLC SDU	SS receives and checks loop back data on common E-DCH

Specific Message Contents

Use the default parameter values for the system information block with the same type specified in clause 6.1.0b of TS 34.108, with the following exceptions

Contents of System Information Block type 1

Information Element	Value/Remark
- UE Timers and constants in connected mode -N300	 0

System Information Block type 5/System Information Block type 5bis

Information Element	Value/Remark
- Primary CCPCH info	Not Present
- PRACH system information list	
- PRACH system information	
-PRACH info	
- CHOICE mode	FDD
- Available Sub Channel number	'1111 1111 1111'B
-PRACH partitioning	
- Access Service Class	2 Access Service Classes
- ASC Setting	
- CHOICE mode	FDD
- Available signature Start Index	0 (ASC#0)
- Available signature End Index	7 (ASC#0)
- Assigned Sub-channel Number	'0001'B The first/ leftmost bit of the bit string contains the most significant bit of the Assigned Sub-Channel Number
- ASC Setting	
- CHOICE mode	FDD
- Available signature Start Index	0 (ASC#1)
- Available signature End Index	7 (ASC#1)
- Assigned Sub-channel Number	'0010'B The first/ leftmost bit of the bit string contains the most significant bit of the Assigned Sub-Channel Number
-PRACH power offset	
- Preamble Retrans Max	5
- RACH transmission parameters	
- Mmax	1
- Common EDCH System Info	
- Maximum period for collision resolution phase	8TTI
- E-DCH transmission continuation back off	infinity

7.1.8.4.5 Test requirements

At step 3, the SS shall receive the loopback PDU.

At step 7, the SS shall receive the loopback PDU on E-DCH resource used other than step 3.

7.1.8.5 RACH procedure with both normal AIs and extended AIs (using E-AICH).

7.1.8.5.1 Definition and Applicability

All UEs which support E-DCH in CELL_FACH

7.1.8.5.2 Conformance Requirement

Extract from 25.211 5.3.3.7.

The use of acquisition indicators is described in [5]. The meaning of acquisition indicators depends on whether a UE sends an access preamble signature corresponding to a PRACH message or corresponding to an E-DCH transmission. Furthermore, if a UE sends an access preamble signature corresponding to an E-DCH transmission, the meaning of the acquisition indicator depends on whether EAI is configured or not. The following rules apply for one PRACH preamble scrambling code. If multiple PRACH preamble scrambling codes are defined in a cell, then for each of them the following rules are used independently.

- If the UE sends an access preamble signature corresponding to a PRACH message, then;
  - if an Acquisition Indicator is set to +1, it represents a positive acknowledgement,

  - if an Acquisition Indicator is set to -1, it represents a negative acknowledgement.

- If the UE sends an access preamble signature corresponding to an E-DCH transmission, then;
  - if the corresponding Acquisition Indicator is set to +1, it represents a positive acknowledgement and the associated default E-DCH resource configuration is allocated to the UE,
  - if the corresponding Acquisition Indicator is set to -1 and EAI is not configured, then it represents a negative acknowledgement,
  - if the corresponding Acquisition Indicator is set to -1 and EAI is configured, then the UE detects which one of the Extended Acquisition Indicator signatures is present.

Extract from 25.331 clause 8.1.3.9 (for RRC CONNECTION REJECT)

2> if V300 is greater than N300:

3> enter idle mode;

3> perform the actions specified in TS 25.331 subclause 8.5.2 when entering idle mode from connected mode;

3> consider the RRC establishment procedure to be unsuccessful;

3> the procedure ends.

References(s)

TS 25.211 5.3.3.7 , TS 25.331 clause 8.1.3.9

7.1.8.5.3 Test purpose

The purpose of the test case is to verify that UE successfully completes raching procedure when E-AICH is not configured and when E-AICH is configured.

7.1.8.5.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

UE: Idle state (state 3 or state 7) as specified in clause 7.4 of TS 34.108 with a CN UE identity, depending on the CN domain(s) supported by the UE.

Test procedure

a) SS transmits the PAGING TYPE 1 with cause BCCH modification.

b) SS transmits the changed system information SIB1 and SIB5 / SIB5bis. UE updates the stored SIBs. The new SIB 5 / SIB5-bis contains the common E-DCH related information (E-AIs not supported).

c) SS transmits the PAGING TYPE 1 with cause Terminating Interactive Call.

d) The SS measures the preamble signature used

e) The SS responds with a negative acquisition indicator on the AICH.

f) The SS monitors the RACH channel for 10 seconds to ensure that no further RACH accesses occur.

g) The SS transmits the PAGING TYPE 1 with cause Terminating Interactive Call.

h) The SS measures the preamble signature used .

i) The SS responds with a positive acquisition indicator on the AICH.

j) UE transmits RRC CONNECTION REQ using the common E-DCH resources allocated.

k) The SS responds with RRC CONNECTION REJECT to avoid any HARQ retransmission and to bring the UE to Idle mode.

l) SS transmits the PAGING TYPE 1 with cause BCCH modification.

m) SS transmits the changed system information SIB5 / SIB5bis. UE updates the stored SIBs. The new SIB 5 / SIB5-bis contain the common E-DCH related information (E-AIs supported).

n) SS transmits the PAGING TYPE 1 with cause Terminating Interactive Call.

o) The SS measures the preamble signature used.

p) The SS responds with a negative acquisition indicator on the AICH.

q) The SS responds with acquisition indicator on the E-AICH with index to use common E-DCH resource.

r) UE transmits RRC CONNECTION REQ using the common E-DCH resources allocated.

s) The SS responds with RRC CONNECTION REJECT to avoid any HARQ retransmission and to bring the UE to Idle mode.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		

1	←	Paging Type 1	BCCH change ind
2	←	SIB1 and SIB 5/ SIB5bis	SS transmits E-DCH common information to UE with E-AIs NOT supported
3	SS		SS waits 5s (to ensure that the UE has time to read the new system information)
4	←	Paging Type 1	SS starts to transmit this message on the PCCH at the correct paging occasion with cause "Terminating Interactive Call"
5	→	Access Preamble	
6	←	AICH = NEG ACQUISITION IND	
7	SS	Wait for T = 10s	SS monitors for RACH access attempts
8	←	Paging Type 1	SS starts to transmit this message continuously on the PCCH at the correct paging occasion with cause "Terminating Interactive Call"
9	→	Access Preamble	
10	←	AICH = POS ACQUISITION IND	Use default common E-DCH resource
11	→	RRC CONNECTION REQ	
12	←	RRC CONNECTION REJECT	IE "wait time" set to 0 to bring the UE to idle mode.
13		Paging Type 1	BCCH change ind
14	SS	SIB 5/ SIB5bis	SS transmits E-DCH common information to UE with E-AIs supported
15	SS		SS waits 5s (to ensure that the UE has time to read the new system information)
16	←	Paging Type 1	SS starts to transmit this message continuously on the PCCH at the correct paging occasion with cause "Terminating Interactive Call"
17	→	Access Preamble	
18	←	AICH = NEG ACQUISITION IND	
19	←	E-AICH = Index to common E-DCH resource	
20	→	RRC CONNECTION REQ	
21	←	RRC CONNECTION REJECT	IE "wait time" set to 0 to bring the UE to idle mode.

Specific Message Contents

Use the default parameter values for the system information block with the same type specified in clause 6.1.0b of TS 34.108, with the following exceptions

PAGING TYPE 1 (Step 1, Step 13)

Information Element	Value/remark
Message Type	
Paging record list	Not Present
BCCH modification info	
MIB Value Tag	Set to (Current MIB value tag + 1)
BCCH Modification time	Not Present

SYSTEM INFORMATION TYPE 1 (Step 2)

Use the default parameter values for the system information block with the same type specified in clause 6.1.0b of TS 34.108, with the following exceptions:

Information Element	Value/Remark
- UE Timers and constants in connected mode -N300	 0

SYSTEM INFORMATION BLOCK TYPE 5/SYSTEM INFORMATION BLOCK TYPE 5bis (Step 2) (FDD)

Use the same message type found in clause 6.1 of TS 34.108 with condition B3 "Only for cells which configure common E-DCH and HS-DSCH reception in CELL_FACH", with the following exception.

Information Element	Value/remark
- Common EDCH system information -PRACH-PreambleForEnhancedUplink - e-ai-Indication	 FALSE
- Common E-DCH Resource Configuration Information List	1 E-DCH resource
- S-offset	0
- F-DPCH Code number	12
- E-RGCH Information	
- Signature Sequence	0
- RG combination index	0
- E-HICH Info	
- Channelisation Code	4
- Signature Sequence	1
- Uplink DPCH Code Info	
- ul-DPCCHscramblingCodeType	Long
- ul-DPCCHscramblingCode	10

PAGING TYPE 1 (Step 4, Step 8 and Step 13)

Information Element	Value/remark
Message Type	
Paging record list	Only 1 entry
Paging record	
- CHOICE Used paging identity	CN identity
- Paging Cause	Terminating Call with one of the supported services
- CN Domain Identity	PS Domain
- CHOICE UE Identity	Local (P)TMSI
- Routing parameter	Same as registered P-TMSI
BCCH modification info	Not Present

SYSTEM INFORMATION BLOCK TYPE 5/SYSTEM INFORMATION BLOCK TYPE 5bis (Step 14) (FDD)

Use the same message type found in clause 6.1 of TS 34.108 with condition B3 "Only for cells which configure common E-DCH and HS-DSCH reception in CELL_FACH", with the following exception.

Information Element	Value/remark
- Common EDCH system information **-PRACH-PreambleForEnhancedUplink** - e-ai-Indication	 TRUE
- Common E-DCH Resource Configuration Information List	1 E-DCH resource
- S-offset	0
- F-DPCH Code number	12
- E-RGCH Information	
- Signature Sequence	0
- RG combination index	0
- E-HICH Info	
- Channelisation Code	4
- Signature Sequence	1
- Uplink DPCH Code Info	
- ul-DPCCHscramblingCodeType	Long
- ul-DPCCHscramblingCode	10

RRC CONNECTION REJECT (Step 12, Step 21)

Use the same message type found in clause 9 of TS 34.108, with the following exception.

Information Element	Value/remark
Initial UE Identity	Same as the type and value defined in RRC CONNECTION REQUEST message (step 5)
Reject Cause	Congestion
Wait time	0 second

7.1.8.5.5 Test requirements

1. At step 7, SS checks UE does not try for RACH access after transmitting AICH = NEG ACQUISITION IND.
2. At step 11, SS shall receive RRC CONNECTION REQ sent by UE after transmitting AICH = POS ACQUISITION IND (with Index to default common E-DCH resource) at step 10.
3. At step 20 , SS shall receive RRC CONNECTION REQ after transmitting AICH = NEG ACQUISITION IND at step 18 and E-AICH = Index to common E-DCH resource at step 19.

7.1.8.6 DTCH/DCCH transmission - Implicit release with E-DCH transmission continuation backoff - Timer Based

7.1.8.6.1 Definition and applicability

Applicable for all UEs supporting Enhanced UL in Cell_FACH.

7.1.8.6.2 Conformance Requirement

[..]

- Implicit release with E-DCH transmission continuation backoff
  Implicit resource release is enabled only if "E-DCH transmission continuation back off" is not set to "infinity".
  If implicit resource release is enabled, then in case of DTCH/DCCH transmission, the timer Tb is set to "E-DCH transmission continuation back off" value, when TEBS is 0 byte and the last generated MAC-i PDU with higher layer data is provided with the PHY-data-REQ primitive to the physical layer for transmission.
  If TEBS <> 0 byte is detected while timer Tb is running, then the timer is stopped and uplink data transmission on the common E-DCH resource continues.
  If a MAC-ehs PDU is received while timer Tb is running, then the timer is re-started.
  If the "E-DCH transmission continuation back off" value is set to "0" or if timer Tb expires the MAC-STATUS-Ind primitive indicates to RLC for each logical channel that no PDUs shall be transferred to MAC. TEBS = 0 byte is reported to the Node B MAC as SI in a MAC-i PDU. If the "E-DCH transmission continuation back off" value is set to "0", then the SI shall be transmitted with the MAC-i PDU carrying the last DCCH/DTCH data, given the serving grant is sufficient to carry the SI in the same MAC-i PDU together with the remaining DCCH/DTCH data. Otherwise, the empty buffer status report is transmitted separately with the next MAC-i PDU.

CMAC-STATUS-Ind which informs the RRC about the Enhanced Uplink in CELL_FACH state and Idle mode process termination is triggered when the empty buffer status has been reported and no MAC-i PDU is left in any HARQ process for (re-)transmission.

[..]

When "E-DCH transmission continuation back off" is set to "infinity", the Scheduling Information with empty buffer status report shall be transmitted with the MAC-i PDU carrying the last DCCH/DTCH data, given the serving grant is sufficient to carry the SI in the same MAC-i PDU together with the remaining DCCH/DTCH data. Otherwise, the Scheduling Information with empty buffer status report is transmitted separately with the next MAC-i PDU.

[..]

If the UE is sending DTCH or DCCH data, the UE shall release the common E-DCH resource under following conditions:

[..]

- "E-DCH transmission continuation back off" is not set to "infinity", the empty buffer status (TEBS = 0 byte) has been reported and no MAC-i PDU is left in a HARQ process for (re-)transmission.

[..]

Reference(s)

TS 25.321 clause 11.2.2A, 11.8.1.6, 11.8.1.9

7.1.8.6.3 Test purpose

1. To verify that the UE releases E-DCH resources implicitly only if "E-DCH transmission continuation backoff is not set to "infinity".
2. To verify that, when "E-DCH transmission continuation backoff is set to "infinity" and all data have been sent, the UE send the Scheduling Information with empty buffer status report in the same MAC-i PDU carrying the last DCCH/DTCH data.

7.1.8.6.4 Method of test

Initial conditions

System Simulator

1 cell, default parameters, Ciphering Off

User Equipment:

SS shall broadcast SIB5/SIB5bis with Common E-DCH/HS-DSCH information with specific message content given below.

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 9.1 using condition "AM Packet to Enhanced CELL_FACH from Enhanced CELL_FACH in PS with SRBs mapped on common E-DCH/HS-DSCH".

UE is in Enhanced CELL_FACH state with DTCH/DCCH on common E-DCH / HS-DSCH.

The radio bearer is placed in UE loop-back mode 1 with the UL SDU size set to 10 bytes.

Test procedure

a) UE has common E-DCH resource and allocated E-RNTI to allow data transmission on DTCH. SS sends absolute grant with value of 4 which is sufficient for the UE to transmit data.
b) The SS sends 1 RLC SDU of size 10 bytes on the downlink.
c) The SS receives looped back data on the common E-DCH channel.

NOTE: Data should be looped back before E-DCH-transmission continuation back off period expires.

d) The SS waits sufficient time for the "E-DCH transmission continuation back off" period to expire after loop back data transfer.

e) The SS sends 1 RLC SDU of size 10 bytes on the downlink.

f) The SS checks that original common E-DCH channel has been implicitly released by checking that UE initiates a PRACH preamble and Acquisition Indication for a new common E-DCH channel which is used to loop back the data. SS checks the loop back data.

g) SS checks that all the data is looped back on common E-DCH channel.

h) SS sends Explicit Release on E-AGCH to release the common E-DCH resource.

i) The SS commences required actions for acquisition indication and assignment of a common E-DCH resource for RACH preamble phase.

j) The SS issues an absolute grant on E-AGCH with the UE's E-RNTI and a signalling value of 4 during the collision resolution phase to allow the UE to transmit data. SS ensure that E-AGCH is received by UE within Maximum period for collision resolution time interval.

k) UE performs PRACH preamble and Acquisition Indication for a common E-DCH resource allocation.

l) After 120TTI, the SS checks that common E-DCH has not been released by checking that there is still transmission on UL DPCCH assigned to that resource.

m) After 120TTI, the SS checks that common E-DCH has not been released by checking that data can be looped back on the existing common E-DCH without PRACH preamble and AICH procedure for acquiring a common E-DCH resource. The SS also checks that the UE includes the SI with TEBS=0 in the same MAC-i PDU together with the DCCH/DTCH data.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←		UE has common E-DCH with E-RNTI allocated. The user plane RAB uses DTCH transmission.
1a	←	Absolute Grant	Serving Grant 4
2	←	RLC SDU	SS sends 1 RLC SDU of size 10 bytes on the downlink
3	→	RLC SDU	SS receives and checks loop back data on common E-DCH
4		Wait for "E-DCH transmission continuation back off" expiry	SS should check that UL DPCCH is maintained by the UE until "E-DCH transmission continuation back off" expiry
5	←	RLC SDU	SS sends another 1 RLC SDU of size 10 bytes
6	<->	UE acquires common E-DCH resource	SS checks that UE perform PRACH Preamble prior to acquiring common E-DCH resource.
6a	←	Absolute Grant	Serving Grant 4
6b	→	RLC SDU	SS receives and checks loop back data on common E-DCH
7	←	Absolute Grant	SS sends Explicit Release on E-AGCHcommand
8	←	System Information change indication	SS modified system information by setting "E-DCH transmission continuation back off" period to

			"infinity"
9	←	RLC SDU	SS sends 1 RLC SDU of size 10 bytes on the downlink
10	<->	UE acquires common E-DCH resource	SS first checks that UE perform Prach Preamble prior to acquiring common E-DCH resource. UE shall then loop back the data using DTCH transmission on common E-DCH
10a	←	Absolute Grant	Serving Grant 4
11	→	RLC SDU	SS receives and checks loop back data on common E-DCH
12		WAIT for 120 TTI	SS waits for the maximum setting of the "E-DCH transmission continuation back off" to end
12a	←	Absolute Grant	Serving Grant 4
13	←	RLC SDU	SS sends 1 RLC SDU of size 10 bytes on the downlink
14	→	RLC SDU	UE shall loop back the data and a SI with TEBS=0 in the same MAC-I PDU on the existing common E-DCH without PRACH preamble and AICH procedure for acquiring a common E-DCH resource

Specific Message Contents

Use the same message type found in clause 6.1.1 of TS 34.108, with SIB5 configured for common E-DCH / HS-DSCH, with the following exceptions.

System Information Block type 5/System Information Block type 5bis

Information Element	Value/Remark
- Primary CCPCH info	Not Present
- PRACH system information list	
- PRACH system information	
-PRACH info	
- CHOICE mode	FDD
- Available Sub Channel number	'1111 1111 1111'B
-PRACH partitioning	
- Access Service Class	2 Access Service Classes
- ASC Setting	
- CHOICE mode	FDD
- Available signature Start Index	0 (ASC#0)
- Available signature End Index	7 (ASC#0)
- Assigned Sub-channel Number	'0001'B The first/ leftmost bit of the bit string contains the most significant bit of the Assigned Sub-Channel Number
- ASC Setting	
- CHOICE mode	FDD
- Available signature Start Index	0 (ASC#1)
- Available signature End Index	7 (ASC#1)
- Assigned Sub-channel Number	'0010'B The first/ leftmost bit of the bit string contains the most significant bit of the Assigned Sub-Channel Number
-PRACH power offset	
- Preamble Retrans Max	5
- RACH transmission parameters	
- Mmax	1
- Common EDCH System Info	
- Maximum period for collision resolution phase	8TTI
- E-DCH transmission continuation back off	80TTI

7.1.8.6.5 Test requirements

- at step 6a, UE shall perform PRACH preamble and receive Acquisition Indication before looping back data on allocated common E-DCH resource.

- at step 14 UE shall loop back data and a SI with TEBS=0 in the same MAC-I PDU on existing common E-DCH resource without PRACH preamble and Acquisition Indication procedure.

7.1.8.6a DTCH/DCCH transmission - Implicit release with E-DCH transmission continuation backoff value set to “0”

7.1.8.6a.1 Definition and applicability

Applicable for all UEs supporting Enhanced UL in Cell_FACH.

7.1.8.6a.2 Conformance Requirement

[..]

- Implicit release with E-DCH transmission continuation backoff
  Implicit resource release is enabled only if "E-DCH transmission continuation back off" is not set to "infinity". If implicit resource release is enabled, then in case of DTCH/DCCH transmission, the timer Tb is set to "E-DCH transmission continuation back off" value, when TEBS is 0 byte and the last generated MAC-i PDU with higher layer data is provided with the PHY-data-REQ primitive to the physical layer for transmission.

If TEBS <> 0 byte is detected while timer Tb is running, then the timer is stopped and uplink data transmission on the common E-DCH resource continues.
If a MAC-ehs PDU is received while timer Tb is running, then the timer is re-started.
If the "E-DCH transmission continuation back off" value is set to "0" or if timer Tb expires the MAC-STATUS-Ind primitive indicates to RLC for each logical channel that no PDUs shall be transferred to MAC. TEBS = 0 byte is reported to the Node B MAC as SI in a MAC-i PDU. If the "E-DCH transmission continuation back off" value is set to "0", then the SI shall be transmitted with the MAC-i PDU carrying the last DCCH/DTCH data, given the serving grant is sufficient to carry the SI in the same MAC-i PDU together with the remaining DCCH/DTCH data. Otherwise, the empty buffer status report is transmitted separately with the next MAC-i PDU.
CMAC-STATUS-Ind which informs the RRC about the Enhanced Uplink in CELL_FACH state and Idle mode process termination is triggered when the empty buffer status has been reported and no MAC-i PDU is left in any HARQ process for (re-)transmission.

[..]

If the UE is sending DTCH or DCCH data, the UE shall release the common E-DCH resource under following conditions:

[..]

- "E-DCH transmission continuation back off" is not set to "infinity", the empty buffer status (TEBS = 0 byte) has been reported and no MAC-i PDU is left in a HARQ process for (re-)transmission.

[..]

Reference(s)

TS 25.321 clause 11.2.2A, 11.8.1.9

7.1.8.6a.3 Test purpose

1. To verify that, when “E-DCH transmission continuation back off" value is set to "0" and UE has resources to transmit all remaining data and a SI, the UE transmit a SI with TEBS=0 in a MAC-i PDU together with the remaining DCCH/DTCH data.

2. To verify that, when “E-DCH transmission continuation back off" value is set to "0" and UE has not resources to transmit all remaining data and a SI, the UE transmit a SI with TEBS=0 separately with the next MAC-i PDU.

7.1.8.6a.4 Method of test

Initial conditions

System Simulator

1 cell, default parameters, Ciphering Off

SS shall broadcast SIB5/SIB5bis with Common E-DCH/HS-DSCH information with specific message content given below.

User Equipment:

UE is in Enhanced CELL_FACH state with DTCH/DCCH on common E-DCH / HS-DSCH.

The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 9.1 using condition “AM Packet to Enhanced CELL_FACH from Enhanced CELL_FACH in PS with SRBs mapped on common E-DCH/HS-DSCH”.

The radio bearer is placed in UE loop-back mode 1 configured to return UL RLC SDUs of the same size as the received DL RLC SDUs.

Test procedure

a) UE has common E-DCH resource and allocated E-RNTI to allow data transmission on DTCH. SS sends absolute grant with value of 30.

b) The SS sends 1 RLC SDU of size 12 bytes on the downlink.

c) The UE has enough resources to transmit all data and SI with TEBS=0. The SS receives looped back data and a SI with TEBS=0 in the same MAC-i PDU on the common E-DCH channel.

d1) After UE has received the HARQ ACK then is the UE performing an implicit release.

NOTE 1: UE is performing an implicit release as “E-DCH transmission continuation back off" value is set to "0" in broadcasted SIB5 and all data have been transmitted.

d2) The SS sends 1 RLC SDU of size 12 bytes on the downlink.

e) The SS checks that original common E-DCH channel has been implicitly released by checking that UE initiates a PRACH preamble and Acquisition Indication for a new common E-DCH channel which is used to loop back the data. SS sends absolute grant with value of 10 allowing UE to return data only.

NOTE 2: An absolute grant of 10 corresponds to AG Index 5, E-TFCI = 1. TBS = 120 bits. With 24 bits for MAC-i/is header of 24 bits this allows 96 bits for data (12 bytes).

f) The SS receives looped back data only in a MAC-i PDU on the common E-DCH channel.

g) The SS receives a MAC-i PDU with SI with TEBS=0 on the common E-DCH channel.

h) After UE has received the HARQ ACK then is the UE performing an implicit release.

NOTE 3: UE is performing an implicit release as “E-DCH transmission continuation back off" value is set to "0" in broadcasted SIB5 and all data have been transmitted.

i) The SS sends 1 RLC SDU of size 12 bytes on the downlink.

j) The SS checks that original common E-DCH channel has been implicitly released by checking that UE initiates a PRACH preamble and Acquisition Indication for a new common E-DCH channel which is used to loop back the data. SS sends absolute grant with value of 30 allowing UE to return data and SI on the same MAC-i PDU.

k) The UE has enough resources to transmit all data and SI with TEBS=0. The SS receives looped back data and a SI with TEBS=0 in the same MAC-i PDU on the common E-DCH channel.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←			UE has common E-DCH with E-RNTI allocated. The user plane RAB uses DTCH transmission.
2	←		Absolute Grant	Serving Grant 30. (Note 1)
3	←		RLC SDU	SS sends 1 RLC SDU of size 12 bytes on the downlink
4	→		RLC SDU	SS checks that UE transmits the loop back data and a SI with TEBS=0 in the same MAC-i PDU on the common E-DCH
5	←		HARQ ACK	SS acknowledge the received RLC SDU and wait 100 ms for UE to release the resources
6	←		RLC SDU	SS sends 1 RLC SDU of size 12 bytes
7	<->		UE acquires common E-DCH resource	SS checks that UE perform PRACH Preamble prior to acquiring common E-DCH resource.
8	←		Absolute Grant	Serving Grant 10. (Note 2)

9	→	RLC SDU	SS receives and checks loop back data on the common E-DCH. The SS checks that no SI is received.
10	→	SI	SS checks that the UE transmit a MAC-I PDU with TEBS=0.
11	←	HARQ ACK	SS acknowledge the received SI and wait 100 ms for UE to release the resources
12	←	RLC SDU	SS sends 1 RLC SDU of size 12 bytes
13	<->	UE acquires common E-DCH resource	SS checks that UE perform PRACH Preamble prior to acquiring common E-DCH resource.
14	←	Absolute Grant	Serving Grant 30. (Note 1)
15	→	RLC SDU	SS receives and checks loop back data and a SI with TEBS=0 in the same MAC-i PDU on the common E-DCH.
Note 1: Grant value of 30 guarantees that UE have common resources to be able to transmit remaining data and the scheduling information in the same TTI. Note 2: Grant value of 10 guarantees that UE have common resources to be able to transmit remaining data only causing the scheduling information to be sent in next TTI.			

Specific Message Contents

Use the same message type found in clause 6.1.1 of TS 34.108, with SIB5 configured for common E-DCH / HS-DSCH, with the following exceptions.

System Information Block type 5/System Information Block type 5bis

Information Element	Value/Remark
- Primary CCPCH info	Not Present
- PRACH system information list	
- PRACH system information	
-PRACH info - CHOICE mode - Available Sub Channel number -PRACH partitioning - Access Service Class - ASC Setting - CHOICE mode - Available signature Start Index - Available signature End Index - Assigned Sub-channel Number - ASC Setting - CHOICE mode - Available signature Start Index - Available signature End Index - Assigned Sub-channel Number -PRACH power offset - Preamble Retrans Max - RACH transmission parameters - Mmax - Common EDCH System Info - Maximum period for collision resolution phase - E-DCH transmission continuation back off	 FDD '1111 1111 1111'B 2 Access Service Classes FDD 0 (ASC#0) 7 (ASC#0) '0001'B The first/ leftmost bit of the bit string contains the most significant bit of the Assigned Sub-Channel Number FDD 0 (ASC#1) 7 (ASC#1) '0010'B The first/ leftmost bit of the bit string contains the most significant bit of the Assigned Sub-Channel Number 5 1 8TTI 0TTI

7.1.8.6a.5 Test requirements

- At step 4 the UE shall include data and a SI with TEBS=0 in the same MAC-i PDU.
- At step 7, UE shall perform PRACH preamble and receive Acquisition Indication before looping back data on allocated common E-DCH resource.
- At step 10, UE shall send a MAC-I PDU including a SI with TEBS=0
- At step 13, UE shall perform PRACH preamble and receive Acquisition Indication before looping back data on allocated common E-DCH resource.

7.1.8.7 Physical Channel Failure for EUL in CELL-FACH during initial access preamble

7.1.8.7.1 Definition and Applicability

All UEs which support E-DCH in CELL_FACH

7.1.8.7.2 Conformance Requirement

- If the UE according to subclause 8.5.4A in [7] failed to establish the physical channels, or if the criteria for radio link failure are met as specified in subclause 8.5.6 in [7], then the timer T_2 is started. After the expiry of T_2 a backoff timer T_{BO1} is started. Backoff timer T_{BO1} is set to an integer number N_{BO1} of 10 ms time intervals, randomly drawn within an interval $0 \leq N_{BO1min} \leq N_{BO1} \leq N_{BO1max}$ (with uniform distribution). N_{BO1min} and N_{BO1max} may be set equal when a fixed delay is desired, and even to zero when no delay other than the one due to persistency is desired. The procedure ends if timer TBO1 expires or the UE performs cell reselection while timer TBO1 is running, whatever occurs first. In case of a cell reselection, the timer TBO1 is stopped.

[…]

When the physical channel establishment for Enhanced Uplink in CELL_FACH state and Idle mode is initiated by the UE, the UE shall considered the physical channel being immediately established.

If the physical layer considers the post-verification of procedure AA failed [29, section 4.3.2.3A], the UE shall consider this as a "physical channel failure".

NOTE: The criteria defined in this subclause only apply in case the UE performs synchronisation procedure AA (FDD only).

[…]

d) The UE shall start transmission on uplink at the time defined for the Enhanced Uplink in CELL_FACH state and IDLE mode in [1] and shall use a post-verification period for confirming the establishment of the downlink physical channel as follows: During the first 40 ms period of the first phase of the downlink synchronisation procedure the UE shall control its transmitter according to a downlink F-DPCH quality criterion as follows:

- When the UE estimates the F-DPCH quality over the first 40 ms period of the first phase of the downlink synchronisation status evaluation to be worse than a threshold Q_{in}, the UE shall shut its transmitter off and consider post-verification failed. Q_{in} is defined implicitly by the relevant tests in [7].

If the post-verification has failed, the UE shall not transmit on uplink and await higher layer orders.

[…]

TS 25.321 11.2.2A , Figure 11.2.2A-2

TS 25.331 8.5.4A

TS 25.214 4.3.2.3A

7.1.8.7.3 Test purpose

To verify that UE detects physical channel failure in the RACH preamble procedure for enhanced uplink in CELL_FACH and ends that access attempt.

7.1.8.7.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

SS shall broadcast SIB5/SIB5bis with condition B3 "Only for cells which configure common E-DCH and HS-DSCH reception in CELL_FACH".

User Equipment:

UE: Idle state (state 3 or state 7) as specified in clause 7.4 of TS 34.108 with a CN UE identity, depending on the CN domain(s) supported by the UE.

Test procedure

a) SS transmits the PAGING TYPE 1 with cause terminating conversational call.

b) UE sends an access preamble.

c) SS responds with positive E-AI but does not send F-DPCH.

d) UE detects Physical channel failure

e) UE should end the RACH attempt

f) UE waits for T2 expiry (10ms) + Tbo1 expiry (<= UE shall not attempt another RACH transmission while in waiting for the timer to expire.)

g) UE takes 40 ms to detect the Physical Channel failure at step (d) after SS has stopped F-DPCH transmission. During this period the UE is allowed to transmit on uplink, therefore the SS may receive the uplink RLC SDU.

h) UE then sends another access preamble. The preamble should be triggered by MAC upon receiving RRC connection request from RRC after T300 expiry.

i) SS responds with E-AI and sends F-DPCH as per normal RACH attempt.

j) The UE sends an RRC connection request

k) SS sends RRC Connection Reject to terminate the procedure

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	Paging Type 1	SS starts to transmit this message on the PCCH at the correct paging occasion with cause “Terminating Interactive Call”
2	→	Access Preamble	
3	←	AICH = POS ACQUISITION IND	
4			SS does not transmit F-DPCH. SS waits for a minimum time of T_2 (10ms) + T_{BO1} (N_{BO1min} * 10 ms) and checks that UE does not perform a new Access Preamble
4a	→		UE takes 40 ms to detect the Physical Channel failure after SS has stopped F-DPCH transmission, SS may receive uplink RLC PDU until 40ms .
5	→	Access Preamble	UE initiates new PRACH preamble attempt after the expiry of T300
6	←	AICH = POS ACQUISITION IND	
7	<->		SS establishes the required physical channels including F-DPCH as per normal enhanced RACH preamble procedure and UE acquires common E-DCH resource
8	→	RRC CONNECTION REQ	Establishment ***cause***=”Terminating Interactive call”
9	←	RRC CONNECTION REJECT	IE "wait time" set to 0 to bring the UE to idle mode.

Specific Message Contents

RRC CONNECTION REJECT (Step 6)

Use the same message type found in clause 9 of TS 34.108, with the following exception.

Information Element	Value/remark
Initial UE Identity	Same as the type and value defined in RRC CONNECTION REQUEST message (step 5)
Reject Cause	Congestion
Wait time	0 second

7.1.8.7.5 Test requirements

1. At step 5, SS checks that UE sends another preamble.

2. At step 8 , UE should send an RRC Connection Request.

7.1.8.8 Radio Link Failure for Enhanced UL in CELL-FACH with DTCH/DCCH active

7.1.8.8.1 Definition and Applicability

All UEs which support E-DCH in CELL_FACH

7.1.8.8.2 Conformance Requirement

For FDD, in CELL_FACH state and Idle mode, in conjunction with the Enhanced Uplink in CELL_FACH state, after receiving an indication from layer 1 that physical layer transmission stopped caused by an DL out-of-synchronisation, the UE shall:

1> consider it as a "Radio link failure".

[…]

The E-DCH enhanced physical random access transmission procedure is completed with release of the allocated common E-DCH resource, if one of the following conditions is fulfilled:

- If the UE according to subclause 8.5.4A in [7] failed to establish the physical channels, or if the criteria for radio link failure are met as specified in subclause 8.5.6 in [7], then the timer T_2 is started. After the expiry of T_2 a backoff timer T_{BO1} is started. Backoff timer T_{BO1} is set to an integer number N_{BO1} of 10 ms time intervals, randomly drawn within an interval $0 \leq N_{BO1min} \leq N_{BO1} \leq N_{BO1max}$ (with uniform distribution). N_{BO1min} and N_{BO1max} may be set equal when a fixed delay is desired, and even to zero when no delay other than the one due to persistency is desired. The procedure ends if timer TBO1 expires or the UE performs cell reselection while timer TBO1 is running, whatever occurs first. In case of a cell reselection, the timer TBO1 is stopped.

[…]

References(s)

TS 25.331 8.5.6

TS 25.321 11.2.2A

7.1.8.8.3 Test purpose

To verify that UE releases common E-DCH resource in the event of radio link failure when DTCH/DCCH is active in Enhanced CELL_FACH state.

7.1.8.8.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

System Information Block type 5 (FDD)

Use the default parameter values for the system information block 5 with the same type specified in clause

6.1.0b of TS 34.108 for common E-DCH and HS-DSCH reception in CELL_FACH, with the following exceptions:

Information Element	Value/Remark
- Common EDCH System Info	
- E-DCH transmission continuation back off	Infinity

User Equipment:

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed with all the parameters as specified in the procedure, with the exception that the default Radio Bearer is replaced with the RB according to clause 6.10.2.4.6.3 using condition A29 with RB mapping to HS-DSCH and E-DCH. The MAC-d flow of the user plane RB is configured for scheduled transmissions. The logical channel, transport channel and common MAC-d flow identities are set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	8	RB25
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the testcase			

The UE is placed into UE test loop mode 1 with the UL SDU size set to 39 octets for RB25

Test procedure

1. SS transmits 1 SDU of size 40 bytes
2. SS waits until data is received and checks that all the data is received. SS checks that there is no RACH preamble prior to data loopback because UE has common E-DCH resource
3. SS stops F-DPCH transmission for 5 seconds. This should be sufficient time for UE to detect Radio Link Failure
4. SS transmits 1 SDU of size 40 bytes
5. UE shall acquire common E-DCH resource as SS resumes F-DPCH following positive AI. SS waits until data is received and checks that all the data is received. SS checks that there is RACH preamble prior to data loopback
6. SS opens the test loop and releases the radio bearer

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures, UE has acquired common E-DCH resource and uses this for UL transmission.
2			Close UE test loop	
2a			Absolute Grant	Serving Grant 4
3	←		DOWNLINK RLC SDU	SDU size = 40 Octets
4	→		UPLINK RLC SDU	The SS checks length and content of the received RLC SDUs. SS checks that there is no RACH preamble prior to data loopback on common E-DCH resource.
5				SS stops F-DPCH transmission
6				Wait 5 seconds. This time is sufficient for UE to detect Radio Link failure and release common E-DCH resource
7	←		DOWNLINK RLC SDU	SDU size = 40 Octets
8	<->		UE acquires common E-DCH resource	SS checks for preamble PRACH and sets up the necessary channels, including the resumption of F-DPCH transmission, and takes the steps necessary for UE to acquire common E-DCH resource
8a			Absolute Grant	Serving Grant 4
9	→		UPLINK RLC SDU	The SS checks length and content of the received RLC SDUs.
10			OPEN UE TEST LOOP PROCEDURE	
11			RB RELEASE	

7.1.8.8.5 Test requirements

- at step 4, the UE shall return 1 SDU with the same content as the transmitted SDU on common E-DCH resource without RACH preamble.

- at step 8, UE shall send RACH preamble.
- t step 9 the UE shall return 1 SDU with the same content as the transmitted SDU on common E-DCH resource.

7.1.8.9 CCCH transmission E-DCH access, the UL transmission within the Scheduling Windows

7.1.8.9.1 Definition and Applicability

1.28Mcps TDD UEs which support E-DCH in CELL_FACH

7.1.8.9.2 Conformance Requirement

Extract from 25.331 8.5.46:

For 1.28 Mcps TDD, whenever the variable COMMON_E_DCH_TRANSMISSION is set to TRUE, the UE shall:

1> if CCCH message is submitted for transmission on the uplink and if the variable E_RNTI is not set:

2> select a common E-RNTI according to subclause 8.5.50;

2> perform E-RUCCH transmission procedure, using the selected common E-RNTI as UE identity;

2> use the selected common E-RNTI as UE identity in the E-AGCH reception procedure in the physical layer in the common E-RNTI scheduling window according to subclause 8.5.50.

1> else:

2> perform E-RUCCH transmission procedure according to the stored PRACH configuration (see [60]), using the value stored in the variable E_RNTI as UE identity;

2> use the value stored in the variable E_RNTI as UE identity in the E-AGCH reception procedure in the physical layer.

1> perform E-HICH reception procedures for the serving E-DCH radio link;

1> perform E-PUCH transmission procedures according to the stored E-PUCH configuration;

1> perform the inclusion of MAC-d PDUs and MAC-c PDUs in a MAC-i PDU for logical channels belonging to the MAC-d flows in accordance with the received scheduling grant on E-AGCH (see [15]).

NOTE: For 1.28 Mcps TDD, when performing E-DCH transmission in CELL_FACH state and Idle mode, the UE shall use the tables of transport block size for the E-DCH physical layer category 3 as specified in [15].

…

When the IE "Common E-RNTI Information" is included in System Information Block type 5, and if the UE is in CELL_FACH state or Idle mode, and if the variable E_RNTI is not set, UE shall use a common E-RNTI for CCCH transmission (i.e. the common E-RNTI identifies the initial access, including RRC connection request and cell update after cell re-selection):

1> configure the MAC layer with the information in the IE(s) "Common E-RNTI information";

1> when a CCCH message is to be sent, and if the variable E_RNTI is not set, the MAC layer operates as follows:

2> select an E-RUCCH;

2> select the instance of the IE(s) "Common E-RNTI information" which is related to the selected E-RUCCH;

2> select a common E-RNTI which is related to the selected E-RUCCH according to the following procedure:

3> compile a list of candidate common E-RNTI group from the selected instance of the IE(s) "Common E-RNTI information" in the order of appearance in System Information Block type 5, and select a common E-RNTI group from the list of candidate Common E-RNTI groups based on the E-RUCCH transmission occasion:

"Index of selected Common E-RNTI group" = SFNE-RUCCH mod K, for TTI of E-RUCCH = 10ms;

or "Index of selected Common E-RNTI group" = SFN'E-RUCCH mod K, for TTI of E-RUCCH = 5ms;

Where K is the number of E-RNTI groups related to the E-RUCCH; $SFN_{E\text{-}RUCCH}$ or $SFN'_{E\text{-}RUCCH}$ is the frame or sub-frame on which the E-RUCCH shall be sent [33].

3> select a common E-RNTI randomly amongst the candidate the candidate E-RNTIs in the selected group.

2> use the value of the selected common E-RNTI as UE identity in current E-RUCCH transmission, and in the E-AGCH reception within the common E-RNTI scheduling window which is of K frames or K sub-frames length.

References(s)

3GPP TS 25.331 clause 8.5.46, 8.5.50.

7.1.8.9.3 Test purpose

The purpose of the test case is to verify support of CCCH transmission E-DCH with common E-RNTI.

7.1.8.9.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

UE: Idle state (state 2 or state 3 or state 7) as specified in clause 7.4 of TS 34.108 with a CN UE identity, depending on the CN domain(s) supported by the UE.

Test procedure

k) SS transmits the PAGING TYPE 1 with cause BCCH modification.

l) SS transmits the changed system information SIB5 / SIB5 bis. UE updates the stored SIBs. The new SIB 5 / SIB5-bis contains the common E-DCH related information.

m) SS transmits the PAGING TYPE 1 with cause terminating conversational call.

n) SS receives E-RUCCH

o) SS transmits a AGCH.

p) SS receives the RRC CONNECTION REQ sent by UE

q) SS transmits a RRC CONNECTION REJECT.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		Paging Type 1	BCCH change ind
2	←		SIB1 and SIB 5/ SIB5 bis	SS transmits E-DCH common information to UE
3				SS waits 5s (to ensure that the UE has time to read the new system information)
4	←		Paging Type 1	SS starts to transmit this message continuously on the PCCH at the correct paging occasion with cause "Terminating conversational call"
5	→		E-RUCCH	SS checks UE use correct common E-RNTI.
6	←		AGCH	
7	→		RRC CONNECTION REQ	

8	←	RRC CONNECTION REJECT	

Specific Message Contents

PAGING TYPE 1 (Step 1)

Information Element	Value/remark
Message Type	
Paging record list	Not Present
BCCH modification info	
MIB Value Tag	Set to (Current MIB value tag + 1)
BCCH Modification time	Not Present

SYSTEM INFORMATION BLOCK TYPE 5 / SYSTEM INFORMATION BLOCK TYPE 5bis (Step 2)

Use the same message type found in clause 6.1 of TS 34.108, with the following exception.

Information Element	Value/remark
- Common EDCH system information	
-CHOICE Mode	TDD
- CHOICE *TDD option*	1.28 Mcps TDD
- CCCH transmission info	
- Common E-RNTI info	
- Common E-RNTI information	
- Starting E-RNTI	'1111 1010 1010 1010'
- Number of group	4
- Number of E-RNTI per group	1

PAGING TYPE 1 (Step 3)

Information Element	Value/remark
Message Type	
Paging record list	Only 1 entry
Paging record	
- CHOICE Used paging identity	CN identity
- Paging Cause	Terminating Call with one of the supported services
- CN Domain Identity	Supported Domain (PS Domain or CS Domain)
- CHOICE UE Identity	Local (P)TMSI
- Routing parameter	Same as registered TMSI or P-TMSI
BCCH modification info	Not Present

7.1.8.9.5 Test requirements

1. At step 5 , SS checks UE use correct common E-RNTI.

7.1.8.10 DTCH/DCCH transmission with E-RUCCH access for dedicated control signalling or dedicated user data when dedicated E-RNTI is allocated

7.1.8.10.1 Definition and Applicability

1.28Mcps TDD UEs which support E-DCH in CELL_FACH

7.1.8.10.2 Conformance Requirement

Extract from 25.331 8.5.46:

For 1.28 Mcps TDD, whenever the variable COMMON_E_DCH_TRANSMISSION is set to TRUE, the UE shall:

1> if CCCH message is submitted for transmission on the uplink and if the variable E_RNTI is not set:

2> select a common E-RNTI according to subclause 8.5.50;

2> perform E-RUCCH transmission procedure, using the selected common E-RNTI as UE identity;

2> use the selected common E-RNTI as UE identity in the E-AGCH reception procedure in the physical layer in the common E-RNTI scheduling window according to subclause 8.5.50.

1> else:

2> perform E-RUCCH transmission procedure according to the stored PRACH configuration (see [60]), using the value stored in the variable E_RNTI as UE identity;

2> use the value stored in the variable E_RNTI as UE identity in the E-AGCH reception procedure in the physical layer.

1> perform E-HICH reception procedures for the serving E-DCH radio link;

1> perform E-PUCH transmission procedures according to the stored E-PUCH configuration;

1> perform the inclusion of MAC-d PDUs and MAC-c PDUs in a MAC-i PDU for logical channels belonging to the MAC-d flows in accordance with the received scheduling grant on E-AGCH (see [15]).

NOTE: For 1.28 Mcps TDD, when performing E-DCH transmission in CELL_FACH state and Idle mode, the UE shall use the tables of transport block size for the E-DCH physical layer category 3 as specified in [15].

References(s)

3GPP TS 25.331 clause 8.5.46.

7.1.8.10.3 Test purpose

The purpose of the test case is to verify support of DTCH/DCCH transmission with E-RUCCH access for dedicated control signalling or dedicated user data when dedicated E-RNTI is allocated

7.1.8.10.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off.

User Equipment:

UE: PS-DCCH+DTCH_FACH (state 6-11) as specified in clause 7.4 of TS 34.108 with a dedicated E-RNTI is allocated.

Test procedure

a) The SS establishes the reference radio bearer configuration specified in TS 34.108 clause 6.11.5.4.7.2 using condition A11 as specified in clause 9.1 of TS 34.108.. See note 1.

b) The SS closes the test loop using UE test loop mode 1 and configuring the UL RLC SDU size to be equal to the received DL SDU size (i.e. not setting the UL RLC SDU size parameter).

c) The SS transmits one RLC SDU of size 320 bits,

d) The SS waits for an E-RUCCHwith SI to be received that indicates that the one RLC SDU is available for transmission (can be identified from the content of the SI)

e) The SS issues an absolute grant that allows the UE to send

f) The SS waits until data is received and verifies that the looped back SDU has correct content

g) The SS opens the UE test loop.

h) The SS release the radio bearer.

i) The SS may optionally deactivate the radio bearer test mode.

Expected sequence

Step	Direction UE	Direction SS	Message	Comments
1	<--		SYSTEM INFORMATION (BCCH)	Broadcast
2	<--		PAGING TYPE 1 (PCCH)	Paging (PS domain, P-TMSI)
3	-->		RRC CONNECTION REQUEST (CCCH)	RRC
4	<--		RRC CONNECTION SETUP (CCCH)	RRC
5	-->		RRC CONNECTION SETUP COMPLETE (DCCH)	RRC
6	-->		SERVICE REQUEST (DCCH)	GMM
7	<--		SECURITY MODE COMMAND	RRC see note 1
8	-->		SECURITY MODE COMPLETE	RRC see note 1
9	<--		ACTIVATE RB TEST MODE (DCCH)	TC
10	-->		ACTIVATE RB TEST MODE COMPLETE (DCCH)	TC
11	<--		RADIO BEARER SETUP (DCCH)	RRC. For the PS radio bearer the 'pdcp info' IE shall be omitted.
12	-->		RADIO BEARER SETUP COMPLETE (DCCH)	RRC
13	<--		CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 with no "LB Setup RB IE#k" parameter set (UE shall return an UL RLC SDU with the same size as the received RLC SDU in downlink)
14	-->		CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
15	SS			The SS creates one RLC SDU
16	<--		DOWNLINK RLC SDU#1	Send test data. The MAC-ehs PDU contains 4 RLC SDUs
17	→		E-RUCCH with SI indicating 1 RLC SDU	This can be verified from the indicated Total E-DCH Buffer Status (TEBS)
18	<--		Absolute grant allowing the UE to transmit at maximum bit rate.	
19	-->		UPLINK RLC SDU	The SS checks that the content of the received UL RLC SDU is correct
20	<--		OPEN UE TEST LOOP (DCCH)	TC
21	-->		OPEN UE TEST LOOP COMPLETE (DCCH)	TC
22			RB RELEASE	RRC
23	<--		DEACTIVATE RB TEST MODE	TC Optional step
24	-->		DEACTIVATE RB TEST MODE COMPLETE	TC Optional step
Note 1: In addition to activate integrity protection Step 6 and Step 7 are inserted in order to stop T3317 timer in the UE, which starts after transmitting SERVICE REQUEST message.				

7.1.8.10.5 Test requirements

1. At step 19 , SS checks UE send correct RLC SDU.

7.1.9 E-DCH MAC-is/i for Dual-Cell HSUPA

7.1.9.1 MAC-i/is multiplexing for Dual-Cell HSUPA

7.1.9.1.1 Definition and applicability

Applicable for all UEs supporting MAC-i/is, DC-HSDPA and DC-HSUPA

7.1.9.1.2 Conformance Requirement

From 25.321 clause 9.1.5:

When MAC-i/is is configured, there are two MAC sublayers, MAC-i and MAC-is. MAC-is sits on top of MAC-i and receives PDUs directly from MAC-d. When MAC-i/is is configured, a MAC PDU for E-DCH consists of one MAC-i header and one or more MAC-is PDUs. Each MAC-is PDU consists of one or more MAC-is SDUs belonging to the same logical channel. Each MAC-is SDU equals a complete or a segment of a MAC-d PDU. The MAC-is SDUs can have different sizes. The LCH-ID and L fields are repeated per MAC-is SDU. The TSN and SS fields are repeated per

MAC-is PDU. Multiple MAC-is PDUs from multiple logical channels, but only one MAC-i PDU can be transmitted in a TTI. In case sufficient space is left in the E-DCH transport block or if Scheduling Information needs to be transmitted, an SI will be included at the end of the MAC-i PDU (see subclause 9.2.4.2).

[…]

From 25.321 clause 4.2.3.6:

- Multiplexing and TSN setting:

The multiplexing and TSN setting entity is responsible for concatenating multiple MAC-d PDUs into MAC-is PDUs, and to multiplex one or multiple MAC-is PDUs into a single MAC-i PDU, or, when more than one uplink frequency is activated, one or two MAC-i PDUs, to be transmitted in the next TTI, as instructed by the E-TFC selection function. It is also responsible for managing and setting the TSN per logical channel for each MAC-is PDU.

[…]

From 25.321 clause 11.8.1.2.1:

When one uplink frequency is configured, after each MAC-es PDU or MAC-is PDU is multiplexed:

- increment CURRENT_TSN by 1;
- if CURRENT_TSN > 63:
    - set CURRENT_TSN = 0.

When more than one uplink frequency is configured, after each MAC-is PDU is multiplexed:

- increment CURRENT_TSN by 1;
- if CURRENT_TSN > 16383:
    - set CURRENT_TSN = 0.

[…]

From 25.331 clause 8.6.5.18:

1> if the IE "E-DCH MAC-d flow multiplexing list" is included:

2> only multiplex MAC-d PDU's from the E-DCH MAC-d flow indicated in the IE "E-DCH MAC-d flow identity" with MAC-d PDU's from E-DCH MAC-d flows with which multiplexing in the same MAC-e or MAC-i PDU is allowed in accordance to the IE "E-DCH MAC-d flow multiplexing list".

Reference(s)

TS 25.321 clause 9.1.5, 4.2.3.6, 11.8.1.2.1, TS 25.331 clause 8.6.5.18

7.1.9.1.3 Test purpose

1. To verify that the UE, when Dual-Cell E-DCH is configured, multiplex multiple MAC-is PDUs into two MAC-i PDUs.
2. To verify that the UE, when Dual-Cell E-DCH is configured, use the extended TSN range (0 to 16383).

7.1.9.1.4 Method of test

Initial conditions

System Simulator:

2 cells –Cell 1/2 DC HSDPA and DC HSUPA cell(s) with Cell 1 (Serving HS.DSCH cell/Primary uplink frequency) and Cell 2 (Secondary serving HS.DSCH cell /Secondary uplink frequency) and Ciphering Off.

User Equipment:

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed with all the parameters as specified in the procedure, with the exception that the default Radio Bearer is replaced with the

Radio Bearers according to clause 6.11.4k.4 (Flexible RLC + MAC-i/is + MAC-ehs) for 2 PS RABs using condition A25c to configure Dual-Cell E-DCH operation.

The MAC-d flows are configured for scheduled transmissions. The following parameters are specific for this test case with the logical channel, transport channel and queue identities set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	6	RB26
8 (LCH2)	3	7	RB27
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the test case			

The following parameters are specific for this test case.

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99) (FDD)
E-DCH MAC-d flow multiplexing list	Flow 2 = 00101000 Flow 3 = 00010000 See 25.331 10.3.5.1b

The UE is placed into UE test loop mode 1 with the UL SDU size for LCH 1 and LCH2 set to 40 octets.

Test procedure

a) The SS has not issued any scheduling grant for E-DCH to the UE

b) The SS transmits one RLC SDU of size 40 bytes on LCH1

c) The SS transmits one RLC SDU of size 40 bytes on LCH2

d) The SS waits for UE to send a SI indicating that all data received in steps b and c is available for transmission.

e) The SS issues an absolute grant on both the uplink frequency that allows the UE to loopback the received data (signalling value 8)

f) The SS checks that the UE returns one RLC SDU for LCH1 and one RLC SDU for LCH2 in 2 MAC-i PDUs in the same TTI. The SS checks the TSN value for each LCH. For the first iteration the TSN value shall be '0'. For each successive iteration the UE shall increment the TSN value by 1 modulo 16383.

g) The SS removes the scheduling grant for E-DCH for the UE.

h) The SS repeats step b to step g 16384 times.

NOTE: The UE may send an SI after step 1 or step 2 indicating that only part of the data is available for transmission. These SIs will be ignored by the SS.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		

1	←	1 RLC SDU on LCH 1	
2	←	1 RLC SDU on LCH 2	
3	→	SI	SS waits until UE sends a SI indicating that all data sent in steps 1 and 2 are available for transmission in uplink. This can be verified from the indicated fraction of data on LCH1 and LCH2. The SS ignores any SI indicating that only part of the data sent in step 1 and 2 is available for transmission in uplink.
4	←	Absolute grant	Absolute grant allowing UE to transmit all data on both E-DCH (signalling value 8)
5	→	2 MAC-i PDUs	Two MAC-i PDUs shall be received in the same TTI containing one RLC PDU on LCH 1 and one RLC PDU on LCH 2. SS check the TSN value for MAC-I PDU.
6	←	SS removes the scheduling grant	
7	SS		Repeat steps 1 to 16384 times

Specific Message Contents

RADIO BEARER SETUP: FFS

7.1.9.1.5 Test requirements

1. At step 5 the SS shall receive 2 MAC-i PDU in the same TTI containing one RLC PDU on LCH1 and one RLC PDU on LCH2.

2. At step 5 the TSN value for both MAC-I PDUs shall be:

   - Frist iteration: ‘0’;

   - Iteration 2 to 16384: ‘1’ to ‘16383’

   - Iteration 16385: ‘0’

7.1.9.2 Happy bit setting and SI handling for Dual-Cell HSUPA

7.1.9.2.1 Definition and applicability

All UEs which support Dual-Cell HSDPA and Dual-Cell E-DCH.

7.1.9.2.2 Conformance requirement

The happy bit is a single bit field that is passed from MAC to the physical layer for inclusion on the E-DPCCH. This field takes two values, "Not Happy" and "Happy" indicating respectively whether the UE could use more resources or not. The setting of the Happy Bit is defined in subclause [TS 25.321] 11.8.1.5.

A happy bit is reported on each of the Activated Uplink Frequencies.

[…]

The Happy Bit is included on the E-DPCCH for every E-DCH transmission on each Activated Uplink Frequency. E-DCH transmissions shall not be triggered specifically to allow the transmission of the happy bit.

RRC configures MAC with the duration Happy_Bit_Delay_Condition, over which to evaluate the current grant relative to the TEBS after application of the E-TFC selection procedure described in subclause 11.8.1.4.

For every E-DCH transmission and for each Activated Uplink Frequency, the Happy Bit on a frequency shall be set to "unhappy" if the three following criteria are met on that frequency:

1) UE is transmitting as much scheduled data as allowed by the current Serving_Grant in E-TFC selection on that frequency; and

2) UE has enough power available to transmit at higher data rate on that frequency; and

3) Based on the same power offset as the one selected in E-TFC selection to transmit data in the same TTI as the Happy Bit, TEBS would require more than Happy_Bit_Delay_Condition ms to be transmitted with the current Serving_Grant × the ratio of active processes to the total number of processes.

   If there is more than one Activated Uplink Frequency, based on the same power offset as the one selected in E-TFC selection on each Activated Uplink Frequency to transmit data in the same TTI as the Happy Bit, TEBS would require more than Happy_Bit_Delay_Condition ms to be transmitted with the current (Serving_Grant × the ratio of active processes to the total number of processes on the Primary Uplink Frequency) plus (Serving_Grant × the ratio of active processes to the total number of processes on the Secondary Uplink Frequency).

The first criteria is always true for a deactivated process and the ratio of the third criteria is always 1 for 10ms TTI.

Otherwise, the Happy Bit shall be set to "happy". When the UE has more than one Activated Uplink Frequency, the power used to assess whether the UE has enough power to transmit at a higher data rate on one Activated Uplink Frequency is based on the maximum remaining power allowed for E-DCH transmission on that Activated Uplink Frequency as determined by E-TFC selection described in subclause 11.8.1.4 and in [12].

In order to assess if it has enough power available to transmit at higher data rate on an Activated Uplink Frequency, the UE shall:

1) If MAC-i/is is configured, identify the E-TFC that has a transport block size at least 32 bits larger than the transport block size of the E-TFC selected for transmission in the same TTI as the Happy Bit. Otherwise, identify the E-TFC that has a transport block size at least *x* bits larger than the transport block size of the E-TFC selected for transmission in the same TTI as the Happy Bit, where *x* is the smallest RLC PDU size configured among all the logical channels that do not belong to non-scheduled MAC-d flows and which have data in the buffer; and

2) Based on the same power offset as the one selected in E-TFC selection to transmit data in the same TTI as the Happy Bit, check that the identified E-TFC is supported i.e. not blocked.

[…]

The Scheduling Information is located at the end of the MAC-e or MAC-i PDU and is used to provide the serving Node B with a better view of the amount of system resources needed by the UE and the amount of resources it can actually make use of. The transmission of this information will be initiated due to the quantization of the transport block sizes that can be supported or based on the triggers defined in subclause 11.8.1.6. When a Scheduling Information is transmitted, its contents shall always be updated in new transmissions with the buffer status after application of the E-TFC selection procedure described in subclause 11.8.1.4. The logical channels for which a non-scheduled grant is configured shall never be taken into account when putting together this information. In addition, the RRC may restrict applicability for logical channels for which no non-scheduled grant was configured.

A Scheduling Information is reported independently on each of the Activated Uplink Frequencies.

This information includes the following fields:

- Highest priority Logical channel ID (HLID):
  The HLID field identifies unambiguously the highest priority logical channel with available data. If multiple logical channels exist with the highest priority, the one corresponding to the highest buffer occupancy will be reported. The length of the HLID is 4 bits. In case the TEBS is indicating index 0 (0 byte), the HLID shall indicate the value "0000".

- Fields related to amount of available data:

- Total E-DCH Buffer Status (TEBS):
  The TEBS field identifies the total amount of data available across all logical channels for which reporting has been requested by the RRC and indicates the amount of data in number of bytes that is available for transmission and retransmission in RLC layer. If MAC-i/is is configured, it also includes the amount of data that is available for transmission in the MAC-i/is segmentation entity. When MAC is connected to an AM RLC entity, control PDUs to be transmitted and RLC PDUs outside the RLC Tx window shall also be included in the TEBS. RLC

PDUs that have been transmitted but not negatively acknowledged by the peer entity shall not be included in the TEBS.

The length of this field is 5 bits. The values taken by TEBS are shown in Table 9.2.5.3.2.1.

Table 9.2.5.3.2-1: TEBS Values

Index	TEBS Value (bytes)
0	TEBS = 0
1	0 < TEBS ≤ 10
2	10 < TEBS ≤ 14
3	14 < TEBS ≤ 18
4	18 < TEBS ≤ 24
5	24 < TEBS ≤ 32
6	32 < TEBS ≤ 42
7	42 < TEBS ≤ 55
8	55 < TEBS ≤ 73
9	73 < TEBS ≤ 97
10	97 < TEBS ≤ 129
11	129 < TEBS ≤ 171
12	171 < TEBS ≤ 228
13	228 < TEBS ≤ 302
14	302 < TEBS ≤ 401
15	401 < TEBS ≤ 533
16	533 < TEBS ≤ 708
17	708 < TEBS ≤ 940
18	940 < TEBS ≤ 1248
19	1248 < TEBS ≤ 1658
20	1658 < TEBS ≤ 2202
21	2202 < TEBS ≤ 2925
22	2925 < TEBS ≤ 3884
23	3884 < TEBS ≤ 5160
24	5160 < TEBS ≤ 6853
25	6853 < TEBS ≤ 9103
26	9103 < TEBS ≤ 12092
27	12092 < TEBS ≤ 16062
28	16062 < TEBS ≤ 21335
29	21335 < TEBS ≤ 28339
30	28339 < TEBS ≤ 37642
31	37642 < TEBS

- Highest priority Logical channel Buffer Status (HLBS):
  The HLBS field indicates the amount of data available from the logical channel identified by HLID, relative to the highest value of the buffer size range reported by TEBS when the reported TEBS index is not 31, and relative to 50000 bytes when the reported TEBS index is 31. The length of HLBS is 4 bits. The values taken by HLBS are shown in table 9.2.5.3.2.2. In case the TEBS field is indicating index 0 (0 byte), the HLBS field shall indicate index 0.

Table 9.2.5.3.2-2: HLBS Values

Index	HLBS values (%)

0	0 < HLBS ≤ 4
1	4 < HLBS ≤ 6
2	6 < HLBS ≤ 8
3	8 < HLBS ≤ 10
4	10 < HLBS ≤ 12
5	12 < HLBS ≤ 14
6	14 < HLBS ≤ 17
7	17 < HLBS ≤ 21
8	21 < HLBS ≤ 25
9	25 < HLBS ≤ 31
10	31 < HLBS ≤ 37
11	37 < HLBS ≤ 45
12	45 < HLBS ≤ 55
13	55 < HLBS ≤ 68
14	68 < HLBS ≤ 82
15	82 < HLBS

- UE Power Headroom (UPH):
  The UPH field of a frequency indicates the ratio of the maximum UE transmission power and the corresponding DPCCH code power of that frequency defined in [17]. The length of UPH is 5 bits.

The Scheduling Information message is represented in figure 9.2.5.3.2-1 where for each field, the LSB is the rightmost bit in the figure and the MSB is the leftmost bit.

UPH (5bits)	TEBS (5bits)	HLBS (4bits)	HLID (4bits)

Figure 9.2.5.3.2-1: Scheduling Information format

Reference(s)

TS 25.321 clause 9.2.5.3.1, 11.8.1.5 and 9.2.5.3.2

7.1.9.2.3 Test purpose

1 To verify that UE makes the correct settings of happy bit for the primary and secondary frequency.

2. To verify that UE makes the correct settings of scheduling information for the primary and secondary frequency.

7.1.9.2.4 Method of test

Initial conditions

System Simulator:

2 cell – Cell 1/2 DC HSDPA and DC HSUPA cell(s) with Cell 1 (Serving HS-DSCH cell/Primary uplink frequency) and 2 (Secondary serving HS-DSCH/Secondary uplink frequency), Ciphering Off.

User Equipment:

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed with all the parameters as specified in the procedure, with the exception that the default Radio Bearer is replaced with the Radio Bearers according to clause 6.11.4k.4 (Flexible RLC + MAC-i/is + MAC-ehs) for 1 PS RAB using condition A25c to configure Dual-Cell E-DCH operation..

The MAC-d flows are configured for scheduled transmissions. The following parameters are specific for this test case with the logical channel, transport channel and queue identities set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7	2	6	RB26
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the test case			

The following parameters are specific for this test case

Parameter	Value
Happy bit delay condition	10 ms (see 25.331 10.3.6.98)
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99) (FDD)

The UE is placed into UE test loop mode 1 with the UL RLC SDU size set to 39 octets.

Test procedure

In this test procedure the UE is configured with one logical channel with Id 7.

a) The SS has not issued any scheduling grant for E-DCH to the UE.

b) The SS transmits 5 RLC SDUs of size 39 bytes to the UE

c) The SS waits for the UE to send a SI on each Activated Uplink Frequency indicating that all data received in step b is available for transmission

d) The SS issues an absolute grant on each Activated Uplink Frequencies allowing the UE to transmit 3 RLC SDUs of size 39 bytes per TTI (signalling value 7 for FDD). This enables the UE to loopback all the received data.

e) The SS waits until all data is received in uplink and checks the happy bit on both E-DPCCH

f) The SS removes the scheduling grant for the UE (Signalling value 1 for FDD).

g) The SS transmits 40 RLC SDUs of size 39 bytes to the UE.

h) The SS waits for the UE to send a SI indicating that all data received in step g is available for transmission

i) The SS issues an absolute grant on both Activated Uplink Frequencies allowing the UE to transmit 2 RLC SDUs of size 39 bytes per TTI on both uplink frequency (signalling value 5 for FDD).

j) The SS waits until data is received in uplink and checks the SI and happy bit on both E-DPCCH

k) The SS issues an absolute grant allowing UE to transmit the remaining RLC SDUs in one TTI (signalling value 31 for FDD)

l) The SS waits until all data has been received in uplink and checks the happy bit on both E-DPCCH

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	5 RLC SDUs	
2	→	SI	Scheduling Information on each Activated Uplink Frequency indicating that data received in step 1 is available for transmission
3	←	Absolute grants	Absolute grant on each Activated Uplink Frequency allowing the UE to transmit at least 3 RLC SDUs of size 39 bytes per TTI. Signalling value 7.
4	→	Data, SI and happy bit	Happy bit on both E-DPCCH shall be set to happy in the first TTI containing data.
5	←	Removal of absolute grant	Signalling value 1 on each Activated Uplink Frequency
6	←	40 RLC SDUs	
7	→	SI	Scheduling Information on each Activated Uplink Frequency indicating that data received in step 6 is available for transmission
8	←	Absolute grants	Absolute grant on each Activated Uplink Frequency allowing the UE to transmit 2 RLC SDUs of size 39 bytes per TTI. Signalling value 5.
9	→	Data, SI and happy bit	Happy bit on both E-DPCCH shall be set to unhappy in the first TTI containing data.
10	←	Absolute grants	Absolute grant on each Activated Uplink Frequency allowing the UE to transmit remaining RLC SDUs in one TTI. Signalling value 31.
11	→	Data, SI and happy bit	Happy bit on both E-DPCCH shall be set to happy in the first TTI containing data.

Specific Message Contents

None

7.1.9.2.5 Test requirements

1. In step 2 the SS shall receive a Scheduling Information on both Activated Uplink Frequencies indicating a total E-DCH Buffer Status (TEBS) Index > 0
2. In step 4 the SS shall for each Activated Uplink Frequency receive data, Scheduling Information and happy bit information. For each E-DPCCH the happy bit shall be set to happy in the first TTI containing data. The Scheduling Information for each Activated Uplink Frequency shall indicate a total E-DCH Buffer Status (TEBS) index = 0.
3. In step 9 the SS shall receive data and the happy bit from both E-DPCCH shall be set to unhappy in the first TTI containing data. The Scheduling Information for each Activated Uplink Frequency shall indicate a total E-DCH Buffer Status (TEBS) Index > 0.
4. In step 11 the SS shall receive data and the happy bit from both E-DPCCH shall be set to happy in the first TTI containing data. The Scheduling Information for each Activated Uplink Frequency shall indicate a total E-DCH Buffer Status (TEBS) index = 0.

7.1.9.3 Void

7.1.9.4 Void

7.1.9.5 Deactivation and activation of secondary uplink frequency using HS-SCCH orders

7.1.9.5.1 Definition and applicability

This test apply for Release 9 and later releases for the FDD UE that supports HSDPA and Dual Cell E-DCH.

7.1.9.5.2 Conformance requirement

If the UE receives:

- a HS-SCCH order for secondary uplink frequency activation/deactivation

it shall:

1> if the variable SECONDARY_CELL_E_DCH_TRANSMISSION is set to TRUE and the HS-SCCH order is to activate the secondary uplink frequency:

2> consider the secondary uplink frequency as activated;

2> initiate the physical dedicated channel establishment procedure on the downlink frequency associated with the secondary uplink frequency according to the stored configuration;

2> configure the serving grant on the secondary uplink frequency in accordance with the IE "Serving Grant Value" configuration.

1> if the HS-SCCH order is to deactivate the secondary uplink frequency:

2> consider the secondary uplink frequency as not activated.

1> determine the value for the SECONDARY_CELL_E_DCH_TRANSMISSION and take the corresponding actions as described in subclause 8.5.58.

…

Whenever the variable SECONDARY_CELL_E_DCH_TRANSMISSION is set to TRUE, and the secondary uplink frequency is an activated uplink frequency, the UE shall:

1> perform E_AGCH reception procedures on the secondary serving E-DCH cell according to the stored E_AGCH configuration as stated in:

2> subclause 8.6.3.14 for the IE "Primary E-RNTI" and the IE "Secondary E-RNTI" for secondary serving E-DCH cell.

1> perform E-HICH reception procedures for all radio links in the secondary E-DCH active set;

1> perform E-RGCH reception procedures for all radio links in the secondary E-DCH active set for which an E-RGCH configuration has been provided;

1> perform uplink DPCCH transmission on the secondary uplink frequency according to the stored uplink DPCH info configuration as stated in:

2> subclause 8.6.6.6 for the IE "Uplink DPCH info";

2> subclause 8.6.6.49 for the IE "Uplink Secondary Cell Info FDD".

1> perform E-DPCCH transmission procedures on the secondary uplink frequency according to the stored E-DPCCH configuration as stated in:

2> subclause 8.6.6.37 for the IE "E-DPCCH Info";

2> subclause 8.6.6.49 for the IE "Uplink Secondary Cell Info FDD".

1> perform E-DPDCH transmission procedures on the secondary uplink frequency according to the stored E-DPDCH configuration as stated in:

2> subclause 8.6.5.16 for the IE "E-DCH Transmission Time Interval";

2> subclause 8.6.5.17 for the IE "HARQ info for E-DCH";

2> subclause 8.6.6.37 for the IE "E-DPDCH Info";

2> subclause 8.6.6.49 for the IE "Uplink Secondary Cell Info FDD".

1> inclusion of MAC-d PDU's in a MAC-i PDU for logical channels on the secondary uplink frequency shall:

2> be performed in accordance with the received scheduling grant on E-AGCH/E-RGCH (see [15]) on the downlink frequency associated with the secondary uplink frequency; and

2> obey the scheduling restrictions as specified for scheduled transmissions (see subclause 8.6.6.37).

Whenever the variable SECONDARY_CELL_E_DCH_TRANSMISSION is set to FALSE, or the secondary uplink frequency is not an activated uplink frequency, the UE shall:

1> not perform F-DPCH, E-AGCH, E-HICH and E-RGCH reception procedures on the downlink frequency associated with the secondary uplink frequency;

1> not perform DPCCH, E-DPCCH and E-DPDCH transmission procedures on the secondary uplink frequency

…

If the UE is configured with multiple uplink frequencies, HS-SCCH ordered deactivation or activation of the secondary serving HS-DSCH cell(s) is applied by the UE 18 slots after the end of the HS-SCCH subframe delivering the order, and any transient behaviour related to this change should take place before this point in time. If:

- the activation statuses of all secondary serving HS-DSCH cells in a frequency band (as defined in [7]) remain unaffected by the HS-SCCH ordered deactivation or activation and the serving HS-DSCH cell is not configured in this band or
- the activation statuses of all secondary serving HS-DSCH cells and the secondary uplink frequency in a frequency band remain unaffected by the HS-SCCH ordered deactivation or activation and the serving HS-DSCH cell is configured in this band

...

Figure 34 shows the timing offset between the uplink DPCH, the HS-PDSCH and the HS-DPCCH at the UE. An HS-DPCCH sub-frame starts $m \times 256$ chips after the start of an uplink DPCH frame that corresponds to the DL DPCH or F-DPCH frame from the HS-DSCH serving cell containing the beginning of the related HS-PDSCH subframe with m calculated as

$m = (T_{TX\_diff}/256) + 101$

where T_{TX_diff} is the difference in chips (T_{TX_diff} =0, 256, ….., 38144), between

- the transmit timing of the start of the related HS-PDSCH subframe (see sub-clauses 7.8 and 7.1)

and

- the transmit timing of the start of the downlink DPCH or F-DPCH frame from the HS-DSCH serving cell that contains the beginning of the HS-PDSCH subframe (see sub-clause 7.1).

At any one time, m therefore takes one of a set of five possible values according to the transmission timing of HS-DSCH sub-frame timings relative to the DPCH or F-DPCH frame boundary. The UE and Node B shall only update the set of values of m in connection to UTRAN reconfiguration of downlink timing.

More information about uplink timing adjustments can be found in [5].

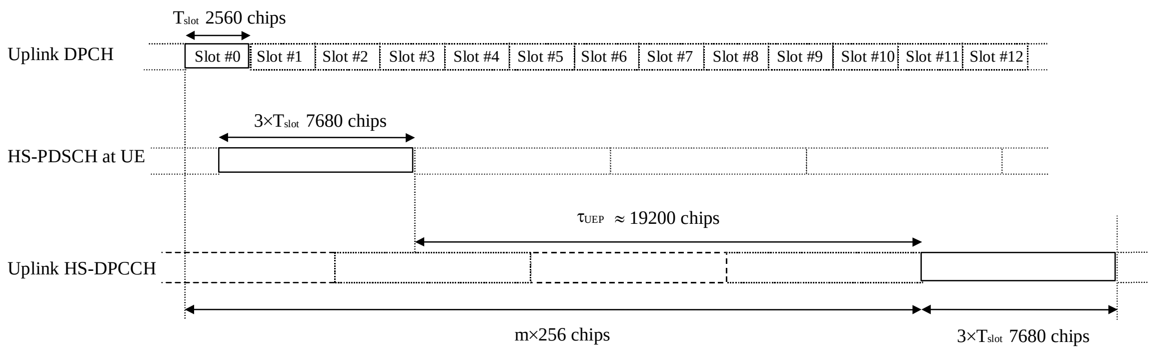


Figure 34: Timing structure at the UE for HS-DPCCH control signalling

...

Figure 35 shows the relative timing between the HS-SCCH and the associated HS-PDSCH for one HS-DSCH sub-frame. The HS-PDSCH starts $\tau_{HS\text{-}PDSCH} = 2\times T_{slot} = 5120$ chips after the start of the HS-SCCH.

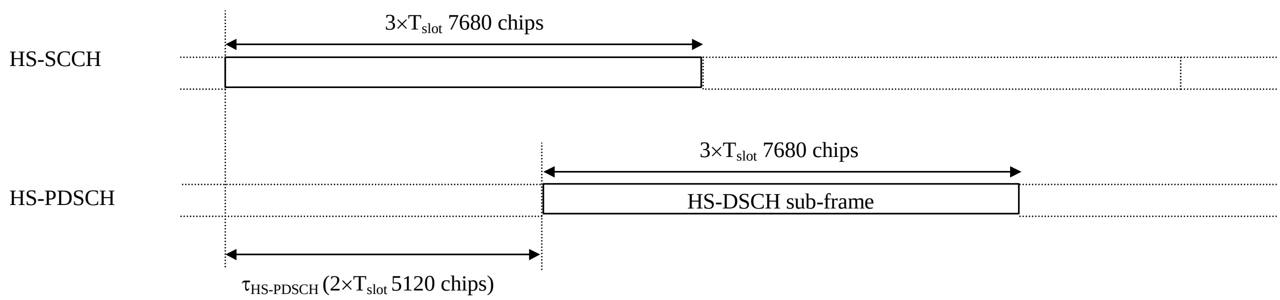


Figure 35: Timing relation between the HS-SCCH and the associated HS-PDSCH

Reference

3GPP TS 25.331 clause 8.5.58, 8.5.59. TS 25.214 clause 6A.1. TS 25.211 clause 7.7, 7.8.

7.1.9.5.3 Test purpose

1. To verify that UE deactivates the secondary uplink frequency when deactivation command is received on the HS-SCCH.
2. To verify that UE activates the secondary uplink frequency when activation command is received on the HS-SCCH.

7.1.9.5.4 Method of test

Initial Condition

System Simulator:

2 cells –Cell 1/2 DC HSDPA and DC HSUPA cell(s) with Cell 1 (Serving HS-DSCH cell/Primary uplink frequency) and Cell 2 (Secondary serving HS-DSCH cell /Secondary uplink frequency) and Ciphering Off.

UE:

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed with all the parameters as specified in the procedure, with the exception that the default Radio Bearer is replaced with the Radio Bearers according to clause 6.11.4k.4 (Flexible RLC + MAC-i/is + MAC-ehs) for 1 PS RAB using condition A25c to configure Dual-Cell E-DCH operation.

The UE is in secondary uplink frequency deactivation state after the establishment of the secondary uplink carrier.

UE is configured with DC-HSDPA in downlink and Flexible RLC, MAC-i/is in uplink.

The MAC-d flows are configured for scheduled transmissions. The following parameters are specific for this test case with the logical channel, transport channel and queue identities set to:

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7 (LCH1)	2	6	RB26
Note: The RAB combination also includes SRBs on E-DCH on MAC-d flow 1 which is not used in the test case			

The following parameters are specific for this test case.

Parameter	Value
Periodicity for Scheduling Info – no grant	500 ms (see 25.331 10.3.6.99) (FDD)

The UE is placed into UE test loop mode 1 with the UL SDU size for LCH 1 set to 40 octets.

Test Procedure

The UE is configured with one logical channel. The logical channel is mapped to MAC-d flow 2.

a) The SS transmits an activation HS-SCCH order to the UE to activate secondary uplink carrier.

b) The UE shall respond with ACK on HS-DPCCH. SS check the ACK on HS-DPCCH.

c) The UE is in secondary uplink frequency activation state. SS should sent zero absolute grant to primary uplink carrier to restrict the data transfer on primary uplink carrier

d) The SS transmits one RLC SDU of size 40 bytes on LCH1

e) The SS waits for an SI to be received that indicates that data is available on LCH1

f) SS should send absolute grant on secondary uplink carrier allowing UE to transmit on secondary E-DCH(Signalling value 4)

g) The SS waits until data is received on the secondary uplink carrier to check that the UE has activated the secondary uplink frequency.

h) The SS transmits deactivation HS-SCCH order to the UE.

i) The UE shall respond with ACK on HS-DPCCH. SS check the ACK on HS-DPCCH.

j) The SS transmits one RLC SDU of size 40 bytes on LCH1

k) The SS waits for an SI to be received that indicates that data is available on LCH1

l) The data will not be received by the SS, if the UE has de-activated the secondary uplink frequency and there is one zero grant on primary carrier.

Expected sequence

Step	Direction		Message	Comment
	UE	SS		
1	←		HS-SCCH order(Activation Command)	The UE is in secondary uplink frequency deactivation state after the establishment of the secondary uplink frequency. The HS-SCCH order is used to activate the secondary uplink frequency.
2	→		ACK	
3	←		Zero absolute grant on primary carrier	Disable the uplink data transmitting on primary uplink carrier
4	←		1 RLC SDU on LCH 1	
5	→		SI indicating data on LCH 1	
6	←		Absolute grant on secondary uplink carrier allowing UE to transmit on secondary E-DCH	signalling value 4
7	→		MAC-i PDUs containing 1 RLC PDU on LCH 1	MAC-I PDU should be received on the secondary uplink carrier
8	←		HS-SCCH order(De-Activation Command)	
9	→		ACK	
10	←		1 RLC SDU on LCH 1	
11	→		SI indicating data on LCH 1	
12				SS check that no uplink data will be received during 10 TTIs

Specific Message Contents

HS-SCCH order

The following information is transmitted by means of the HS-SCCH order physical channel. The content of HS-SCCH order in this test case is specified in the TS 25.212, clause 4.6C.2.2.2.

- Order type (3 bits): *001*
- Order (3 bits): *011(Activation) / 000(Deactvation)*
- UE identity (16 bits): H-RNTI

7.1.9.5.4 Test requirement

At step 2 the UE shall transmit a HS-DPCCH ACK to respond the Activation Command.

At step 7 the UE shall transmit data to SS on the secondary uplink carrier.

At step 9 the UE shall transmit a HS-DPCCH ACK to respond the De-Activation Command.

After step 11 the UE should not send any data on the primary or secondary uplink carrier during the check time e.g. 10 TTIs.

7.2 RLC testing

7.2.0 General

7.2.0.1 Radio bearer setup

For radio bearer setup the following settings shall be used in both CS and PS mode:

- Re-establishment Timer: useT314
- MAC logical channel priority: 7
- UL Logical Channel Identity:7

- DL Logical Channel Identity:7

7.2.1 Transparent mode

7.2.1.1 Segmentation and reassembly

Transparent mode segmentation and reassembly are not tested in this release of the specification.

7.2.2 Unacknowledged mode

7.2.2.1 General information for UM tests

Two generic Radio Access Bearers are provided for UM tests.

The UM test RAB is set up using the Generic Procedure described in clause 7.1.3 of 3GPP TS 34.108, and with the default RAB replaced as follows:

- For UM 7-bit "Length Indicator" tests: the RB configuration described in 3GPP TS 34.108 clause 6.11.1 is used. For these tests, let UM_7_PayloadSize denote the RAB payload size in octets.
- For UM 15-bit "Length Indicator" tests: the RB configuration described in 3GPP TS 34.108 clause 6.11.2 is used. For these tests, let UM_15_PayloadSize denote the RAB payload size in octets.

The UM test RABs are used in all tests with the following exception:

- Tests that explicitly specify a different Radio Bearer configuration.

All other settings are the same.

The special "Length Indicator" indicating that an SDU begins in the first octet of a PDU, described in clause 9.2.2.8 in 3GPP TS 25.322 is not used in uplink or downlink except when explicitly stated in the corresponding test case.

7.2.2.2 Segmentation and reassembly / Selection of 7 or 15 bit "Length Indicators"

7.2.2.2.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. The selection of the size of the "Length Indicator" fields used must follow the specified rules. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2.2.2 Conformance requirement

Except for the predefined values reserved for special purposes and listed in TS 25.322 section 9.2.2.8 the "Length Indicator" shall:

- be set to the number of octets between the end of the RLC header and up to and including the last octet of an RLC SDU segment;
- be included in the PDUs that they refer to.

The size of the Length Indicator may be either 7 bits or 15 bits.

[...]

For UM:

- if the "largest UMD PDU size" is ≤ 125 octets:
    - 7-bit "Length Indicators" shall be used.
- else:
    - 15-bit "Length Indicators" shall be used.

- between modifications of the "largest UMD PDU size", the size of the "Length Indicator" is the same for all UMD PDUs.

Reference(s)

TS 25.322 clauses 9.2.2.8 and 9.2.2.9.

7.2.2.2.3 Test purpose

To test that if the size of the largest PDU is ≤ 125 octets, 7 bit indicators are used, otherwise, 15 bit indicators are used.

7.2.2.2.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 7-bit "Length Indicator" tests in clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 10 bytes.

Test procedure

a) The SS transmits an RLC SDU of size 10 bytes.

b) The SS checks the "Length Indicator" values and SDU size and contents in the RLC PDU returned on the uplink (assuming a 7-bit "Length Indicator" size). SS shall take into account presence of Special “Length Indicator” indicating “beginning of an SDU” that will be included by a Rel5 and later UE.

c) The SS releases the RB, and performs the Radio Bearer establishment procedure (clause 7.1.3 of TS 34.108) with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 15-bit "Length Indicator" tests in clause 7.2.2.1.

All other settings the same.

d) The SS transmits an RLC SDU of size 10 bytes.

e) The SS checks the "Length Indicator" values and SDU size and contents in the RLC PDU returned on the uplink (assuming a 15-bit "Length Indicator" size). SS shall take into account presence of Special “Length Indicator” indicating “beginning of an SDU” that will be included by a Rel5 and later UE.

f) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE	SS	Message	Comments
1			RB ESTABLISHMENT	See generic procedures for UM 7 bit LIs
2	←		DOWNLINK RLC PDU	10 byte SDU + padding
3	→		UPLINK RLC PDU	10 byte SDU + padding
4	←		RB RELEASE	
5			RB ESTABLISHMENT	See generic procedures for UM 15 bit LIs (largest UMD PDU size > 125 bytes)
6	←		DOWNLINK RLC PDU	10 byte SDU + padding
7	→		UPLINK RLC PDU	10 byte SDU + padding
8			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.2.2.5 Test requirements

1. The UE shall send 7 bit "Length Indicators" with values that correctly indicate the end of the SDU received in step 3.

2. The UE shall send 15 bit "Length Indicators" with values that correctly indicate the end of the SDU received in step 7.

7.2.2.3 Segmentation and reassembly / 7-bit "Length Indicators" / Padding

7.2.2.3.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2.3.2 Conformance requirement

A "Length Indicator" is used to indicate the last octet of each RLC SDU ending within the PDU.

Except for the predefined values reserved for special purposes and listed in the tables below, the "Length Indicator" shall:

- be set to the number of octets between the end of the RLC header and up to and including the last octet of an RLC SDU segment;

- be included in the PDUs that they refer to.

[...]

For UM and AM RLC:

- if a 7 bit "Length Indicator" is used in a RLC PDU and one or more padding octets are present in the RLC PDU after the end of the last RLC SDU:

  - indicate the presence of padding by including a "Length Indicator" with value "1111111" as the last "Length Indicator" in the PDU.

NOTE: After the "Length Indicator" indicating the presence of padding has been included in the RLC PDU, the length of the padding may be zero.

Reference(s)

TS 25.322 clauses 9.2.2.8 and 11.2.2.1.

7.2.2.3.3 Test purpose

1. To test that the UE correctly segments a large SDU, includes a "Length Indicator" indicating padding in the RLC PDU carrying the last SDU segment, and adds padding at the end.

2. To test that the UE correctly deals with a 7-bit padding "Length Indicator" when present in a received PDU.

7.2.2.3.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 7-bit "Length Indicator" tests in clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to UM_7_PayloadSize + 1 bytes.

Test procedure

a) The SS transmits an RLC SDU of size UM_7_PayloadSize + 1 bytes. The second of the 2 PDUs sent shall contain a "Length Indicator" indicating the end of the SDU and the "Length Indicator" indicating that padding is present.

b) The SS checks the "Length Indicator" values in the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDU (assuming a 7-bit "Length Indicator" size). SS shall take into account presence of Special "Length Indicator" indicating "beginning of an SDU" that will be included by a Rel5 and later UE in the first PDU.

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1 & Padding
4	→		UPLINK RLC PDU	No LI. See Note 2
5	→		UPLINK RLC PDU	Check LIs and re-assembled SDU
6			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes. NOTE 2: SS shall take into account presence of Special "Length Indicator" indicating "beginning of an SDU" that will be included by a Rel5 and later UE.				

7.2.2.3.5 Test requirements

1. The UE shall return two RLC PDUs. The first RLC PDU shall not include "Length Indicators". except for presence of Special "Length Indicator" indicating "beginning of an SDU" that will be included by a Rel5 and later UE. The second RLC PDU shall have a "Length Indicator" indicating the PDU contains an SDU boundary after octet 1 of the data field, and the second "Length Indicator" shall indicate that the remainder of the PDU contains padding.

2. The length and data content of the received SDU shall be the same as the transmitted SDU.

7.2.2.4 Segmentation and Reassembly / 7-bit "Length Indicators" / LI = 0

7.2.2.4.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. A pre-defined "Length Indicator" value is used to indicate when a SDU ends coincident with the end of the previous PDU. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2.4.2 Conformance requirement

A "Length Indicator" is used to indicate the last octet of each RLC SDU ending within the PDU.

Except for the predefined values reserved for special purposes and listed in TS 25.322 subclause 9.2.2.8, the "Length Indicator" shall:

- be set to the number of octets between the end of the RLC header and up to and including the last octet of an RLC SDU segment;

- be included in the PDUs that they refer to.

[...]

In the case where the end of the last segment of an RLC SDU exactly ends at the end of a PDU and there is no "Length Indicator" that indicates the end of the RLC SDU:

- if 7-bit "Length Indicator" is used:
  - a "Length Indicator" with value "000 0000" shall be placed as the first "Length Indicator" in the following PDU;

[...]

For UM and AM RLC:

- if a 7 bit "Length Indicator" is used in a RLC PDU and one or more padding octets are present in the RLC PDU after the end of the last RLC SDU:
- indicate the presence of padding by including a "Length Indicator" with value "1111111" as the last "Length Indicator" in the PDU.

Reference(s)

TS 25.322 clause 9.2.2.8 and 11.2.2.1.

7.2.2.4.3 Test purpose

1. To test that where a SDU exactly fills a PDU, a "Length Indicator" of all 0's is placed by the transmitter as the first "Length Indicator" in the next PDU.
2. To test that where a SDU exactly fills a PDU, the receiver accepts a "Length Indicator" of all 0's, placed as the first "Length Indicator" in the next PDU.

7.2.2.4.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 7-bit "Length Indicator" tests in clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to UM_7_PayloadSize bytes. For a Rel-5 and later UE , the UL SDU size shall be set to (UM_7_PayloadSize -1) bytes.

Test procedure

a) The SS transmits an RLC SDU of size 2 * UM_7_PayloadSize bytes.

b) The SS checks the "Length Indicator" values in the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDU (assuming a 7-bit "Length Indicator" size).

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE	SS	Message	Comments
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1
4	←		DOWNLINK RLC PDU	LI=0 and padding
5	→		UPLINK RLC PDU	No LIs. See Note 2
6	→		UPLINK RLC PDU	Check Lis and re-assembled SDU
7			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes. NOTE 2: SS shall take into account presence of Special "Length Indicator" indicating "beginning of an SDU" that will be included by a Rel5 and later UE.				

7.2.2.4.5 Test requirements

The UE shall return two RLC PDUs. The first RLC PDU shall not include "Length Indicators" except for presence of Special “Length Indicator” indicating “beginning of an SDU” that will be included by a Rel-5 and later UE.. The second RLC PDU shall have a "Length Indicator" indicating that the SDU exactly filled the previous UMD PDU, and a "Length Indicator" indicating that the remainder of the PDU contains padding.

For Rel99 UE, the length of the received SDU shall be UM_7_PayloadSize bytes, and the data content shall be the same as the first UM_7_PayloadSize bytes of the transmitted SDU.

For Rel-5 and later UEs , the length of the received SDU shall be (UM_7_PayloadSize-1) bytes, and the data content shall be the same as the first (UM_7_PayloadSize-1) bytes of the transmitted SDU.

7.2.2.5 Reassembly / 7-bit "Length Indicators" / Invalid LI value

7.2.2.5.1 Definition

The RLC segments and concatenates SDUs into UMD PDU according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of an invalid "Length Indicator" value has been specified. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2.5.2 Conformance requirement

Upon delivery by the lower layer of an UMD PDU that contains a "Length Indicator" value specified to be reserved for UMD PDUs in this version of the protocol, the Receiver shall:

- ignore that UMD PDU.

[...]

Length: 7 bits

Bit	Description
1111101	Reserved (PDUs with this coding will be discarded by this version of the protocol).
1111110	AMD PDU: The rest of the RLC PDU includes a piggybacked STATUS PDU. UMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).

Reference(s)

TS 25.322 clause 9.2.2.8 and 11.2.4.1.

7.2.2.5.3 Test purpose

To test that PDUs with invalid "Length indicator" '111 1110' are discarded by the receiving RLC.

7.2.2.5.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 7-bit "Length Indicator" tests in clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1with the UL SDU size set to UM_7_PayloadSize + 1 bytes.

Test procedure

a) The SS transmits two RLC SDUs of size UM_7_PayloadSize + 1 bytes. In the third PDU for transmission, the SS sets the value of the second (padding) LI to 1111110.

b) The SS checks the "Length Indicator" sizes and values of any RLC PDUs returned on the uplink, and checks for the presence of any received RLC SDUs. SS shall take into account presence of Special "Length Indicator" indicating "beginning of an SDU" that will be included by a Rel-5 and later UE in the first PDU

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1 & SDU 2
4	←		DOWNLINK RLC PDU	SDU 2 and invalid LI (=11111110)
5	→		UPLINK RLC PDU	SDU 1
6	→		UPLINK RLC PDU	SDU 1: Check Lis and re-assembled SDU
7			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.2.5.5 Test requirements

The UE shall return two RLC PDUs. The first RLC PDU shall not include any "Length Indicators" except for presence of Special "Length Indicator" indicating "beginning of an SDU" that will be included by a Rel-5 and later UE. The second RLC PDU shall have a "Length Indicator" indicating the end of the SDU, and a padding "Length Indicator".

The length and data content of the received SDU shall be the same as the first transmitted SDU. The second SDU shall not be returned.

7.2.2.6 Reassembly / 7-bit "Length Indicators" / LI value > PDU size

7.2.2.6.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of an invalid "Length Indicator" value has been specified. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2.6.2 Conformance requirement

If the "Length Indicator" of an UMD PDU has a value that is larger than the PDU size – RLC header size and is not one of the predefined values listed in the table of TS 25.322 subclause 9.2.2.8, the Receiver shall:

- ignore the UMD PDU.

[...]

Upon delivery of a set of UMD PDUs from the lower layer, the Receiver shall:

- update VR(US) according to each received UMD PDU (see TS 25.322 subclause 9.4);
- if the updating step of VR(US) is not equal to one (i.e. one or more UMD PDUs are missing):
    - discard the SDUs that have segments in the missing UMD PDUs.

Reference(s)

TS 25.322 clauses 11.2.4.2 and 11.2.3.

7.2.2.6.3 Test purpose

To test that PDUs with "Length Indicators" that point beyond the end of the PDU are ignored by the receiving RLC entity.

7.2.2.6.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 7-bit "Length Indicator" tests in clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to UM_7_PayloadSize + 1 bytes.

Test procedure

a) The SS transmits three RLC SDUs of size UM 7 PayloadSize + 1 bytes. All the SDUs are concatenated or segmented over successive RLC PDUs. In the third PDU for transmission, the SS sets value of the "Length Indicator" to be UM_7_PayloadSize (decimal).

b) The SS checks the "Length Indicator" values in the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDUs (assuming a 7-bit "Length Indicator" size). . SS shall take into account presence of Special “Length Indicator” indicating “beginning of an SDU” that will be included by a Rel-5 and later UE in the first PDU

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE	SS	Message	Comments
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1 & SDU 2
4	←		DOWNLINK RLC PDU	SDU 2 & SDU 3, with bad LI
5	←		DOWNLINK RLC PDU	SDU 3 and padding
6	→		UPLINK RLC PDU	SDU 1
7	→		UPLINK RLC PDU	SDU 1 and padding: Check LIs and re-assembled SDU
8			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.2.6.5 Test requirements

The UE shall return two RLC PDUs. The first RLC PDU shall not include "Length Indicators" except for presence of Special “Length Indicator” indicating “beginning of an SDU” that will be included by a Rel-5 and later UE. The second RLC PDU shall have a LI indicating the end of an SDU and an "Length Indicator" indicating that the remainder of the PDU contains padding.

The length and data content of the received SDU should be the same as the first transmitted SDU. No further SDUs or PDUs should be received.

7.2.2.7 Reassembly / 7-bit "Length Indicators" / First data octet LI

7.2.2.7.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length indicators" are added to allow correct reconstruction of SDUs. A special "Length Indicator" is defined to indicate that the start of an SDU is coincident with the start of the PDU. The special "Length Indicator" is needed to avoid discarding of an SDU when the first received PDU has a sequence number different from zero. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2.7.2 Conformance requirement

1. "Length Indicator" = 1111100, UMD PDU: The first data octet in this RLC PDU is the first octet of a RLC SDU.

2. Upon delivery of a set of UMD PDUs from the lower layer, the Receiver shall:

...

- if the special "Length Indicator" "1111 100" or "1111 1111 1111 100" is the first "Length Indicator" of a UMD PDU received on the downlink:
  - consider the first data octet in this UMD PDU as the first octet of an RLC SDU.

Reference(s)

1. TS 25.322 clause 9.2.2.8.
2. TS 25.322 clause 11.2.3.

7.2.2.7.3 Test purpose

To test that a UE in unacknowledged mode correctly handles a received RLC PDU with a 7-bit "Length Indicator" having its value equal to the special "Length Indicator" value 1111100 when the sequence number of the first received PDU is different from zero.

7.2.2.7.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 7-bit "Length Indicator" tests in clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 12 bytes.

Test procedure

a) The SS transmits a RLC SDU of size 12 bytes in a PDU which has the 'First Data Octet LI' as the first "Length Indicator" in the PDU.

b) The SS waits until the SDU has been received back from the UE, and then transmits another SDU of 12 bytes in a PDU which has the 'First Data Octet LI' as the first "Length Indicator" in the PDU.

c) The SS waits until this SDU has been received back from the UE.

c) The SS may optionally release the radio bearer.

NOTE: The SS sends PDUs in downlink starting at sequence number 10.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU, SN 10	SDU 1 with LI = 1111100
3			…	Wait for loopback
4	→		UPLINK RLC PDU	SDU 1. See Note 2
5	←		DOWNLINK RLC PDU, SN 11	SDU 2 with LI = 1111100
6	→		UPLINK RLC PDU	SDU 2. See Note 2
7			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes. NOTE 2: SS shall take into account presence of Special “Length Indicator” indicating “beginning of an SDU” that will be included by a Rel5 and later UE.				

7.2.2.7.5 Test requirements

1. The UE shall return two RLC PDUs.

2. The length and data content of each received SDU shall be the same as the transmitted SDU.

7.2.2.8 Segmentation and reassembly / 15-bit "Length Indicators" / Padding

7.2.2.8.1 Definition

The RLC segments and concatenates SDUs into UMD PDU according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2.8.2 Conformance requirement

A PDU that has unused space, to be referred to as padding, shall use a "Length Indicator" to indicate that this space is used as padding unless the padding size is one octet for PDUs with 15-bit "Length Indicators". A padding "Length Indicator" must be placed after any "Length Indicators" for a PU.

One "Length Indicator" field shall be included for each end of a SDU that the PDU includes. The "Length Indicator" shall be set equal to the number of octets between the end of the header fields and the end of the segment. If padding is needed, another "Length Indicator" field set to only 1's shall be added unless the padding size is one octet for PDUs with 15-bit "Length Indicators".

Reference(s)

TS 25.322 clauses 9.2.2.8 and 11.2.2.1.

7.2.2.8.3 Test purpose

1. To test that the UE correctly segments a large SDU and padding is added at the end.

2. To test that the UE correctly deals with a 15-bit padding "Length Indicator" when present in a received PDU.

7.2.2.8.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 15-bit "Length Indicator" tests in clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to UM_15_PayloadSize + 1 bytes.

Test procedure

a) The SS transmits an RLC SDU of size UM_15_PayloadSize + 1 bytes. The second of the 2 PDUs sent shall contain a "Length Indicator" indicating the end of the SDU and the "Length Indicator" indicating that padding is present.

b) The SS checks the "Length Indicator" values in the RLC PDU returned on the uplink, and checks the length and content of the received RLC SDU (assuming a 15-bit "Length Indicator" size).

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE	SS	Message	Comments
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1 & Padding
4	→		UPLINK RLC PDU	No LI
5	→		UPLINK RLC PDU	Check LIs and re-assembled SDU
6			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.2.8.5 Test requirements

1. The UE shall return two RLC PDUs. The first shall not include "Length Indicators". The second shall have a "Length Indicator" indicating the PDU contains a SDU boundary after octet 1 of the data field, and the second shall indicate that the remainder of the PDU contains padding.

2. The length and data content of the received SDU shall be the same as the transmitted SDU.

7.2.2.9 Segmentation and Reassembly / 15-bit "Length Indicators" / LI = 0

7.2.2.9.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. A pre-defined "Length Indicator" value is used to indicate when an SDUs ends coincident with the end of the previous PU. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2.9.2 Conformance requirement

If the PDU is exactly filled with the last segment of a SDU and there is no room for an "Length Indicator" field, a "Length Indicator" field set to all 0's shall be included as the first "Length Indicator" in the following PDU.

Reference(s)

TS 25.322 clause 11.2.2.1.

7.2.2.9.3 Test purpose

1. To test that where a SDU exactly fills a PDU, a "Length Indicator" of all 0's is placed by the transmitter as the first "Length Indicator" in the next PDU.

2. To test that where an SDU exactly fills a PDU, and an "Length Indicator" of all 0's is the first "Length Indicator" in the next PDU, the receiver correctly reassembles the PDU.

7.2.2.9.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 15-bit "Length Indicator" tests in clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to UM_15_PayloadSize bytes.

Test procedure

a) The SS transmits an RLC SDU of size 2 * UM_15_PayloadSize bytes.

b) The SS checks the "Length Indicator" values in the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDU (assuming a 15-bit "Length Indicator" size).

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE SS	Message	Comments
1		RB ESTABLISHMENT	See generic procedures
2	←	DOWNLINK RLC PDU	SDU 1
3	←	DOWNLINK RLC PDU	SDU 1
4	←	DOWNLINK RLC PDU	LI=0 and padding
5	→	UPLINK RLC PDU	No Lis
6	→	UPLINK RLC PDU	Check LIs and re-assembled SDU
7		RB RELEASE	Optional step

NOTE 1: The Expected Sequence shown is informative.
The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity.
Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.

7.2.2.9.5 Test requirements

The UE shall return two RLC PDUs. The first shall not include "Length Indicators". The second shall have an "Length Indicators" indicating that the SDU exactly filled the previous UMD PDU, and a "Length Indicators" indicating that the remainder of the PDU contains padding.

The length of the received SDU shall be UM_15_PayloadSize bytes, and the data content shall be the same as the first UM_15_PayloadSize bytes of the transmitted SDU.

7.2.2.10 Segmentation and reassembly / 15-bit "Length Indicators" / One octet short LI

7.2.2.10.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. A pre-defined "Length Indicator" value is used to indicate when an SDUs ends one octet short of the end of the previous PDU. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2.10.2 Conformance requirement

In the case where the last segment of an RLC SDU is one octet short of exactly filling the last RLC PDU, and 15-bit "Length Indicators" are used, the next "Length Indicator" shall be placed as the first "Length Indicator" in the next PDU and have value "Length Indicator"=111 1111 1111 1011.

In the case where a PDU contains a 15-bit "Length Indicator" indicating that an SDU ends with one octet left in the PDU, the last octet of this PDU shall be ignored and shall not be filled with the first octet of the next SDU data.

Reference(s)

TS 25.322 clause 9.2.2.8.

7.2.2.10.3 Test purpose

1. To test that where the UE transmits an SDU, which is one byte short of filling a PDU, an "Length Indicator" indicating one byte short is placed as the first "Length Indicator" in the next PDU.

2. To test that where the UE correctly handles a received PDU containing an "Length Indicator" indicating that an SDU ended one byte short of the end of the previous PDU.

7.2.2.10.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 15-bit "Length Indicator" tests in clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to UM_15_PayloadSize - 1bytes.

Test procedure

a) The SS transmits an RLC SDU of size (2 * UM_15_PayloadSize) - 1 bytes.

b) The SS checks the "Length Indicator" sizes and values in the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDU (assuming a 15-bit "Length Indicator" size).

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1
4	←		DOWNLINK RLC PDU	LI=111 1111 1111 1011 and padding
5	→		UPLINK RLC PDU	No LIs
6	→		UPLINK RLC PDU	Check LIs and re-assembled SDU
7			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.2.10.5 Test requirements

1. The UE shall return two RLC PDUs. The first shall have no "Length Indicators". The second shall have 2 "Length Indicators". The first "Length Indicator" shall be a "Length Indicator" indicating that the SDU was one byte short of filling the previous PDU, and the second shall be a "Length Indicator" indicating that the remainder of the PDU contains padding.

2. The length of the received SDU shall be UM_15_PayloadSize - 1bytes, and the data content shall be the same as the first UM_15_PayloadSize - 1 bytes of the transmitted SDU.

7.2.2.11 Reassembly / 15-bit "Length Indicators" / Invalid LI value

7.2.2.11.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of an invalid "Length Indicator" value has been specified. Incorrect operation of segmentation, concatenation, or coding of "Length Indicator" will result in failure of the UE to communicate.

7.2.2.11.2 Conformance requirement

Upon delivery by the lower layer of an UMD PDU that contains a "Length Indicator" value specified to be reserved for UMD PDUs in this version of the protocol, the Receiver shall:

- ignore that UMD PDU.;

Length: 15bits

Bit	Description
111111111111110	AMD PDU: The rest of the RLC PDU includes a piggybacked STATUS PDU. UMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).

Reference(s)

TS 25.322 clause 11.2.4.1, 9.2.2.8.

7.2.2.11.3 Test purpose

To test that PDUs with invalid "Length Indicators" are discarded by the receiving RLC.

7.2.2.11.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 15-bit "Length Indicator" tests in clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to UM_15_PayloadSize + 1 bytes.

Test procedure

a) The SS transmits two RLC SDUs of size UM_15_PayloadSize + 1 bytes. In the third PDU for transmission, the SS sets the value of the second (padding) LI to 111111111111110.

b) The SS checks the "Length Indicator" sizes and values of any RLC PDUs returned on the uplink, and checks for the presence of any received RLC SDUs.

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1 & SDU 2
4	←		DOWNLINK RLC PDU	SDU 2 and invalid LI (=111111111111110)
5	→		UPLINK RLC PDU	SDU 1
6	→		UPLINK RLC PDU	SDU 1: Check Lis and re-assembled SDU
7			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.2.11.5 Test requirements

The UE shall return two RLC PDUs. The first shall not include any "Length Indicators". The second shall have a "Length Indicator" indicating the end of the SDU, and a padding "Length Indicator".

The length and data content of the received SDU shall be the same as the first transmitted SDU. The second SDU shall not be returned.

7.2.2.12 Reassembly / 15-bit "Length Indicators" / LI value > PDU size

7.2.2.12.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of an invalid

"Length Indicator" value has been specified. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2.12.2 Conformance requirement

If the "Length Indicator" of a PDU has a value that is larger than the PDU size – the number of octets containing "Length Indicators" in the PDU – 1 and is not one of the predefined values listed in the table of 3GPP TS 25.322 clause 9.2.2.8, the PDU shall be discarded and treated as a missing PDU.

If a PDU with sequence number < VR(US) is missing then all SDUs that have segments in this PDU shall be discarded.

Reference(s)

TS 25.322 clauses 11.2.4.2 and 11.2.3.

7.2.2.12.3 Test purpose

To test that PDUs with "Length Indicators" that point beyond the end of the PDU are ignored by the receiving RLC entity.

7.2.2.12.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 15-bit "Length Indicator" tests in clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to UM_15_PayloadSize + 1bytes.

Test procedure

a) The SS transmits three RLC SDUs of size UM_15_PayloadSize + 1 bytes. All the SDUs are concatenated or segmented over successive RLC PDUs. In the third PDU for transmission, the SS sets value of the "Length Indicator" to be UM_15_PayloadSize + 1 (decimal).

b) The SS checks the "Length Indicator" values in the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDUs (assuming a 15-bit "Length Indicator" size).

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1 & SDU 2
4	←		DOWNLINK RLC PDU	SDU 2 & SDU 3, with bad LI
5	←		DOWNLINK RLC PDU	SDU 3 and padding
6	→		UPLINK RLC PDU	SDU 1
7	→		UPLINK RLC PDU	SDU 1 and padding: Check LIs and re-assembled SDU
8			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.2.12.5 Test requirements

The UE shall return two RLC PDUs. The first shall not include any "Length Indicators". The second shall have a "Length Indicator" indicating the end of an SDU and a "Length Indicator" indicating that the remainder of the PDU contains padding.

The length and data content of the received SDU shall be the same as the first transmitted SDU. No further SDUs or PDUs shall be received.

7.2.2.13 Reassembly / 15-bit "Length Indicators" / First data octet LI

7.2.2.13.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. A special LI is defined to indicate that the start of on SDU is coincident with the start of the PDU. The special LI is needed to avoid discarding of an SDU when the first received PDU has a sequence number different from zero. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2.13.2 Conformance requirement

"Length Indicators" = 111111111111100, UMD PDU: The first data octet in this RLC PDU is the first octet of a RLC SDU.

Reference(s)

TS 25.322 clause 9.2.2.8.

7.2.2.13.3 Test purpose

To test that a UE in unacknowledged mode correctly handles a received RLC PDU with a 15-bit "Length Indicator" having its value equal to the special LI value 111111111111100 when the sequence number of the first received PDU is different from zero.

7.2.2.13.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 15-bit "Length Indicator" tests in clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 150 bytes.

Test procedure

a) The SS transmits a RLC SDU of size 150 bytes in a PDU which has the 'First Data Octet LI' as the first "Length Indicator" in the PDU.

b) The SS waits until the SDU has been received back from the UE, and then transmits another SDU of 150 bytes in a PDU which has the 'First Data Octet LI' as the first "Length Indicator" in the PDU.

c) The SS waits until this SDU has been received back from the UE.

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE	Direction SS	Message	Comments
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1 with LI = 111111111111100
3			…	Wait for loopback
4	→		UPLINK RLC PDU	SDU 1
5	←		DOWNLINK RLC PDU	SDU 2 with LI = 111111111111100
6	→		UPLINK RLC PDU	SDU 2
7			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.2.13.5 Test requirements

1. The UE shall return two RLC PDUs.
2. The length and data content of each received SDU shall be the same as the transmitted SDU.

7.2.2.14 Flexible handling of RLC PDU sizes for UM RLC in downlink

7.2.2.14.1 Definition

When UM RLC is mapped to MAC-ehs (downlink only) the RLC PDU size can have arbitrary size (integer number of octets). The network can choose to segment the SDUs into smaller RLC PDUs or select the RLC PDU size to exactly fit the SDU size.

7.2.2.14.2 Conformance requirement

Unless the "Extension bit" indicates that a UMD PDU contains a complete SDU which is not segmented, concatenated or padded, or the HE field indicates that an AMD PDU contains the last octet of the RLC SDU, a "Length Indicator" is used to indicate the last octet of each RLC SDU ending within the PDU

[…]

The interpretation of this [E bit] bit depends on RLC mode and higher layer configuration:

- In the UMD PDU, the "Extension bit" in the first octet has either the normal E-bit interpretation or the alternative E-bit interpretation depending on higher layer configuration. The "Extension bit" in all the other octets always has the normal E-bit interpretation.
- In the AMD PDU, the "Extension bit" always has the normal E-bit interpretation.

Normal E-bit interpretation:

Bit	Description
0	The next field is data, piggybacked STATUS PDU or padding
1	The next field is Length Indicator and E bit

Alternative E-bit interpretation:

Bit	Description
0	The next field is a complete SDU, which is not segmented, concatenated or padded.
1	The next field is Length Indicator and E bit

[…]

If one or more SDUs have been scheduled for transmission according to subclause 11.2.2, the Sender shall:

- inform the lower layer of the number and size of SDUs scheduled for transmission;
- segment, and if possible concatenate the SDUs according to the PDU sizes indicated by the lower layer (see subclause 9.2.2.9);

[…]

- reassemble the received UMD PDUs into RLC SDUs;
- submit the RLC SDUs to upper layers through the UM-SAP.

Reference(s)

TS 25.322 clauses 9.2.2.8, 11.2.2 and 11.2.3.

7.2.2.14.3 Test purpose

1. To test that a large SDU is correctly received for varying RLC PDU sizes up to the maximum RLC PDU size
2. To test that a segmented SDU is reassembled correctly and delivered to higher layers

7.2.2.14.4 Method of test

Initial conditions

The following parameters are specific for this test case:

Parameter	Value
DL UM RLC LI size	15
Alternative E-bit interpretation	TRUE

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Bearer is replaced with the RB according to 34.108 clause 6.11.4j.1..

The radio bearer is placed into UE test loop mode 1 and configured to return UL RLC SDUs of the same size as received in DL.

Test procedure

a) The SS transmits one RLC SDU of size 20 octets. An RLC PDU is created by adding a one octet UMD header (the SDU is not segmented or concatenated). In the RLC PDU the E field is set to “0”.

b) The SS checks the length and content of the received RLC SDUs

c) The SS transmits one RLC SDU of size 80 octets. An RLC PDU is created by adding a one octet UMD header (the SDU is not segmented or concatenated). In the RLC PDU the E field is set to “0”.

d) The SS checks the length and content of the received RLC SDUs

e) The SS transmits one RLC SDU of size 1500 octets. An RLC PDU is created by adding a one octet UMD header (the SDU is not segmented or concatenated). In the RLC PDU the E field is set to “0”.

f) The SS checks the length and content of the received RLC SDUs

g) The SS transmits one RLC SDU of size 240 octets. The SDU is segmented into successive RLC PDUs of size 2-3, 43, 83 and 103 octets including a one octet UMD header and a length indicator in each RLC PDU.

h) The SS checks the length and content of the received RLC SDUs

i) The SS opens the UE test loop and release the radio bearer.

Expected sequence

Step	Direction UE SS	Message	Comments
1		RB ESTABLISHMENT	See generic procedures,
2		Close UE test loop	
3	←	DOWNLINK RLC PDU (SDU1)	SN=0, RLC SDU size = 20 Octets
4	→	UPLINK RLC PDU (SDU1)	The SS checks length and content of received RLC SDU.
5	←	DOWNLINK RLC PDU (SDU2)	SN=1, RLC SDU size = 80 Octets
6	→	UPLINK RLC PDU (SDU2)	The SS checks length and content of received RLC SDU.
7	←	DOWNLINK RLC PDU (SDU3)	SN=2, RLC SDU size = 1500 Octets
8	→	UPLINK RLC PDU (SDU3)	The SS checks length and content of received RLC SDU.
9	←	DOWNLINK RLC PDUs (SDU4)	SN= 3,4,5,6, RLC SDU size = 240 Octets.
10	→	UPLINK RLC PDU (SDU4)	The SS checks length and content of received RLC SDU.
11		Open UE test loop	
12		RB RELEASE	
NOTE 1: The Expected Sequence shown is informative. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.			

7.2.2.14.5 Test requirements

For each execution of the test procedure:

1. In steps 4, the UE shall return one RLC SDU with the same size and content as the transmitted SDU
2. In steps 6, the UE shall return one RLC SDU with the same size and content as the transmitted SDU
3. In steps 8, the UE shall return one RLC SDU with the same size and content as the transmitted SDU
4. In steps 10, the UE shall return one RLC SDU with the same size and content as the transmitted SDU

7.2.2.15 Flexible handling of RLC PDU sizes for UM RLC in uplink

7.2.2.15.1 Definition

When UM RLC is mapped to MAC-i/is (uplink only) the RLC PDU size can have arbitrary size (integer number of octets) as long as the size is between the configured minimum and maximum size. For each transmission the RLC entity constructs an RLC PDU with a size that matches the size indicated by the MAC layer.

7.2.2.15.2 Conformance requirement

The transmitting UM RLC entity segments the RLC SDU into UMD PDUs of appropriate size, if the RLC SDU is larger than the length of available space in the UMD PDU. The size of the UMD PDUs after segmentation and/or concatenation shall be smaller than or equal to the largest UL UMD PDU size. If MAC-i/is has been configured, the size of the UMD PDUs after segmentation and/or concatenation shall be larger than or equal to the Minimum UL RLC PDU size.

[..]

- in uplink, if MAC-i/is has been configured:
  - if the UE pre-generates RLC PDUs for transmission in a later TTI:
    - provided that the UE has sufficient amount of data available for transmission, the size of the data field of the RLC PDU shall be chosen so that each RLC PDU to be multiplexed to the MAC-i/is PDU matches the maximum amount of data allowed to be transmitted by the applicable current grant (scheduled or non-scheduled) for the current TTI.
    - RLC PDUs may only be pre-generated if the amount of data in outstanding pre-generated RLC PDUs for this logical channel is less than or equal to four times the maximum amount of data allowed to be transmitted by the applicable current grant (scheduled or non-scheduled) for the current TTI.

- else:
    - the size of the data field of the RLC PDU shall be chosen so that the RLC PDU size matches the data requested for this logical channel by the current E-TFC selection.

[…]

For UM uplink:

- if the "largest UL UMD PDU size" is ≤ 125 octets:
    - 7-bit "Length Indicators" shall be used.
- else:
    - 15-bit "Length Indicators" shall be used.

[…]

If one or more SDUs have been scheduled for transmission according to subclause 11.2.2, the Sender shall:

- inform the lower layer of the number and size of SDUs scheduled for transmission;
- segment, and if possible concatenate the SDUs according to the PDU sizes indicated by the lower layer (see subclause 9.2.2.9);

Reference(s)

TS 25.322 clauses 4.2.1.2.1, 9.2.2.8 and 11.2.2.2.

7.2.2.15.3 Test purpose

1. To test that SDUs are correctly concatenated/segmented into RLC PDUs not smaller than “Minimum UL PDU size” (unless there is no other data in the buffer) and not larger than “largest UL UMD PDU size”
2. To test that the size of the RLC PDU is adapted to the size of the issued grant
3. To test that the size of the Length Indicator field is correctly selected based on the maximum PDU size

7.2.2.15.4 Method of test

Initial conditions

The following parameters are specific for this test case:

Parameter	Value
Minimum UL PDU size	320 bit
Largest UL UMD PDU size	640 bit
Alternative E-bit interpretation	TRUE

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exceptions that the default Radio Bearer is replaced with the RB according to 34.108 clause 6.11.4k.1 (Flexible RLC + MAC-i/is) and that the MAC-d flow#1 of the RB in 34.108 clause 6.11.4k.1 is configured for scheduled transmissions.

The UE is placed into UE test loop mode 1 with the UL SDU size set to 80 octets.

Test procedure

a) The SS has not issued any grant to the UE for E-DCH

b) The SS transmits 4 RLC SDUs of size 80 octets. RLC PDUs are created by adding a one octet UMD header (the SDUs are not segmented or concatenated). In each RLC PDU the E field is set to “0”.

c) The SS waits for an SI

d) The SS issues an absolute grant correspondent to a Maximum allowed RLC PDU size below the configured "Minimum UL PDU size" (signalling value 3). See note 1.

e) The SS checks the content of the received RLC SDUs and size of the received RLC PDUs;

f) The SS removes the scheduling grant for the UE

g) The SS transmits 4 RLC SDUs of size 80 octets. RLC PDUs are created by adding a one octet UMD header (the SDUs are not segmented or concatenated). In each RLC PDU the E field is set to "0".

h) The SS issues an absolute grant correspondent to a Maximum allowed RLC PDU size above the configured "Largest UL UMD PDU size" (signalling value 5). See note 2.

i) The SS checks the content of the received RLC SDUs and size of the received RLC PDUs

j) The SS opens the UE test loop and release the radio bearer.

NOTE 1: Signalled absolute grant of 3 enable the UE to transmit a maximum RLC PDU size of 235 bits (10ms TTI, Reference E-TFCI=11 Signalled power offset=4), which is less than the configured "Minimum UL PDU size" of 320 bits.

NOTE 2: Signalled absolute grant of 5 enable the UE to transmit a maximum RLC PDU size of 752 bits (10ms TTI, Reference E-TFCI=11 Signalled power offset=4), which is larger than the configured "Largest UL AMD PDU size" of 640 bits.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures,
2			Close UE test loop	
3	←		DOWNLINK RLC PDUs	SN=0,1,2,3, RLC SDU size = 80 Octets
4	→		SI indicating data	
5	←		Absolute grant	Grant value 3
6	→		UPLINK RLC PDUs	The SS checks length and content of received RLC SDUs.
7	←		Absolute grant	Grant value 1, removal of SG
8	←		DOWNLINK RLC PDUs	SN=4,5,6,7, RLC SDU size = 80 Octets
9	→		SI indicating data	
10	←		Absolute grant	Grant value 5
11	→		UPLINK RLC PDUs	The SS checks length and content of received RLC SDUs.
12			Open UE test loop	
13			RB RELEASE	
NOTE 1: The Expected Sequence shown is informative. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.2.15.5 Test requirements

For each execution of the test procedure:

1. In step 6, the UE shall return 4 RLC SDUs with the same content as the transmitted SDUs. The RLC PDU size of the first three RLC PDUs shall be equal to "minimum UL PDU size". The size of the LI field in the RLC header shall be 7 bit.

2. In step 11, the UE shall return 4 RLC SDUs with the same content as the transmitted SDUs. The RLC PDU size of the first three RLC PDUs shall be equal to "Largest UL UMD PDU size". The size of the LI field in the RLC header shall be 7 bit.

7.2.2a Unacknowledged mode (TDD MBSFN) (non-IMB)

7.2.2a.1 P-T-M Radio bearer setup

Two generic P-T-M Radio Access Bearers are provided for the MBSFN UM tests.

The UM test RAB is set up using the Generic Procedure described below, and with the default RAB replaced as follows:

- For UM 7-bit "Length Indicator" tests: the RB configuration described in 3GPP TS 34.108 clause 6.11.1c (3.84 Mcps TDD) or 6.11.1d (7.68 Mcps TDD) or 6.11.5.4.4.13 (1.28 Mcps TDD) is used. For these tests, let UM_7_PayloadSize denote the RAB payload size in octets.

- For UM 15-bit "Length Indicator" tests: the RB configuration described in 3GPP TS 34.108 clause 6.11.2a (3.84 Mcps TDD) or 6.11.2b (7.68 Mcps TDD) or 6.11.5.4.4.14 (1.28 Mcps TDD) is used. For these tests, let UM_15_PayloadSize denote the RAB payload size in octets.

These UM test RABs are used in all tests with the following exception:

- Tests that explicitly specify a different Radio Bearer configuration.

All other settings are the same.

The special "Length Indicator" indicating that an SDU begins in the first octet of a PDU, described in clause 9.2.2.8 in 3GPP TS 25.322 is not used except when explicitly stated in the corresponding test case.

Initial conditions

System Simulator:

Unicast carrier: 1 cell, Cell 1 with default configuration.

- MBSFN carriers: 1 cell, Cell 31 has default parameters. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 and Default1 MCCH scheduling (No ongoing session) according to subclause 11.2 of TS 34.108.

  The configuration of the S-CCPCH which will carry the MTCH is based upon the default test RAB configuration defined above.

User Equipment:

- On the unicast carrier cell the UE is in registered Idle Mode on PS (state 3) if the UE only supports PS domain or registered Idle Mode on CS/PS (state 7) if the UE supports both CS and PS domains, as specified in clause 7.2.2 of TS 34.108.

- The UE is in MBSFN Idle mode with one activated service as specified in clause 7.6.4 of TS 34.108. The UE has selected (i.e. it is included in MBMS_ACTIVATED_SERVICES variable) a national service for which there will be a session starting on MBSFN Cell 31 (see TS 34.108 clause 11.2.4).

Procedure

a) The UE is camping on Cell 1 and Cell 31. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 (no session ongoing) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108.

b) The SS sends ACTIVATE RB TEST MODE on the unicast carrier and the UE responds with ACTIVATE RB TEST MODE COMPLETE.

c) The SS sends CLOSE UE TEST LOOP to activate RLC SDU counting on Cell 31 MTCH (Transmission identity indicating the MBSFN MBMS activated service).

d) The SS notifies on MCCH about the start of an MBMS session for one modification period. MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C4 (one PTM session starting) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108.

e) MCCH messages are then transmitted by the SS on Cell 31 using MBMS configuration C2 (one PTM session ongoing) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108.

f) The SS waits for the UE to start reception of the MBMS data on MTCH according to the specified service activation time. The UE closes the test loop. The UE sends CLOSE UE TEST LOOP COMPLETE.

Expected sequence

Step	Direction		Carrier	Message	Comment
	UE	SS			
1	←		U	ACTIVATE RB TEST MODE	
2	→		U	ACTIVATE RB TEST MODE COMPLETE	
3	←		U	CLOSE UE TEST LOOP	Loop back mode 3 is activated on Cell 31 for the selected national service on MTCH.
4	←		M	MBMS MCCH Message Configuration C4	Includes the national service activated at UE in the modified services list for one modification period.
5	←		M	MBMS MCCH Message Configuration C2	No modified services. One ongoing service corresponding to that activated at the UE.
6	→		U	CLOSE UE TEST LOOP COMPLETE	The UE establishes the MTCH according to the activation time and closes the test loop.

7.2.2a.2 Reassembly / 7-bit "Length Indicators" / Invalid LI value (TDD MBSFN)

7.2.2a.2.1 Definition

The RLC segments and concatenates SDUs into UMD PDU according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of an invalid "Length Indicator" value has been specified. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2a.2.2 Conformance requirement

Upon delivery by the lower layer of an UMD PDU that contains a "Length Indicator" value specified to be reserved for UMD PDUs in this version of the protocol, the Receiver shall:

- ignore that UMD PDU.

[...]

Length: 7 bits

Bit	Description
1111101	Reserved (PDUs with this coding will be discarded by this version of the protocol).
1111110	AMD PDU: The rest of the RLC PDU includes a piggybacked STATUS PDU. UMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).

Reference(s)

TS 25.322 clause 9.2.2.8 and 11.2.4.1.

7.2.2a.2.3 Test purpose

To test that PDUs with reserved "Length indicator" values of '111 1110' and '111 1101' are discarded by the receiving RLC.

7.2.2a.2.4 Method of test

Initial conditions

The generic procedure for P-T-M Radio Bearer setup (clause 7.2.2a.1) is executed with all the parameters as specified in the procedure for the RAB defined for UM 7-bit "Length Indicator" tests.

Test procedure

a) The SS transmits two RLC SDUs of size UM_7_PayloadSize + 1 bytes. In the third PDU for transmission, the SS sets the value of the second (padding) LI to 1111110.

b) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is = 1. The SS records the value.

c) The SS transmits two RLC SDUs of size UM_7_PayloadSize + 1 bytes. In the third PDU for transmission, the SS sets the value of the second (padding) LI to 1111101.

d) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is consistent with a number of received RLC SDUs equal to 1.

Expected sequence

Step	Direction UE SS	Carrier	Message	Comment
1			P-T-M RADIO BEARER SETUP	See clause 7.2.2a.1
2	←	M	DOWNLINK RLC PDU	SDU 1
3	←	M	DOWNLINK RLC PDU	SDU 1 & SDU 2
4	←	M	DOWNLINK RLC PDU	SDU 2 and invalid LI (=11111110)
5	←	U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
6	→	U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one. SS records value.
7	←	M	DOWNLINK RLC PDU	SDU 1
8	←	M	DOWNLINK RLC PDU	SDU 1 & SDU 2
9	←	M	DOWNLINK RLC PDU	SDU 2 and invalid LI (=11111101)
10	←	U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
11	→	U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one.
12	←	U	OPEN UE TEST LOOP	
13	→	U	OPEN UE TEST LOOP COMPLETE	
14	←	U	DEACTIVATE RB TEST MODE	
15	→	U	DEACTIVATE RB TEST MODE COMPLETE	

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

None.

7.2.2a.2.5 Test requirements

1) At step 6, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

2) At step 11, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

7.2.2a.3 Reassembly / 7-bit "Length Indicators" / LI value > PDU size (TDD MBSFN)

7.2.2a.3.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of an invalid "Length Indicator" value has been specified. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2a.3.2 Conformance requirement

If the "Length Indicator" of an UMD PDU has a value that is larger than the PDU size – RLC header size and is not one of the predefined values listed in the table of TS 25.322 subclause 9.2.2.8, the Receiver shall:

- ignore the UMD PDU.

[...]

Upon delivery of a set of UMD PDUs from the lower layer, the Receiver shall:

- update VR(US) according to each received UMD PDU (see TS 25.322 subclause 9.4);
- if the updating step of VR(US) is not equal to one (i.e. one or more UMD PDUs are missing):
    - discard the SDUs that have segments in the missing UMD PDUs.

Reference(s)

TS 25.322 clauses 11.2.4.2 and 11.2.3.

7.2.2a.3.3 Test purpose

To test that PDUs with "Length Indicators" that point beyond the end of the PDU are ignored by the receiving RLC entity.

7.2.2a.3.4 Method of test

Initial conditions

The generic procedure for P-T-M Radio Bearer setup (clause 7.2.2a.1) is executed with all the parameters as specified in the procedure for the RAB defined for UM 7-bit "Length Indicator" tests.

Test procedure

a) The SS transmits three RLC SDUs of size UM 7 PayloadSize + 1 bytes. All the SDUs are concatenated or segmented over successive RLC PDUs. In the third PDU for transmission, the SS sets value of the "Length Indicator" to be UM_7_PayloadSize (decimal).

b) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 4 RLC SDU COUNTER RESPONSE is = 1. The SS records the value.

c) The SS transmits three RLC SDUs of size UM 7 PayloadSize + 1 bytes. All the SDUs are concatenated or segmented over successive RLC PDUs. In the third PDU for transmission, the SS sets value of the "Length Indicator" to be UM_7_PayloadSize (decimal).

d) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 4 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is consistent with a number of received RLC SDUs equal to 1.

Expected sequence

Step	Direction		Carrier	Message	Comment
	UE	SS			
1				P-T-M RADIO BEARER SETUP	See clause 7.2.2a.1
2	←		M	DOWNLINK RLC PDU	SDU 1
3	←		M	DOWNLINK RLC PDU	SDU 1 & SDU 2
4	←		M	DOWNLINK RLC PDU	SDU 2 & SDU 3, with bad LI
5	←		M	DOWNLINK RLC PDU	SDU 3 and padding
6	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
7	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one. SS records value.
8	←		M	DOWNLINK RLC PDU	SDU 4
9	←		M	DOWNLINK RLC PDU	SDU 4 & SDU 5
10	←		M	DOWNLINK RLC PDU	SDU 5 & SDU 6, with bad LI
11	←		M	DOWNLINK RLC PDU	SDU 6 and padding
12	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
13	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one.
14	←		U	OPEN UE TEST LOOP	
15	→		U	OPEN UE TEST LOOP COMPLETE	
16	←		U	DEACTIVATE RB TEST MODE	
17	→		U	DEACTIVATE RB TEST MODE COMPLETE	

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

None.

7.2.2a.3.5 Test requirements

1) At step 7, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

2) At step 13, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

7.2.2a.4 Reassembly / 7-bit "Length Indicators" / First data octet LI (TDD MBSFN)

7.2.2a.4.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length indicators" are added to allow correct reconstruction of SDUs. A special "Length Indicator" is defined to indicate that the start of an SDU is coincident with the start of the PDU. The special "Length Indicator" is needed to avoid discarding of an SDU when the first received PDU has a sequence number different from zero. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2a.4.2 Conformance requirement

1. "Length Indicator" = 1111100, UMD PDU: The first data octet in this RLC PDU is the first octet of a RLC SDU.

2. Upon delivery of a set of UMD PDUs from the lower layer, the Receiver shall:

   ...

   - if the special "Length Indicator" "1111 100" or "1111 1111 1111 100" is the first "Length Indicator" of a UMD PDU received on the downlink:
     - consider the first data octet in this UMD PDU as the first octet of an RLC SDU.

Reference(s)

1. TS 25.322 clause 9.2.2.8.
2. TS 25.322 clause 11.2.3.

7.2.2a.4.3 Test purpose

To test that a UE in unacknowledged mode correctly handles a received RLC PDU with a 7-bit "Length Indicator" having its value equal to the special "Length Indicator" value 1111100 when the sequence number of the first received PDU is different from zero.

7.2.2a.4.4 Method of test

Initial conditions

The generic procedure for P-T-M Radio Bearer setup (clause 7.2.2a.1) is executed with all the parameters as specified in the procedure for the RAB defined for UM 7-bit "Length Indicator" tests.

Test procedure

a) The SS transmits a RLC SDU of size 12 bytes in a PDU which has the 'First Data Octet LI' as the first "Length Indicator" in the PDU.

b) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is = 1. The SS records the value.

c) The SS transmits another SDU of 12 bytes in a PDU which has the 'First Data Octet LI' as the first "Length Indicator" in the PDU.

d) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is consistent with a number of received RLC SDUs equal to 1.

NOTE: The SS sends PDUs in downlink starting at sequence number 10.

Expected sequence

Step	Direction		Carrier	Message	Comment
	UE	SS			
1				P-T-M RADIO BEARER SETUP	See clause 7.2.2a.1
2	←		M	DOWNLINK RLC PDU, SN 10	SDU 1 with LI = 1111100
3	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
4	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one. SS records value.
5	←		M	DOWNLINK RLC PDU, SN 11	SDU 2 with LI = 1111100
6	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
7	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one.
8	←		U	OPEN UE TEST LOOP	
9	→		U	OPEN UE TEST LOOP COMPLETE	
10	←		U	DEACTIVATE RB TEST MODE	
11	→		U	DEACTIVATE RB TEST MODE COMPLETE	

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

None.

7.2.2a.4.5 Test requirements

1) At step 4, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

2) At step 7, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

7.2.2a.5 Reassembly / 15-bit "Length Indicators" / Invalid LI value (TDD MBSFN)

7.2.2a.5.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of an invalid "Length Indicator" value has been specified. Incorrect operation of segmentation, concatenation, or coding of "Length Indicator" will result in failure of the UE to communicate.

7.2.2a.5.2 Conformance requirement

Upon delivery by the lower layer of an UMD PDU that contains a "Length Indicator" value specified to be reserved for UMD PDUs in this version of the protocol, the Receiver shall:

- ignore that UMD PDU.;

Length: 15bits

Bit	Description
111111111111110	AMD PDU: The rest of the RLC PDU includes a piggybacked STATUS PDU. UMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).

Reference(s)

TS 25.322 clause 11.2.4.1, 9.2.2.8.

7.2.2a.5.3 Test purpose

To test that PDUs with invalid "Length Indicators" are discarded by the receiving RLC.

7.2.2a.5.4 Method of test

Initial conditions

The generic procedure for P-T-M Radio Bearer setup (clause 7.2.2a.1) is executed with all the parameters as specified in the procedure for the RAB defined for UM 15-bit "Length Indicator" tests.

Test procedure

a) The SS transmits two RLC SDUs of size UM_15_PayloadSize + 1 bytes. In the third PDU for transmission, the SS sets the value of the second (padding) LI to 111111111111110.

b) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is = 1. The SS records the value.

c) The SS transmits two RLC SDUs of size UM_15_PayloadSize + 1 bytes. In the third PDU for transmission, the SS sets the value of the second (padding) LI to 111111111111110.

d) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is consistent with a number of received RLC SDUs equal to 1.

Expected sequence

Step	Direction		Carrier	Message	Comment
	UE	SS			
1				P-T-M RADIO BEARER SETUP	See clause 7.2.2a.1
2	←		M	DOWNLINK RLC PDU	SDU 1
3	←		M	DOWNLINK RLC PDU	SDU 1 & SDU 2
4	←		M	DOWNLINK RLC PDU	SDU 2 and invalid LI (=111111111111110)
5	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
6	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one. SS records value.
7	←		M	DOWNLINK RLC PDU	SDU 1
8	←		M	DOWNLINK RLC PDU	SDU 1 & SDU 2
9	←		M	DOWNLINK RLC PDU	SDU 2 and invalid LI (=111111111111110)
10	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
11	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one.
12	←		U	OPEN UE TEST LOOP	
13	→		U	OPEN UE TEST LOOP COMPLETE	
14	←		U	DEACTIVATE RB TEST MODE	
15	→		U	DEACTIVATE RB TEST MODE COMPLETE	

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

None.

7.2.2a.5.5 Test requirements

1) At step 6, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

2) At step 11, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

7.2.2a.6 Reassembly / 15-bit "Length Indicators" / LI value > PDU size (TDD MBSFN)

7.2.2a.6.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of an invalid "Length Indicator" value has been specified. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2a.6.2 Conformance requirement

If the "Length Indicator" of a PDU has a value that is larger than the PDU size – the number of octets containing "Length Indicators" in the PDU – 1 and is not one of the predefined values listed in the table of 3GPP TS 25.322 clause 9.2.2.8, the PDU shall be discarded and treated as a missing PDU.

If a PDU with sequence number < VR(US) is missing then all SDUs that have segments in this PDU shall be discarded.

Reference(s)

TS 25.322 clauses 11.2.4.2 and 11.2.3.

7.2.2a.6.3 Test purpose

To test that PDUs with "Length Indicators" that point beyond the end of the PDU are ignored by the receiving RLC entity.

7.2.2a.6.4 Method of test

Initial conditions

The generic procedure for P-T-M Radio Bearer setup (clause 7.2.2a.1) is executed with all the parameters as specified in the procedure for the RAB defined for UM 15-bit "Length Indicator" tests.

Test procedure

a) The SS transmits three RLC SDUs of size UM 15 PayloadSize + 1 bytes. All the SDUs are concatenated or segmented over successive RLC PDUs. In the third PDU for transmission, the SS sets value of the "Length Indicator" to be UM_15_PayloadSize (decimal).

b) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is = 1. The SS records the value.

c) The SS transmits three RLC SDUs of size UM 15 PayloadSize + 1 bytes. All the SDUs are concatenated or segmented over successive RLC PDUs. In the third PDU for transmission, the SS sets value of the "Length Indicator" to be UM_15_PayloadSize (decimal).

d) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is consistent with a number of received RLC SDUs equal to 1.

Expected sequence

Step	Direction		Carrier	Message	Comment
	UE	SS			
1				P-T-M RADIO BEARER SETUP	See clause 7.2.2a.1
2	←		M	DOWNLINK RLC PDU	SDU 1
3	←		M	DOWNLINK RLC PDU	SDU 1 & SDU 2
4	←		M	DOWNLINK RLC PDU	SDU 2 & SDU 3, with bad LI
5	←		M	DOWNLINK RLC PDU	SDU 3 and padding
6	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
7	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one. SS records value.
8	←		M	DOWNLINK RLC PDU	SDU 4
9	←		M	DOWNLINK RLC PDU	SDU 4 & SDU 5
10	←		M	DOWNLINK RLC PDU	SDU 5 & SDU 6, with bad LI
11	←		M	DOWNLINK RLC PDU	SDU 6 and padding
12	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
13	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one.
14	←		U	OPEN UE TEST LOOP	
15	→		U	OPEN UE TEST LOOP COMPLETE	
16	←		U	DEACTIVATE RB TEST MODE	
17	→		U	DEACTIVATE RB TEST MODE COMPLETE	

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

None.

7.2.2a.6.5 Test requirements

1) At step 7, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

2) At step 13, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

7.2.2a.7 Reassembly / 15-bit "Length Indicators" / First data octet LI (TDD MBSFN)

7.2.2a.7.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. A special LI is defined to indicate that the start of on SDU is coincident with the start of the PDU. The special LI is needed to avoid discarding of an SDU when the first received PDU has a sequence number different from zero. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2a.7.2 Conformance requirement

"Length Indicators" = 111111111111100, UMD PDU: The first data octet in this RLC PDU is the first octet of a RLC SDU.

Reference(s)

TS 25.322 clause 9.2.2.8.

7.2.2a.7.3 Test purpose

To test that a UE in unacknowledged mode correctly handles a received RLC PDU with a 15-bit "Length Indicator" having its value equal to the special LI value 111111111111100 when the sequence number of the first received PDU is different from zero.

7.2.2a.7.4 Method of test

Initial conditions

The generic procedure for P-T-M Radio Bearer setup (clause 7.2.2a.1) is executed with all the parameters as specified in the procedure for the RAB defined for UM 15-bit "Length Indicator" tests.

Test procedure

a) The SS transmits a RLC SDU of size 150 bytes in a PDU which has the 'First Data Octet LI' as the first "Length Indicator" in the PDU.

b) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is = 1. The SS records the value.

c) The SS transmits another SDU of 150 bytes in a PDU which has the 'First Data Octet LI' as the first "Length Indicator" in the PDU.

d) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is consistent with a number of received RLC SDUs equal to 1.

NOTE: The SS sends PDUs in downlink starting at sequence number 10.

Expected sequence

Step	Direction		Carrier	Message	Comment
	UE	SS			
1				P-T-M RADIO BEARER SETUP	See clause 7.2.2a.1
2	←		M	DOWNLINK RLC PDU, SN 10	SDU 1 with LI = 111111111111100
3	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
4	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one. SS records value.
5	←		M	DOWNLINK RLC PDU, SN 11	SDU 2 with LI = 111111111111100
6	←		M	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
7	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one.
8	←		U	OPEN UE TEST LOOP	
9	→		U	OPEN UE TEST LOOP COMPLETE	
10	←		U	DEACTIVATE RB TEST MODE	
11	→		U	DEACTIVATE RB TEST MODE COMPLETE	

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

None.

7.2.2a.7.5 Test requirements

1) At step 4, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

2) At step 7, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

7.2.2b Unacknowledged mode (MBSFN IMB)

7.2.2b.1 P-T-M Radio bearer setup

Two generic P-T-M Radio Access Bearers are provided for the MBSFN UM tests.

The UM test RAB is set up using the Generic Procedure described below, and with the default RAB replaced as follows:

- For UM 7-bit "Length Indicator" tests: the RB configuration described in 3GPP TS 34.108 clause 6.11.1e (3.84 Mcps TDD IMB) is used. For these tests, let UM_7_PayloadSize denote the RAB payload size in octets.

- For UM 15-bit "Length Indicator" tests: the RB configuration described in 3GPP TS 34.108 clause 6.11.2c (3.84 Mcps TDD IMB) is used. For these tests, let UM_15_PayloadSize denote the RAB payload size in octets.

These UM test RABs are used in all tests with the following exception:

- Tests that explicitly specify a different Radio Bearer configuration.

All other settings are the same.

The special "Length Indicator" indicating that an SDU begins in the first octet of a PDU, described in clause 9.2.2.8 in 3GPP TS 25.322 is not used except when explicitly stated in the corresponding test case.

Initial conditions

System Simulator:

Unicast carrier: 1 cell, Cell 1 with default configuration.

- MBSFN carriers: 1 cell, Cell 31 has default parameters. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 and Default1 MCCH scheduling (No ongoing session) according to subclause 11.2 of TS 34.108.

  The configuration of the S-CCPCH which will carry the MTCH is based upon the default test RAB configuration defined above.

User Equipment:

- On the unicast carrier cell the UE is in registered Idle Mode on PS (state 3) if the UE only supports PS domain or registered Idle Mode on CS/PS (state 7) if the UE supports both CS and PS domains, as specified in clause 7.2.2 of TS 34.108.
- The UE is in MBSFN Idle mode with one activated service as specified in clause 7.6.4 of TS 34.108. The UE has selected (i.e. it is included in MBMS_ACTIVATED_SERVICES variable) a national service for which there will be a session starting on MBSFN Cell 31 (see TS 34.108 clause 11.2.4).

Procedure

a) The UE is camping on Cell 1 and Cell 31. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 (no session ongoing) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108.

b) The SS sends ACTIVATE RB TEST MODE on the unicast carrier and the UE responds with ACTIVATE RB TEST MODE COMPLETE.

c) The SS sends CLOSE UE TEST LOOP to activate RLC SDU counting on Cell 31 MTCH (Transmission identity indicating the MBSFN MBMS activated service).

d) The SS notifies on MCCH about the start of an MBMS session for one modification period. MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C4 (one PTM session starting) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108.

e) MCCH messages are then transmitted by the SS on Cell 31 using MBMS configuration C2 (one PTM session ongoing) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108.

f) The SS waits for the UE to start reception of the MBMS data on MTCH according to the specified service activation time. The UE closes the test loop. The UE sends CLOSE UE TEST LOOP COMPLETE.

Expected sequence

Step	Direction		Carrier	Message	Comment
	UE	SS			
1	←		U	ACTIVATE RB TEST MODE	
2	→		U	ACTIVATE RB TEST MODE COMPLETE	
3	←		U	CLOSE UE TEST LOOP	Loop back mode 3 is activated on Cell 31 for the selected national service on MTCH.
4	←		M	MBMS MCCH Message Configuration C4	Includes the national service activated at UE in the modified services list for one modification period.
5	←		M	MBMS MCCH Message Configuration C2	No modified services. One ongoing service corresponding to that activated at the UE.
6	→		U	CLOSE UE TEST LOOP COMPLETE	The UE establishes the MTCH according to the activation time and closes the test loop.

7.2.2b.2 Reassembly / 7-bit "Length Indicators" / Invalid LI value (MBSFN IMB)

7.2.2b.2.1 Definition

The RLC segments and concatenates SDUs into UMD PDU according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of an invalid

"Length Indicator" value has been specified. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2b.2.2 Conformance requirement

Upon delivery by the lower layer of an UMD PDU that contains a "Length Indicator" value specified to be reserved for UMD PDUs in this version of the protocol, the Receiver shall:

- ignore that UMD PDU.

[...]

Length: 7 bits

Bit	Description
1111101	Reserved (PDUs with this coding will be discarded by this version of the protocol).
1111110	AMD PDU: The rest of the RLC PDU includes a piggybacked STATUS PDU. UMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).

Reference(s)

TS 25.322 clause 9.2.2.8 and 11.2.4.1.

7.2.2b.2.3 Test purpose

To test that PDUs with reserved "Length indicator" values of '111 1110' and '111 1101' are discarded by the receiving RLC.

7.2.2b.2.4 Method of test

Initial conditions

The generic procedure for P-T-M Radio Bearer setup (clause 7.2.2b.1) is executed with all the parameters as specified in the procedure for the RAB defined for UM 7-bit "Length Indicator" tests.

Test procedure

a) The SS transmits two RLC SDUs of size UM_7_PayloadSize + 1 bytes. In the third PDU for transmission, the SS sets the value of the second (padding) LI to 1111110.

b) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is = 1. The SS records the value.

c) The SS transmits two RLC SDUs of size UM_7_PayloadSize + 1 bytes. In the third PDU for transmission, the SS sets the value of the second (padding) LI to 1111101.

d) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is consistent with a number of received RLC SDUs equal to 1.

Expected sequence

Step	Direction		Carrier	Message	Comment
	UE	SS			
1				P-T-M RADIO BEARER SETUP	See clause 7.2.2b.1
2	←		MU	DOWNLINK RLC PDU	SDU 1
3	←		MU	DOWNLINK RLC PDU	SDU 1 & SDU 2
4	←		MU	DOWNLINK RLC PDU	SDU 2 and invalid LI (=11111110)
5	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
6	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one. SS records value.
7	←		MU	DOWNLINK RLC PDU	SDU 1
8	←		MU	DOWNLINK RLC PDU	SDU 1 & SDU 2
9	←		MU	DOWNLINK RLC PDU	SDU 2 and invalid LI (=11111101)
10	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
11	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one.
12	←		U	OPEN UE TEST LOOP	
13	→		U	OPEN UE TEST LOOP COMPLETE	
14	←		U	DEACTIVATE RB TEST MODE	
15	→		U	DEACTIVATE RB TEST MODE COMPLETE	

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

None.

7.2.2b.2.5 Test requirements

1) At step 6, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

2) At step 11, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

7.2.2b.3 Reassembly / 7-bit "Length Indicators" / LI value > PDU size (MBSFN IMB)

7.2.2b.3.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of an invalid "Length Indicator" value has been specified. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2b.3.2 Conformance requirement

If the "Length Indicator" of an UMD PDU has a value that is larger than the PDU size – RLC header size and is not one of the predefined values listed in the table of TS 25.322 subclause 9.2.2.8, the Receiver shall:

- ignore the UMD PDU.

[...]

Upon delivery of a set of UMD PDUs from the lower layer, the Receiver shall:

- update VR(US) according to each received UMD PDU (see TS 25.322 subclause 9.4);
- if the updating step of VR(US) is not equal to one (i.e. one or more UMD PDUs are missing):
  - discard the SDUs that have segments in the missing UMD PDUs.

Reference(s)

TS 25.322 clauses 11.2.4.2 and 11.2.3.

7.2.2b.3.3 Test purpose

To test that PDUs with "Length Indicators" that point beyond the end of the PDU are ignored by the receiving RLC entity.

7.2.2b.3.4 Method of test

Initial conditions

The generic procedure for P-T-M Radio Bearer setup (clause 7.2.2b.1) is executed with all the parameters as specified in the procedure for the RAB defined for UM 7-bit "Length Indicator" tests.

Test procedure

a) The SS transmits three RLC SDUs of size UM 7 PayloadSize + 1 bytes. All the SDUs are concatenated or segmented over successive RLC PDUs. In the third PDU for transmission, the SS sets value of the "Length Indicator" to be UM_7_PayloadSize (decimal).

b) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 4 RLC SDU COUNTER RESPONSE is = 1. The SS records the value.

c) The SS transmits three RLC SDUs of size UM 7 PayloadSize + 1 bytes. All the SDUs are concatenated or segmented over successive RLC PDUs. In the third PDU for transmission, the SS sets value of the "Length Indicator" to be UM_7_PayloadSize (decimal).

d) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 4 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is consistent with a number of received RLC SDUs equal to 1.

Expected sequence

Step	Direction		Carrier	Message	Comment
	UE	SS			
1				P-T-M RADIO BEARER SETUP	See clause 7.2.2a.1
2	←		MU	DOWNLINK RLC PDU	SDU 1
3	←		MU	DOWNLINK RLC PDU	SDU 1 & SDU 2
4	←		MU	DOWNLINK RLC PDU	SDU 2 & SDU 3, with bad LI
5	←		M	DOWNLINK RLC PDU	SDU 3 and padding
6	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
7	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one. SS records value.
8	←		MU	DOWNLINK RLC PDU	SDU 4
9	←		MU	DOWNLINK RLC PDU	SDU 4 & SDU 5
10	←		MU	DOWNLINK RLC PDU	SDU 5 & SDU 6, with bad LI
11	←		M	DOWNLINK RLC PDU	SDU 6 and padding
12	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
13	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one.
14	←		U	OPEN UE TEST LOOP	
15	→		U	OPEN UE TEST LOOP COMPLETE	
16	←		U	DEACTIVATE RB TEST MODE	
17	→		U	DEACTIVATE RB TEST MODE COMPLETE	

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

None.

7.2.2b.3.5 Test requirements

1) At step 7, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

2) At step 13, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

7.2.2b.4 Reassembly / 7-bit "Length Indicators" / First data octet LI (MBSFN IMB)

7.2.2b.4.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length indicators" are added to allow correct reconstruction of SDUs. A special "Length Indicator" is defined to indicate that the start of an SDU is coincident with the start of the PDU. The special "Length Indicator" is needed to avoid discarding of an SDU when the first received PDU has a sequence number different from zero. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2b.4.2 Conformance requirement

1. "Length Indicator" = 1111100, UMD PDU: The first data octet in this RLC PDU is the first octet of a RLC SDU.

2. Upon delivery of a set of UMD PDUs from the lower layer, the Receiver shall:

   ...

   - if the special "Length Indicator" "1111 100" or "1111 1111 1111 100" is the first "Length Indicator" of a UMD PDU received on the downlink:

     - consider the first data octet in this UMD PDU as the first octet of an RLC SDU.

Reference(s)

1. TS 25.322 clause 9.2.2.8.
2. TS 25.322 clause 11.2.3.

7.2.2b.4.3 Test purpose

To test that a UE in unacknowledged mode correctly handles a received RLC PDU with a 7-bit "Length Indicator" having its value equal to the special "Length Indicator" value 1111100 when the sequence number of the first received PDU is different from zero.

7.2.2b.4.4 Method of test

Initial conditions

The generic procedure for P-T-M Radio Bearer setup (clause 7.2.2b.1) is executed with all the parameters as specified in the procedure for the RAB defined for UM 7-bit "Length Indicator" tests.

Test procedure

a) The SS transmits a RLC SDU of size 12 bytes in a PDU which has the 'First Data Octet LI' as the first "Length Indicator" in the PDU.

b) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is = 1. The SS records the value.

c) The SS transmits another SDU of 12 bytes in a PDU which has the 'First Data Octet LI' as the first "Length Indicator" in the PDU.

d) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is consistent with a number of received RLC SDUs equal to 1.

NOTE: The SS sends PDUs in downlink starting at sequence number 10.

Expected sequence

Step	Direction UE	SS	Carrier	Message	Comment
1				P-T-M RADIO BEARER SETUP	See clause 7.2.2a.1
2	←		MU	DOWNLINK RLC PDU, SN 10	SDU 1 with LI = 1111100
3	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
4	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one. SS records value.
5	←		MU	DOWNLINK RLC PDU, SN 11	SDU 2 with LI = 1111100
6	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
7	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one.
8	←		U	OPEN UE TEST LOOP	
9	→		U	OPEN UE TEST LOOP COMPLETE	
10	←		U	DEACTIVATE RB TEST MODE	
11	→		U	DEACTIVATE RB TEST MODE COMPLETE	

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

None.

7.2.2b.4.5 Test requirements

1) At step 4, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

2) At step 7, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

7.2.2b.5 Reassembly / 15-bit "Length Indicators" / Invalid LI value (MBSFN IMB)

7.2.2b.5.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of an invalid "Length Indicator" value has been specified. Incorrect operation of segmentation, concatenation, or coding of "Length Indicator" will result in failure of the UE to communicate.

7.2.2b.5.2 Conformance requirement

Upon delivery by the lower layer of an UMD PDU that contains a "Length Indicator" value specified to be reserved for UMD PDUs in this version of the protocol, the Receiver shall:

- ignore that UMD PDU.;

Length: 15bits

Bit	Description
111111111111110	AMD PDU: The rest of the RLC PDU includes a piggybacked STATUS PDU. UMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).

Reference(s)

TS 25.322 clause 11.2.4.1, 9.2.2.8.

7.2.2b.5.3 Test purpose

To test that PDUs with invalid "Length Indicators" are discarded by the receiving RLC.

7.2.2b.5.4 Method of test

Initial conditions

The generic procedure for P-T-M Radio Bearer setup (clause 7.2.2b.1) is executed with all the parameters as specified in the procedure for the RAB defined for UM 15-bit "Length Indicator" tests.

Test procedure

a) The SS transmits two RLC SDUs of size UM_15_PayloadSize + 1 bytes. In the third PDU for transmission, the SS sets the value of the second (padding) LI to 111111111111110.

b) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is = 1. The SS records the value.

c) The SS transmits two RLC SDUs of size UM_15_PayloadSize + 1 bytes. In the third PDU for transmission, the SS sets the value of the second (padding) LI to 111111111111110.

d) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is consistent with a number of received RLC SDUs equal to 1.

Expected sequence

Step	Direction UE	Direction SS	Carrier	Message	Comment
1				P-T-M RADIO BEARER SETUP	See clause 7.2.2a.1
2	←		MU	DOWNLINK RLC PDU	SDU 1
3	←		MU	DOWNLINK RLC PDU	SDU 1 & SDU 2
4	←		MU	DOWNLINK RLC PDU	SDU 2 and invalid LI (=111111111111110)
5	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
6	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one. SS records value.
7	←		MU	DOWNLINK RLC PDU	SDU 1
8	←		MU	DOWNLINK RLC PDU	SDU 1 & SDU 2
9	←		MU	DOWNLINK RLC PDU	SDU 2 and invalid LI (=111111111111110)
10	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
11	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one.
12	←		U	OPEN UE TEST LOOP	
13	→		U	OPEN UE TEST LOOP COMPLETE	
14	←		U	DEACTIVATE RB TEST MODE	
15	→		U	DEACTIVATE RB TEST MODE COMPLETE	

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

None.

7.2.2b.5.5 Test requirements

1) At step 6, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

2) At step 11, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

7.2.2b.6 Reassembly / 15-bit "Length Indicators" / LI value > PDU size (MBSFN IMB)

7.2.2b.6.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of an invalid "Length Indicator" value has been specified. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2b.6.2 Conformance requirement

If the "Length Indicator" of a PDU has a value that is larger than the PDU size – the number of octets containing "Length Indicators" in the PDU – 1 and is not one of the predefined values listed in the table of 3GPP TS 25.322 clause 9.2.2.8, the PDU shall be discarded and treated as a missing PDU.

If a PDU with sequence number < VR(US) is missing then all SDUs that have segments in this PDU shall be discarded.

Reference(s)

TS 25.322 clauses 11.2.4.2 and 11.2.3.

7.2.2b.6.3 Test purpose

To test that PDUs with "Length Indicators" that point beyond the end of the PDU are ignored by the receiving RLC entity.

7.2.2b.6.4 Method of test

Initial conditions

The generic procedure for P-T-M Radio Bearer setup (clause 7.2.2b.1) is executed with all the parameters as specified in the procedure for the RAB defined for UM 15-bit "Length Indicator" tests.

Test procedure

a) The SS transmits three RLC SDUs of size UM 15 PayloadSize + 1 bytes. All the SDUs are concatenated or segmented over successive RLC PDUs. In the third PDU for transmission, the SS sets value of the "Length Indicator" to be UM_15_PayloadSize (decimal).

b) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is = 1. The SS records the value.

c) The SS transmits three RLC SDUs of size UM 15 PayloadSize + 1 bytes. All the SDUs are concatenated or segmented over successive RLC PDUs. In the third PDU for transmission, the SS sets value of the "Length Indicator" to be UM_15_PayloadSize (decimal).

d) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is consistent with a number of received RLC SDUs equal to 1.

Expected sequence

Step	Direction UE	Direction SS	Carrier	Message	Comment
1				P-T-M RADIO BEARER SETUP	See clause 7.2.2a.1
2	←		MU	DOWNLINK RLC PDU	SDU 1
3	←		MU	DOWNLINK RLC PDU	SDU 1 & SDU 2
4	←		MU	DOWNLINK RLC PDU	SDU 2 & SDU 3, with bad LI
5	←		M	DOWNLINK RLC PDU	SDU 3 and padding
6	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
7	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one. SS records value.
8	←		MU	DOWNLINK RLC PDU	SDU 4
9	←		MU	DOWNLINK RLC PDU	SDU 4 & SDU 5
10	←		MU	DOWNLINK RLC PDU	SDU 5 & SDU 6, with bad LI
11	←		M	DOWNLINK RLC PDU	SDU 6 and padding
12	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
13	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one.
14	←		U	OPEN UE TEST LOOP	
15	→		U	OPEN UE TEST LOOP COMPLETE	
16	←		U	DEACTIVATE RB TEST MODE	
17	→		U	DEACTIVATE RB TEST MODE COMPLETE	

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

None.

7.2.2b.6.5 Test requirements

1) At step 7, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

2) At step 13, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

7.2.2b.7 Reassembly / 15-bit "Length Indicators" / First data octet LI (MBSFN IMB)

7.2.2b.7.1 Definition

The RLC segments and concatenates SDUs into UMD PDUs according to the PDU size requested by MAC. "Length Indicators" are added to allow correct reconstruction of SDUs. A special LI is defined to indicate that the start of on SDU is coincident with the start of the PDU. The special LI is needed to avoid discarding of an SDU when the first received PDU has a sequence number different from zero. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.2b.7.2 Conformance requirement

"Length Indicators" = 111111111111100, UMD PDU: The first data octet in this RLC PDU is the first octet of a RLC SDU.

Reference(s)

TS 25.322 clause 9.2.2.8.

7.2.2b.7.3 Test purpose

To test that a UE in unacknowledged mode correctly handles a received RLC PDU with a 15-bit "Length Indicator" having its value equal to the special LI value 111111111111100 when the sequence number of the first received PDU is different from zero.

7.2.2b.7.4 Method of test

Initial conditions

The generic procedure for P-T-M Radio Bearer setup (clause 7.2.2b.1) is executed with all the parameters as specified in the procedure for the RAB defined for UM 15-bit "Length Indicator" tests.

Test procedure

a) The SS transmits a RLC SDU of size 150 bytes in a PDU which has the 'First Data Octet LI' as the first "Length Indicator" in the PDU.

b) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is = 1. The SS records the value.

c) The SS transmits another SDU of 150 bytes in a PDU which has the 'First Data Octet LI' as the first "Length Indicator" in the PDU.

d) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is consistent with a number of received RLC SDUs equal to 1.

NOTE: The SS sends PDUs in downlink starting at sequence number 10.

Expected sequence

Step	Direction		Carrier	Message	Comment
	UE	SS			
1				P-T-M RADIO BEARER SETUP	See clause 7.2.2a.1
2	←		MU	DOWNLINK RLC PDU, SN 10	SDU 1 with LI = 111111111111100
3	←		U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
4	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one. SS records value.
5	←		MU	DOWNLINK RLC PDU, SN 11	SDU 2 with LI = 111111111111100
6	←		MU	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
7	→		U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is equal to one.
8	←		U	OPEN UE TEST LOOP	
9	→		U	OPEN UE TEST LOOP COMPLETE	
10	←		U	DEACTIVATE RB TEST MODE	
11	→		U	DEACTIVATE RB TEST MODE COMPLETE	

Specific Message Contents

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

None.

7.2.2b.7.5 Test requirements

1) At step 4, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

2) At step 7, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a number that corresponds to one received RLC SDU for Cell 31 MTCH.

7.2.3 Acknowledged mode

7.2.3.1 General information for AM tests

Two generic Radio Access Bearers are provided for AM tests.

The AM test RAB is set up using the Generic Procedure described in clause 7.1.3 of TS 34.108, and with the default RAB replaced as follows:

- For AM 7-bit "Length Indicator" tests: the RB configuration described in 3G TS 34.108 clause 6.11.3 is used. For these tests, let AM_7_PayloadSize denote the RAB payload size in octets.

- For AM 15-bit "Length Indicator" tests: the RB configuration described in 3G TS 34.108 clause 6.11.4 is used. For these tests, let AM_15_PayloadSize denote the RAB payload size in octets.

Unless specified in individual test cases, the default RLC settings are given in table 7.2/1.

Table 7.2/1: RLC Parameters for AM testing

Uplink RLC	
Transmission RLC discard	
Max DAT retransmissions	
Max_DAT	4
Transmission window size	128
Timer_RST	500
Max_RST	4
Polling info	
Timer_poll_prohibit	disabled
Timer_poll	disabled
Poll_PU	disabled
Poll_SDU	disabled
Last transmission PDU poll	TRUE
Last retransmission PDU poll	TRUE
Poll_Window	disabled
Timer_poll_periodic	disabled
Downlink RLC	
In-sequence delivery	TRUE
Receiving window size	128
Timer_Status_Prohibit	disabled
Timer_EPC	disabled
Missing PDU Indicator	TRUE
Timer_STATUS_periodic	disabled

The AM test RABs are used in all tests with the following exception:

- Tests that explicitly specify a different Radio Bearer configuration.

All other settings are the same.

7.2.3.2 Segmentation and reassembly / Selection of 7 or 15 bit Length Indicators

7.2.3.2.1 Definition

The RLC segments and concatenates SDUs into PDUs according to the PDU size configured by RRC. "Length Indicators" are added to allow correct reconstruction of SDUs. The selection of the size of the "Length Indicator" fields used must follow the specified rules. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.3.2.2 Conformance requirement

Except for the predefined values reserved for special purposes and listed in TS 25.322 section 9.2.2.8 the "Length Indicator" shall:

- be set to the number of octets between the end of the RLC header and up to and including the last octet of an RLC SDU segment;
- be included in the PDUs that they refer to.

[...]

The size of the Length Indicator may be either 7 bits or 15 bits.

[...]

For AM:

- if the "AMD PDU size" is ≤ 126 octets:
  - 7-bit "Length Indicators" shall be used.
- else:

  - 15-bit "Length Indicators" shall be used.

- the size of the "Length Indicator" is always the same for all AMD PDUs, for one RLC entity.

Reference(s)

TS 25.322 clauses 9.2.2.8 and 9.2.2.9.

7.2.3.2.3 Test purpose

To test that if the configured AMD PDU size is ≤ 126 octets, 7 bit "Length Indicators" are used in transmitted AMD PDUs, otherwise, 15 bit "Length Indicators" are used.

7.2.3.2.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to 10 bytes.

Test procedure

a) The SS transmits an RLC SDU of size 10 bytes. The PDU carrying this SDU is transmitted with a poll for status.

b) The SS checks the "Length Indicator" values and SDU size and contents in the RLC PDU returned on the uplink (assuming a 7-bit "Length Indicator" size).

c) The SS releases the RB.

The SS performs the Radio Bearer establishment procedure (clause 7.1.3 of TS 34.108) with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 15-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC Transmission window size	16
Downlink RLC Receiving window size	16

All other settings are the same.

d) The SS transmits an RLC SDU of size 10 bytes. The PDU carrying this SDU is transmitted with a poll for status.

e) The SS checks the "Length Indicator" values and SDU size and contents in the RLC PDU returned on the uplink (assuming a 15-bit "Length Indicator" size).

f) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE	Direction SS	Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures for AM 7 bit LIs
2	←		DOWNLINK RLC PDU	10 byte SDU + padding + poll
3	→		UPLINK RLC PDU	10 byte SDU + piggy-backed status + poll
3a	→		*STATUS PDU*	*If piggy-backed status is not used in 3*
4	←		STATUS PDU	
5	←		RB RELEASE	
6			RB ESTABLISHMENT	See generic procedures for AM 15 bit LIs (AMD PDU size > 126 bytes)
7	←		DOWNLINK RLC PDU	10 byte SDU + padding + poll
8	→		UPLINK RLC PDU	10 byte SDU + piggy-backed status + poll
8a	→		*STATUS PDU*	*If piggy-backed status is not used in 7*
9	←		STATUS PDU	
10			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.3.2.5 Test requirements

The UE shall send 7 bit "Length Indicators" with values that correctly indicate the end of SDU in step b).

The UE shall send 15 bit "Length Indicators" with values that correctly indicate the end of SDU in step e).

7.2.3.3 Segmentation and Reassembly / 7-bit "Length Indicators" / Padding or Piggy-backed Status

7.2.3.3.1 Definition

The RLC segments and concatenates SDUs into AMD PDUs according to the PDU size configured by RRC. "Length Indicators" are added to allow correct reconstruction of SDUs. Incorrect operation of segmentation, concatenation, or coding of length indicators will result in failure of the UE to communicate.

7.2.3.3.2 Conformance requirement

A "Length Indicator" is used to indicate the last octet of each RLC SDU ending within the PDU.

Except for the predefined values reserved for special purposes and listed in the tables below, the "Length Indicator" shall:

- be set to the number of octets between the end of the RLC header and up to and including the last octet of an RLC SDU segment;
- be included in the PDUs that they refer to.

Predefined values of the "Length Indicator" are used to indicate padding. The values that are reserved for special purposes are listed in the tables below depending on the size of the "Length Indicator". Only predefined "Length Indicator" values can refer to the padding space. These values shall only be placed after all other "Length Indicators" for a PDU.

STATUS PDUs can be piggybacked on the AMD PDU by using part or all of the padding space. A predefined "Length Indicator" shall be used to indicate the presence of a piggybacked STATUS PDU. This "Length Indicator" replaces the padding "Length Indicator". The piggybacked STATUS PDU shall be appended immediately following the PDU data. When only part of the padding space is used, the end of the piggybacked STATUS PDU is indicated by one of the SUFI fields NO_MORE or ACK. Thus no additional "Length Indicator" is required to show that there is still padding in the AMD PDU.

[…]

Sender shall:

- when RLC SDUs are received from upper layers:

  - segment the RLC SDUs into AMD PDUs where the fixed PDU size is configured by upper layer;
  - set a "Length Indicator" field for each SDU that ends in the AMD PDU according to subclause 9.2.2.8;

[…]

The Receiver may:

- if STATUS PDU(s) to be sent fit into padding octets in AMD PDU(s) to be sent:
  - piggyback a STATUS PDU on the AMD PDU to be sent.

Submission of a piggybacked STATUS PDU in an AMD PDU to the lower layer follows the same rules as an ordinary STATUS PDU.

Reference(s)

TS 25.322 clauses 9.2.2.8, 11.3.2 and 11.5.2.1.

7.2.3.3.3 Test purpose

1. To test that a large SDU is correctly segmented and padding added at the end.
2. To test that a large SDU is received correctly, whether or not it has piggy-backed status at the end.

7.2.3.3.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to AM_7_PayloadSize + 1 bytes.

Test procedure

a) The SS transmits an RLC SDU (SDU1) of size AM_7_PayloadSize + 1bytes, and polls the receiver for status.

b) The SS checks the "Length Indicator" values in the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDU (assuming a 7-bit "Length Indicator" size).

c) The SS transmits another RLC SDU (SDU2) of size AM_7_PayloadSize + 1 bytes, and includes piggy-backed status in the second of the 2 PDUs sent. The SS also polls the receiver for status.

d) The SS checks the "Length Indicator" values in the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDU (assuming a 7-bit "Length Indicator" size).

e) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1 +poll + Padding
4	→		UPLINK RLC PDU	No LI
5	→		UPLINK RLC PDU	Poll, Check LIs and re-assembled SDU
5a	→		*STATUS PDU*	*If piggy-backed status is not used in 5*
6	←		DOWNLINK RLC PDU	SDU 2
7	←		DOWNLINK RLC PDU	SDU 2 + poll + piggy-backed status
8	→		UPLINK RLC PDU	No LI
9	→		UPLINK RLC PDU	Poll, Check LIs and re-assembled SDU
9a	→		*STATUS PDU*	*If piggy-backed status is not used in 9*
10	←		STATUS PDU	
11			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.3.3.5 Test requirements

1. In steps 4 and 5, the UE shall return two RLC PDUs. The first shall have no "Length Indicators". The second shall have a "Length Indicator" indicating the PDU contains an SDU boundary after octet 1 of the data field, and the second shall indicate either that the remainder of the PDU contains padding, or that it contains a piggy-backed status PDU.

2. In steps 8 and 9, the UE shall return two RLC PDUs. The first shall have no "Length Indicators". The second shall have a "Length Indicator" indicating the PDU contains an SDU boundary after octet 1 of the data field, and the second shall indicate either that the remainder of the PDU contains padding, or that it contains a piggy-backed status PDU.

3. The length and data content of all received SDUs shall be the same as the transmitted SDUs.

7.2.3.4 Segmentation and Reassembly / 7-bit "Length Indicators" / LI = 0

7.2.3.4.1 Definition

The RLC segments and concatenates SDUs into AMD PDUs according to the PDU size configured by RRC. A pre-defined "Length Indicator" value is used to indicate when an SDUs ends coincident with the end of the previous PDU. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.3.4.2 Conformance requirement

Except for the predefined values reserved for special purposes and listed in TS 25.322 section 9.2.2.8 the "Length Indicator" shall:

- be set to the number of octets between the end of the RLC header and up to and including the last octet of an RLC SDU segment;

- be included in the PDUs that they refer to.

[...]

In the case where the end of the last segment of an RLC SDU exactly ends at the end of a PDU and there is no "Length Indicator" that indicates the end of the RLC SDU:

- if 7-bit "Length Indicator" is used:

  - a "Length Indicator" with value "000 0000" shall be placed as the first "Length Indicator" in the following PDU;

[...]

For UM and AM RLC:

- if a 7 bit "Length Indicator" is used in a RLC PDU and one or more padding octets are present in the RLC PDU after the end of the last RLC SDU:

- indicate the presence of padding by including a "Length Indicator" with value "1111111" as the last "Length Indicator" in the PDU.

[...]

STATUS PDUs can be piggybacked on the AMD PDU by using part or all of the padding space. A predefined "Length Indicator" shall be used to indicate the presence of a piggybacked STATUS PDU. This "Length Indicator" replaces the padding "Length Indicator". The piggybacked STATUS PDU shall be appended immediately following the PDU data. When only part of the padding space is used, the end of the piggybacked STATUS PDU is indicated by one of the SUFI fields NO_MORE or ACK. Thus no additional "Length Indicator" is required to show that there is still padding in the AMD PDU.

Reference(s)

TS 25.322 clause 9.2.2.8 and 11.3.2.1.

7.2.3.4.3 Test purpose

1. To test that where an SDU exactly fills a PDU, an "Length Indicator" of all 0's is placed by the transmitter as the first "Length Indicator" in the next PDU.
2. To test that where an SDU exactly fills a PDU, and an "Length Indicator" of all 0's is the first "Length Indicator" in the next PDU, the receiver correctly reassembles the SDU.

7.2.3.4.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to AM_7_PayloadSize bytes.

Test procedure

a) The SS transmits an RLC SDU of size 2 * AM_7_PayloadSize bytes. The SS polls the receiver for status in the last RLC PDU sent.

b) The SS checks the "Length Indicator" sizes and values in the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDU (assuming a 7-bit "Length Indicator" size).

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1
4	←		DOWNLINK RLC PDU	LI=0, poll and padding
5	→		UPLINK RLC PDU	No Lis
6	→		UPLINK RLC PDU	(Poll) Check Lis and re-assembled SDU
6a	→		*STATUS PDU*	*If piggy-backed status is not used in 6*
7	←		STATUS PDU	
8			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.3.4.5 Test requirements

The UE shall return two RLC PDUs. The first shall not include any "Length Indicators". The second shall have a "Length Indicator" indicating that the SDU exactly filled the previous PDU, and a "Length Indicator" indicating either that the remainder of the PDU contains padding, or that it contains a piggy-backed STATUS PDU.

The length of the received SDU shall be AM_7_PayloadSize bytes, and the data content shall be the same as the first AM_7_PayloadSize bytes of the transmitted SDU.

7.2.3.5 Reassembly / 7-bit "Length Indicators" / Reserved LI value

7.2.3.5.1 Definition

The RLC segments and concatenates SDUs into AMD PDUs according to the PDU size configured by RRC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of a reserved "Length Indicator" value is specified in the conformance requirement below. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.3.5.2 Conformance requirement

Upon delivery by the lower layer of an AMD PDU that contains a "Length Indicator" value specified to be reserved for AMD PDUs in this version of the protocol, the Receiver shall:

- ignore that AMD PDU.

[...]

Length: 7 bits

Bit	Description
1111100	UMD PDU: The first data octet in this RLC PDU is the first octet of an RLC SDU. AMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).
1111101	Reserved (PDUs with this coding will be discarded by this version of the protocol).

Reference(s)

TS 25.322 clause 9.2.2.8 and 11.3.4.6.

7.2.3.5.3 Test purpose

To test that PDUs with reserved "Length Indicators" are discarded by the receiving RLC.

7.2.3.5.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicators" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Downlink RLC Missing PDU Indicator	FALSE

These settings apply to both the uplink and downlink DTCH.

Test procedure

a) The SS transmits three concatenated RLC SDUs of size AM_7_PayloadSize + 1 bytes. In the second PDU, the SS sets the value of the first "Length Indicator" to correctly indicate the end of SDU1 and adds a second erroneous "Length Indicator" with value 1111100. In the third PDU for transmission, the SS sets the value of the "Length Indicator" to 1111101.

b) The SS waits to receive a status report from the UE.

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU #0	SDU 1
3	←		DOWNLINK RLC PDU #1	SDU 1 + SDU 2, good LI, LI = 1111100
4	←		DOWNLINK RLC PDU #2	SDU 2 + SDU 3, LI = 1111101
5	←		DOWNLINK RLC PDU #3	SDU 3 + poll
6	→		STATUS PDU	Nack PDUs 1 and 2
7			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.3.5.5 Test requirements

1. The UE shall return a STATUS PDU indicating that PDUs with sequence numbers 1 and 2 were not received.

7.2.3.6 Reassembly / 7-bit "Length Indicators" / LI value > PDU size

7.2.3.6.1 Definition

The RLC segments and concatenates SDUs into AMD PDUs according to the PDU size configured by RRC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of an invalid "Length Indicator" value where the value is too large is specified in the conformance requirement below. Incorrect operation of segmentation, concatenation, or coding of "Length Indicator" will result in failure of the UE to communicate.

7.2.3.6.2 Conformance requirement

If the "Length Indicator" of an AMD PDU has a value that is larger than the PDU size – RLC header size and is not one of the predefined values listed in the table of subclause 9.2.2.8, the Sender shall:

- ignore that AMD PDU.

Reference(s)

TS 25.322 clause 11.3.4.5.

7.2.3.6.3 Test purpose

To test that PDUs with "Length Indicators" that point beyond the end of the PDU are discarded by the receiving RLC.

7.2.3.6.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Downlink RLC Missing PDU Indicator	FALSE

These settings apply to both the uplink and downlink DTCH.

Test procedure

a) The SS transmits three RLC SDUs of size AM_7_PayloadSize + 1bytes. All the SDUs are concatenated or segmented over successive RLC PDUs. In the third PDU for transmission, the SS sets value of the "Length Indicator" to be AM_7_PayloadSize (decimal).

b) The SS checks the "Length Indicator" values in the RLC PDUs returned on the uplink, and checks the content of the received STATUS PDU (assuming a 7-bit "Length Indicator" size).

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE	Direction SS	Message	Comments
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU #0	SDU 1
3	←		DOWNLINK RLC PDU #1	SDU 1 & SDU 2
4	←		DOWNLINK RLC PDU #2	SDU 2 & SDU 3, with bad LI
5	←		DOWNLINK RLC PDU #3	SDU 3, poll and padding
6	→		STATUS PDU	Nack PDU #2
7			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.3.6.5 Test requirements

The UE shall return a STATUS PDU indicating that the PDU with sequence number 2 was not received.

7.2.3.7 Segmentation and Reassembly / 15-bit "Length Indicators" / Padding or Piggy-backed Status

7.2.3.7.1 Definition

The RLC segments and concatenates SDUs into AMD PDUs according to the PDU size configured by RRC. "Length Indicators" are added to allow correct reconstruction of SDUs. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.3.7.2 Conformance requirement

The "Length Indicator" is used to indicate, each time, the end of an SDU occurs in the PU. The "Length Indicator" points out the number of octets between the end of the last "Length Indicator" field and up to and including the octet at the end of an SDU segment

A PDU that has unused space, to be referred to as padding, shall use a "Length Indicator" to indicate that this space is used as padding unless the padding size is one octet for PDUs with 15-bit LIs. A padding "Length Indicator" must be placed after any "Length Indicators" for a PDU.

Upon reception of a SDU, RLC shall segment the SDU to fit into the fixed size of a PDU. The segments are inserted in the data field of a PDU. A "Length Indicator" shall be added to each PDU that includes a border of an SDU, i.e. if a PDU does not contain a "Length Indicator", the SDU continues in the next PDU. The length indicator indicates where the border occurs in the PDU. The data after the indicated border can be either a new SDU, padding or piggybacked information. If padding or piggybacking is added another "Length Indicator" shall be added unless the padding size is one octet for PDUs with 15-bit "Length Indicators", see clauses 9.2.2.8 and 9.2.2.9.

Reference(s)

TS 25.322 clauses 9.2.2.8 and 11.3.2.1.2.

7.2.3.7.3 Test purpose

1. To test that a large SDU is correctly segmented and padding added at the end.
2. To test that a large SDU is received correctly, whether or not it has piggy-backed status at the end.

7.2.3.7.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 15-bit "Length Indicator" tests in clause 7.2.3.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to AM_15_PayloadSize + 1bytes.

Test procedure

a) The SS transmits an RLC SDU (SDU1) of size AM_15_PayloadSize + 1 bytes, and polls the receiver for status.
b) The SS checks the "Length Indicator" values in the RLC PDU returned on the uplink, and checks the length and content of the received RLC SDU (assuming a 15-bit "Length Indicator" size).
c) The SS transmits another RLC SDU (SDU2) of size AM_15_PayloadSize + 1 bytes, and includes piggy-backed status in the second of the 2 PDUs sent. The SS also polls the receiver for status.
d) The SS checks the "Length Indicator" sizes and values in the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDU (assuming a 15-bit "Length Indicator" size).
e) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE SS	Message	Comments
1		RB ESTABLISHMENT	See generic procedures
2	←	DOWNLINK RLC PDU	SDU 1
3	←	DOWNLINK RLC PDU	SDU 1 +poll + Padding
4	→	UPLINK RLC PDU	No LI
5	→	UPLINK RLC PDU	Poll, Check LIs and re-assembled SDU
5a	→	*STATUS PDU*	*If piggy-backed status is not used in 5*
6	←	DOWNLINK RLC PDU	SDU 2
7	←	DOWNLINK RLC PDU	SDU 2 + poll + piggy-backed status
8	→	UPLINK RLC PDU	No LI
9	→	UPLINK RLC PDU	Poll, Check LIs and re-assembled SDU
9a	→	*STATUS PDU*	*If piggy-backed status is not used in 9*
10	←	STATUS PDU	
11		RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.			

7.2.3.7.5 Test requirements

1. In steps 4 and 5, the UE shall return two RLC PDUs. The first shall not include any "Length Indicators". The second shall have a "Length Indicator" indicating the PDU contains an SDU boundary after octet 1 of the data field, and the second shall indicate either that the remainder of the PDU contains padding, or that it contains a piggy-backed status PDU.

2. In steps 8 and 9, the UE shall return two RLC PDUs. The first shall not include any "Length Indicators". The second shall have a "Length Indicator" indicating the PDU contains an SDU boundary after octet 1 of the data field, and the second shall indicate either that the remainder of the PDU contains padding, or that it contains a piggy-backed status PDU.

3. The length and data content of all received SDUs shall be the same as the transmitted SDUs.

7.2.3.8 Segmentation and Reassembly / 15-bit "Length Indicators" / LI = 0

7.2.3.8.1 Definition

The RLC segments and concatenates SDUs into AMD PDUs according to the PDU size configured by RRC. A pre-defined "Length Indicator" value is used to indicate when an SDUs ends coincident with the end of the previous PU. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.3.8.2 Conformance requirement

If the PDU is exactly filled with the last segment of a SDU and there is no room for a "Length Indicator" field, a "Length Indicator" field set to only 0's shall be included as the first "Length Indicator" in the following PDU.

Reference(s)

TS 25.322 clause 11.3.2.1.

7.2.3.8.3 Test purpose

1. To test that where an SDU exactly fills a PDU, a "Length Indicator" of all 0's is placed by the transmitter as the first "Length Indicator" in the next PDU.

2. To test that where an SDU exactly fills a PDU, and a "Length Indicator" of all 0's is the first "Length Indicator" in the next PDU, the receiver correctly reassembles the SDU.

7.2.3.8.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 15-bit "Length Indicator" tests in clause 7.2.3.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to AM_15_PayloadSize bytes.

Test procedure

a) The SS transmits an RLC SDU of size 2 * AM_15_PayloadSize bytes. The SS polls the receiver for status in the last RLC PDU sent.

b) The SS checks the "Length Indicator" values in the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDU (assuming a 15-bit "Length Indicator" size).

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1
4	←		DOWNLINK RLC PDU	LI=0, poll and padding
5	→		UPLINK RLC PDU	No Lis
6	→		UPLINK RLC PDU	(Poll) Check Lis and re-assembled SDU
6a	→		*STATUS PDU*	*If piggy-backed status is not used in 6*
7	←		STATUS PDU	
8			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.3.8.5 Test requirements

The UE shall return two RLC PDUs. The first shall have no "Length Indicators". The second shall have a "Length Indicator" indicating that the SDU exactly filled the previous PDU, and a "Length Indicator" indicating either that the remainder of the PDU contains padding, or that it contains a piggy-backed STATUS PDU.

The length of the received SDU shall be AM_15_PayloadSize bytes, and the data content shall be the same as the first AM_15_PayloadSize bytes of the transmitted SDU.

7.2.3.9 Segmentation and reassembly / 15-bit "Length Indicators" / One octet short LI

7.2.3.9.1 Definition

The RLC segments and concatenates SDUs into AMD PDUs according to the PDU size configured by RRC. A pre-defined "Length Indicator" value is used to indicate when an SDUs ends one octet short of the end of the previous PU. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.3.9.2 Conformance requirement

In the case where the last segment of an RLC SDU is one octet short of exactly filling the last RLC PU, and 15-bit "Length Indicators" are used, the next "Length Indicator" shall be placed as the first "Length Indicator" in the next PDU and have value "Length Indicator"=111 1111 1111 1011.

In the case where a PDU contains a 15-bit "Length Indicator" indicating that an SDU ends with one octet left in the PDU, the last octet of this PDU shall be ignored and shall not be filled with the first octet of the next SDU data.

Reference(s)

TS 25.322 clause 9.2.2.8.

7.2.3.9.3 Test purpose

1. To test that where the UE transmits an SDU, which is one byte short of filling a PDU, a "Length Indicator" indicating one byte short is placed as the first "Length Indicator" in the next PDU.
2. To test that where the UE correctly handles a received PDU containing a "Length Indicator" indicating that an SDU ended one byte short of the end of the previous PDU.

7.2.3.9.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 15-bit "Length Indicator" tests in clause 7.2.3.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into UE test loop mode 1 with the UL SDU size set to AM_15_PayloadSize – 1bytes.

Test procedure

a) The SS transmits an RLC SDU of size (2 * AM_15_PayloadSize) - 1 bytes. The SS polls the receiver for status in the last RLC PDU sent.
b) The SS checks the "Length Indicator" values of the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDU (assuming a 15-bit "Length Indicator" size).
c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE	SS	Message	Comments
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1
4	←		DOWNLINK RLC PDU	LI=111 1111 1111 1011, poll and padding
5	→		UPLINK RLC PDU	No LIs
6	→		UPLINK RLC PDU	(Poll) Check LIs and re-assembled SDU
6a	→		*STATUS PDU*	*If piggy-backed status is not used in 6*
7	←		STATUS PDU	
8			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.3.9.5 Test requirements

1. The UE shall return two RLC PDUs. The first shall have no "Length Indicators". The second shall have 2 "Length Indicators". The first "Length Indicator" shall be an "Length Indicator" indicating that the SDU was one byte short of filling the previous PDU, and the second shall be a "Length Indicator" indicating that the remainder of the PDU contains padding.
2. The length of the received SDU shall be AM_15_PayloadSize - 1 bytes, and the data content shall be the same as the first AM_15_PayloadSize - 1 bytes of the transmitted SDU.

7.2.3.10 Reassembly / 15-bit "Length Indicators" / Reserved LI value

7.2.3.10.1 Definition

The RLC segments and concatenates SDUs into AMD PDU according to the PDU size configured by RRC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of a reserved LI value has been specified. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.3.10.2 Conformance requirement

Upon reception of an AMD PDU that contains "Length Indicator" value "111111111111100" or "111111111111101": PDUs with this coding will be discarded by this version of the protocol.

Reference(s)

TS 25.322 clause 9.2.2.8.

7.2.3.10.3 Test purpose

To test that PDUs with reserved "Length Indicators" are discarded by the receiving RLC.

7.2.3.10.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 15-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Downlink RLC Missing PDU Indicator	FALSE

These settings apply to both the uplink and downlink DTCH.

Test procedure

a) The SS transmits three RLC SDUs of size AM_15_PayloadSize + 1 bytes. In the second PDU, the SS sets the value of the "Length Indicator" to 111111111111100. In the third PDU for transmission, the SS sets the value of the second (padding) "Length Indicator" to 111111111111101.

b) The SS waits to receive a status report from the UE.

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE	SS	Message	Comments
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU #0	SDU 1
3	←		DOWNLINK RLC PDU #1	SDU 1 + SDU 2, LI = 111111111111100
4	←		DOWNLINK RLC PDU #2	SDU 2+ SDU 3, LI = 111111111111101
5	←		DOWNLINK RLC PDU #3	SDU 3 + poll
6	→		STATUS PDU	Nack PDUs 1 and 2
7			RB RELEASE	Optional step

NOTE 1: The Expected Sequence shown is informative.
The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity.
Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.

7.2.3.10.5 Test requirements

1. The UE shall return a STATUS PDU indicating that PDUs with sequence numbers 1 and 2 were incorrectly received.

2. No uplink SDUs shall be received.

7.2.3.11 Reassembly / 15-bit "Length Indicators" / LI value > PDU size

7.2.3.11.1 Definition

The RLC segments and concatenates SDUs into PDUs according to the PDU size configured by RRC. "Length Indicators" are added to allow correct reconstruction of SDUs. The behaviour of the RLC on reception of an invalid LI value has been specified. Incorrect operation of segmentation, concatenation, or coding of "Length Indicators" will result in failure of the UE to communicate.

7.2.3.11.2 Conformance requirement

If the "Length Indicator" of a PDU has a value that is larger than the PDU size – the number of octets containing "Length Indicators" in the PDU – 1 and is not one of the predefined values listed in the table of 3GPP TS 25.322 clause 9.2.2.8, the PDU shall be discarded and treated as a missing PDU.

Reference(s)

TS 25.322 clause 11.3.4.5.

7.2.3.11.3 Test purpose

To test that PDUs with "Length Indicators" that point beyond the end of the PDU are discarded by the receiving RLC.

7.2.3.11.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 15-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Downlink RLC Missing PDU Indicator	FALSE

These settings apply to both the uplink and downlink DTCH.

Test procedure

a) The SS transmits three RLC SDUs of size AM_15_PayloadSize + 1 bytes. All the SDUs are concatenated or segmented over successive RLC PDUs. In the third PDU for transmission, the SS sets value of the "Length Indicators" to be AM_15_PayloadSize + 1 (decimal).

b) The SS checks the "Length Indicator" values of the RLC PDUs returned on the uplink, and checks the content of the received STATUS PDUs (assuming a 15-bit "Length Indicator" size).

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU #0	SDU 1
3	←		DOWNLINK RLC PDU #1	SDU 1 & SDU 2
4	←		DOWNLINK RLC PDU #2	SDU 2 & SDU 3, with bad LI
5	←		DOWNLINK RLC PDU #4	SDU 3, poll and padding
6	→		STATUS PDU	Nack PDU #2
7			RB RELEASE	Optional step

7.2.3.11.5 Test requirements

The UE shall indicate that the PDU with sequence number 2 was not received.

7.2.3.12 Correct use of Sequence Numbering

7.2.3.12.1 Definition

Peer RLC entities use sequence numbering to detect missing PDUs, and for flow control purposes. Incorrect operation of sequence numbering will result in failure of the UE to communicate.

7.2.3.12.2 Conformance requirement

This sub-clause describes the state variables used in AM and UM in order to specify the peer-to-peer protocol. All state variables are non-negative integers. UMD and AMD PDUs are numbered by modulo integer sequence numbers (SN) cycling through the field: 0 to $2^{12} - 1$ for AM …. All arithmetic operations contained in the present document on VT(S), VT(A), VT(MS), VR(R), VR(H) and VR(MR) are affected by the AM modulus. …. When performing arithmetic comparisons of state variables or Sequence number values a modulus base shall be used. This modulus base is subtracted (within the appropriate field) from all the values involved and then an absolute comparison is performed. At the Sender, VT(A) … shall be assumed to be the modulus base in AM …. At the Receiver, VR(R) … shall be assumed to be the modulus base in AM ….

The RLC shall maintain the following state variables in the Sender.

a) VT(S) - Send state variable.

This state variable contains the "Sequence Number" of the next AMD PDU to be transmitted for the first time (i.e. excluding retransmitted PDUs). It shall be updated after the aforementioned AMD PDU is transmitted or after transmission of a MRW SUFI which includes SN_MRW_{LENGTH} >VT(S) (see subclause 11.6). The initial value of this variable is 0.

[...]

If the AMD PDU is transmitted for the first time, the Sender shall:

- set the "Sequence Number" field equal to VT(S);

Reference(s)

TS 25.322, clauses 9.4 and 11.3.2.1.

7.2.3.12.3 Test purpose

1. To verify that the UE transmits the first PDU with the Sequence Number field equal to 0.
2. To verify that the UE increments the Sequence Number field according to the number of PDUs transmitted.
3. To verify that the UE wraps the Sequence Number after transmitting the 2^{12}-1th PDU.
4. To verify that the UE receiver accepts PDUs with SNs that wrap around every 2^{12}-1th PDU.

7.2.3.12.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC
    Polling info
        Poll_PDU
    Transmission window size
	
	64
	128

Downlink RLC Receiving window size	 128

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to (2 * AM_7_PayloadSize) - 1 bytes.

Test procedure

a) The SS sends 2049 RLC SDUs to the UE, each of (2 * AM_7_PayloadSize) - 1 bytes. The SS polls for status on each 64th RLC PDU and the last PDU transmitted

b) When the SS received an uplink PDU with the P bit set to 1, the SS transmits a STATUS PDU acknowledging all the RLC PDUs received so far.

c) The SS checks the sequence numbers of the RLC PDUs it receives in the uplink

d) The SS checks the content of the SDUs it receives from the UE.

e) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction (UE / SS)	Message	Comments
1		RB ESTABLISHMENT	See generic procedures
2	←	DOWNLINK RLC PDU #1	
3	←	DOWNLINK RLC PDU #2	
		…	Transmission of DOWNLINK PDUs continues
4	→	UPLINK RLC PDU#1	SN should be set to 0
5	→	UPLINK RLC PDU#2	SN should be set to 1
	←	…	Transmission of DOWNLINK PDUs continues to SN = 63
6	←	DOWNLINK RLC PDU #64	Poll
7	→	UPLINK STATUS PDU	
	←	…	Transmission of DOWNLINK PDUs continues, polling every 64th PDU, to SN = 4094
8	←	DOWNLINK RLC PDU #4096	
9	←	DOWNLINK RLC PDU #4097	SN=0
10	←	DOWNLINK RLC PDU #4098	SN=1, Poll
10a	→	UPLINK RLC PDUs	UE transmission of UPLINK RLC PDUs continues, polling every 64th PDU, to SN=4094. On poll, SS acknowledge all received PDUs.
10b		Void	
10c	→	UPLINK RLC PDU#4096	SN = 4095, Poll (cause: Poll_PDU=64)
10d	←	STATUS PDU	ACK SN up to 4095
10e		Void	
11		Void	
12	→	UPLINK RLC PDU#4097	SN should be set to 0
13	→	UPLINK RLC PDU#4098	SN should be set to 1, Poll
14	←	DOWNLINK STATUS PDU	
15		RB RELEASE	Optional step
NOTE: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.			

7.2.3.12.5 Test requirements

1. The first PDU received shall have the SN field set to 0. The second PDU shall have the SN field set to 1, and the 4 097th PDU shall have the SN field set to 0.

2. The size and data content of the received SDUs shall match those of the transmitted SDUs.

7.2.3.13 Control of Transmit Window

7.2.3.13.1 Definition

This test is to check that the UE is able to correctly control its RLC transmission window. Correct operation of RLC windowing is critical for acknowledged mode operation.

7.2.3.13.2 Conformance requirement

VT(MS) - Maximum Send state variable.

This state variable contains the "Sequence Number" of the first AMD PDU that can be rejected by the peer Receiver, VT(MS) = VT(A) + VT(WS). This value represents the upper edge of the transmission window. The transmitter shall not transmit AMD PDUs with "Sequence Number" ≥ VT(MS) unless VT(S) ≥ VT(MS). In that case, the AMD PDU with "Sequence Number" = VT(S) - 1 can also be transmitted. VT(MS) shall be updated when VT(A) or VT(WS) is updated.

The initial value of this variable is Configured_Tx_Window_size.

... The receiver is always allowed to change the Tx window size of the peer entity during a connection, but the minimum and the maximum allowed value is given by RRC configuration. The Rx window of the receiver is not changed.

Reference(s)

TS 25.322, clauses 9.2.2.11.3 and 9.4.

7.2.3.13.3 Test purpose

To verify that the UE does not transmit PDUs with sequence numbers outside of the transmit window, except the PDU with SN=VT(S)-1, even when the transmit window size is changed by the receiver.

7.2.3.13.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC	First run	Second run
Transmission window size	16	128

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to AM_7_PayloadSize - 1 bytes.

Related IXIT statement

UE support for either RLC SDU Buffering OR RLC SDU Discard.

Test procedure

Let W be the size of the transmit window.

The length of all transmitted SDUs is set to AM_7_PayloadSize - 1 bytes.

a) The SS transmits W+1 RLC SDUs to the UE.

b) The SS checks the RLC SDUs received on the uplink, but does not reply to poll requests from the UE, or transmit STATUS PDUs for any other reason.

c) After confirming that the UE has stopped transmitting new RLC SDUs for at least (2*W*TTI) ms, the SS transmits a STATUS PDU acknowledging all the RLC PDUs received so far. The SS transmits W+1 additional RLC SDUs to the UE.

d) The SS again checks the RLC SDUs received on the uplink, but does not reply to poll requests from the UE, or transmit further STATUS PDUs for any other reason.

e) After confirming that the UE has again stopped transmitting new RLC SDUs for at least (2*W*TTI) ms, the SS transmits a STATUS PDU acknowledging all the RLC PDUs received so far, and containing a WINDOW command to reduce the UE transmit window size (W) to half its initial size. The SS transmits W/2+1 additional RLC SDUs to the UE (where W is the original window size).

f) The SS checks the RLC SDUs received on the uplink, but does not reply to poll requests from the UE, or transmit STATUS PDUs for any other reason.

g) After confirming that the UE has stopped transmitting new RLC SDUs for at least (2*W*TTI) ms, the SS transmits a STATUS PDU acknowledging all the RLC PDUs received so far. The SS transmits W/2+1 additional RLC SDUs to the UE (where W is the original window size).

h) The SS checks the RLC SDUs received on the uplink.

i) The SS may optionally release the radio bearer.

NOTE: Window arithmetic is carried out modulo 4096.

The test procedure is run with the window transmit window size set to 16, and the repeated with the transmit window size set to 128.

Expected sequence

Step	Direction UE SS	Message	Comments
1		RB ESTABLISHMENT	See generic procedures
2	←	DOWNLINK RLC PDU	SDU 1
3	←	DOWNLINK RLC PDU	SDU 2
4	←	DOWNLINK RLC PDU	SDU 3
5	←	DOWNLINK RLC PDU	SDU 4
6	←	…	SS continues to transmit RLC SDUs
7	←	DOWNLINK RLC PDU	SDU W+1
8	→	UPLINK RLC PDU	SDU 1
9	→	UPLINK RLC PDU	SDU 2
10	→	…	SS continues to receive RLC SDUs
11	→	UPLINK RLC PDU	SDU W + poll
12			No new transmissions from UE
13	←	STATUS PDU	
13a	←	DOWNLINK RLC PDUs	SDU W+2
13b		…	SS continues to transmit RLC SDUs
13c	←	DOWNLINK RLC PDUs	SDU 2W+2
14	→	UPLINK RLC PDU	SDU W+1 (SDU buffered), or W+2 (SDU W+1 discarded, see note 3)
15	→	UPLINK RLC PDU	Next SDU
16	→	...	SS continues to receive RLC SDUs
17	→	UPLINK RLC PDU	SDU 2W+poll (SDU buffered), or SDU 2W+1+poll (SDU W+1 discarded, see note 3)
18			No new transmissions from UE
19	←	STATUS PDU	WINDOW = W/2
19a	←	DOWNLINK RLC PDUs	SDU 2W+3
19b		…	SS continues to transmit RLC SDUs
19c	←	DOWNLINK RLC PDUs	SDU 2W + W/2 + 3
20	→	UPLINK RLC PDU	SDU 2W+1 (SDU buffered), or 2W+3 (SDU 2W+2 discarded, see note 3)
21	→	UPLINK RLC PDU	Next SDU
22	←	…	SS continues to receive RLC SDUs
23	→	UPLINK RLC PDU	SDU 2W+W/2+poll (SDU buffered), or SDU 2W+W/2+2+poll (SDU 2W+2 discarded, see note 3)
24			No new transmissions from UE
25	←	STATUS PDU	
25a	←	DOWNLINK RLC PDUs	SDU 2W + W/2 + 4
25b		…	SS continues to transmit RLC SDUs
25c	←	DOWNLINK RLC PDUs	SDU 3W + 4
26	→	UPLINK RLC PDU	SDU 2W+W/2+1 (SDU buffered), or 2W+W/2+4 (SDU 2W+W/2+3 discarded, see note 3)
27	→	UPLINK RLC PDU	Next SDU
28	←	…	SS continues to receive RLC SDUs
29	→	UPLINK RLC PDU	SDU 3W+poll (SDU buffered), or SDU 3W+3+poll (SDU 2W+W/2+3 discarded, see note 3)
30		RB RELEASE	Optional step

NOTE 1: The Expected Sequence shown is informative.
The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity.
Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.

NOTE 2: The polls in step 11, 17, 23 and 29 are transmitted as the last PDU in buffer trigger is set to TRUE and the transmitted PDU is the last PDU in the transmitter window, see TS 25.322 clause 9.7.1.

NOTE 3: TS 25.322 does not specify the UE behaviour when transmission buffer is full. Thus, depending on UE implementation, the uplink AM entity may or may not discard AM RLC PDUs received from upper layer (e.g. from UE test loop function) when transmission buffer is full. The SS need to take this into consideration when comparing SS sent SDUs in downlink with the UE returned SDUs in uplink.

7.2.3.13.5 Test requirements

From steps 8 to 11, the SDU contents reassembled from the uplink shall match those of the first W transmitted SDUs.

At step 12 there shall be no further transmission on the uplink DTCH whilst the SS is waiting, except for any repeats of SDUs from 1 to W.

After step 13, the UE shall resume transmission of the next W SDUs. The contents of these SDUs shall match those of SDUs W+1 to 2*W (SDU buffered, see note 3), or W+2 to 2*W+1 (SDU W+1 discarded, see note 3), sent on the downlink.

At step 18 there shall be no further transmission on the uplink DTCH whilst the SS is waiting, except for any repeats of SDUs from W+1 to 2*W or W+2 to 2*W+1.

After step 19, the UE shall resume transmission of the next W/2 SDUs. The contents of these SDUs shall match those of SDUs 2*W+1 to 2*W+W/2 (SDU buffered, see note 3), or 2*W+3 to 2*W+W/2+2 (SDU 2W+2 discarded, see note 3), sent on the downlink.

At step 24 there shall be no further transmission on the uplink DTCH whilst the SS is waiting, except for any repeats of SDUs from 2*W+1 to 2*W+W/2 or 2*W+3 to 2*W+W/2+2.

After step 25, the UE shall resume transmission of the next W/2 SDUs. The contents of these SDUs shall match those of SDUs 2*W+W/2+1 to 3*W (SDU buffered, see note 3), or 2*W+W/2+4 to 3*W+3 (SDU 2W+W/2+3 discarded, see note 3), sent on the downlink.

7.2.3.14 Control of Receive Window

7.2.3.14.1 Definition

This test is to check that the UE is able to correctly control its RLC receive window. Correct operation of RLC windowing is critical for acknowledged mode operation.

This test applies to all UE.

7.2.3.14.2 Conformance requirement

Upon reception of an AMD PDU with "Sequence Number" outside the interval VR(R)≤SN<VR(MR), the Receiver shall:

- discard the AMD PDU;
- if the "polling bit" in the discarded AMD PDU is set to "1":
    - initiate the STATUS PDU transfer procedure.

Reference(s)

TS 25.322, clause 11.3.4.2.

7.2.3.14.3 Test purpose

To verify that the UE discards PDUs with sequence numbers outside the upper boundary of the receive window.

7.2.3.14.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

	First run	Second run
Uplink RLC Transmission window size	8	128
Downlink RLC Missing PDU Indicator Receiving window size	FALSE 8	FALSE 128

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to AM_7_PayloadSize - 1 bytes.

Test procedure

Let W be the size of the receive window.

The length of all transmitted SDUs is set to AM_7_PayloadSize - 1 bytes.

a) The SS transmits W RLC SDUs to the UE, polling only on the last RLC PDU.

b) The SS checks the RLC SDUs received on the uplink, responding to poll requests with acknowledgements. Then after receiving the STATUS PDU from the UE it transmits a further RLC SDU with the poll bit set. The SS sets the sequence number for the associated RLC PDU above the top of the receive window, for example, 2*W.

c) The SS receives a STATUS PDU from the UE.

d) The SS transmits a further RLC SDU with the sequence number set to the value of the next sequence number within the receive window.

e) The SS checks the RLC SDUs received on the uplink.

f) The SS may optionally release the radio bearer.

This test case is run once for the default receive window size (8) and again with the receive window size set to 128.

Expected sequence

Step	Direction UE	SS	Message	Comments
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1, SN = 0
3	←		DOWNLINK RLC PDU	SDU 2, SN = 1
4	←		…	SS continues to transmit RLC SDUs
5	←		DOWNLINK RLC PDU	SDU W + Poll, SN = W-1
6	→		STATUS PDU	
7	→		UPLINK RLC PDU	SDU 1
8	→		UPLINK RLC PDU	SDU 2
9			…	UE continues to transmit RLC SDUs
10	→		UPLINK RLC PDU	SDU W, Poll
10a	←		STATUS PDU	
11	←		DOWNLINK RLC PDU	SDU W+1, SN = 2W, Poll
11a	→		STATUS PDU	
12	←		DOWNLINK RLC PDU	SDU W+2, SN = W
13	→		UPLINK RLC PDU	SDU W+2
14			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.3.14.5 Test requirements

1. The SS shall receive back SDUs 1 to W, and SDU W + 2 only. No other SDUs shall be looped back.

2. The SS shall receive a STATUS PDU in step 11a. SN=2W shall not be indicated as received in the STATUS PDU. Negative acknowledgements shall not be indicated for SN=W to 2W-1 either.

7.2.3.15 Polling for status / Last PDU in transmission queue

7.2.3.15.1 Definition

This case tests that the UE will poll for a status request on the last PDU in its transmission queue when that mode is enabled. Incorrect operation of polling will cause degradation of service, or at worst service failure.

7.2.3.15.2 Conformance requirement

Last PDU in buffer.

When an AMD PDU to be transmitted for the first time is submitted to lower layer, the Sender shall:

- if the AMD PDU is the last AMD PDU scheduled for transmission according to subclause 11.3.2 (i.e. no data received from upper layer remains to be segmented into AMD PDUs); or
- if the AMD PDU is the last AMD PDU that is allowed to transmit according to subclause 11.3.2.2:
    - trigger a poll for this AMD PDU

....

- AMD PDUs are only allowed to transmit:
    - if the AMD PDU has a "Sequence Number" < VT(MS); or
    - if the AMD PDU has a "Sequence Number" equal to VT(S)-1; and
    - if the AMD PDU is not restricted to be transmitted by the local suspend function, see 3GPP TS 25.322 subclause 9.7.5.

...

The Sender shall:

- if a poll has been triggered by one or several poll triggers (see 3GPP TS 25.322 subclause 9.7.1):
    - if polling is not prohibited, see subclause 9.5:
        - set the "Polling bit" in the AMD PDU header to "1";
- otherwise:
    - set the "Polling bit" in the AMD PDU header to "0".

Reference

TS 25.322 clause 11.3.2.1.1, 9.7.1 and 11.3.2.

7.2.3.15.3 Test purpose

1. To verify that a poll is performed when only one PDU is available for transmission, and the poll prohibit timer function is not used.
2. To verify that a poll is performed when only one PDU is available for transmission, and the poll prohibit timer function is used, but inactive.

7.2.3.15.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC	First run	Second run
Polling info		
Timer_poll_prohibit	disabled	200
Last transmission PDU poll	TRUE	TRUE
Last retransmission PDU poll	FALSE	FALSE

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to (2 * AM_7_PayloadSize) - 1 bytes.

Test procedure

a) The SS transmits an RLC SDU of length (4 * AM_7_PayloadSize) - 1bytes to the UE.

b) The SS checks the uplink RLC PDUs for a poll for status flag.

c) The SS may optionally release the radio bearer.

The test is repeated using the RLC parameters given in the Second run column of the configuration table for the initial conditions.

Expected sequence

Step	Direction UE	Direction SS	Message	Comments
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1
4	←		DOWNLINK RLC PDU	SDU 1
5	←		DOWNLINK RLC PDU	SDU 1 + Poll
6	→		STATUS PDU	
7	→		UPLINK RLC PDU	SDU 1
8	→		UPLINK RLC PDU	SDU 1 + Poll
9	←		STATUS PDU	
10			RB RELEASE	Optional step

NOTE 1: The Expected Sequence shown is informative.
The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity.
Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.

7.2.3.15.5 Test requirements

The Poll bit shall be set in the AMD PDU header of the PDU returned in step 8. The poll bit shall not be set in the AMD PDU header of other PDUs.

7.2.3.16 Polling for status / Last PDU in retransmission queue

7.2.3.16.1 Definition

This case tests that the UE will poll for a status request on the last PDU in its retransmission queue when that mode is enabled. Incorrect operation of polling will cause degradation of service, or at worst service failure.

7.2.3.16.2 Conformance requirement

Last PDU in Retransmission buffer.

When a retransmitted AMD PDU is submitted to lower layer, the Sender shall:

- if the AMD PDU is the last AMD PDU scheduled for retransmission according to subclause 11.3.2; or
- if the AMD PDU is the last of the AMD PDUs scheduled for retransmission that are allowed to transmit according to subclause 11.3.2.2:
  - trigger a poll for this AMD PDU

....

- AMD PDUs are only allowed to transmit:
  - if the AMD PDU has a "Sequence Number" < VT(MS); or
  - if the AMD PDU has a "Sequence Number" equal to VT(S)-1; and
  - if the AMD PDU is not restricted to be transmitted by the local suspend function, see 3GPP TS 25.322 subclause 9.7.5.

...

The Sender shall:

- if a poll has been triggered by one or several poll triggers (see 3GPP TS 25.322 subclause 9.7.1):
  - if polling is not prohibited, see subclause 9.5:
    - set the "Polling bit" in the AMD PDU header to "1";
- otherwise:

- set the "Polling bit" in the AMD PDU header to "0".

Reference

25.322 clause 11.3.2.1.1, 9.7.1 and 11.3.2.

7.2.3.16.3 Test purpose

1. To verify that a poll is performed when only one PDU is available for retransmission, and the poll prohibit timer function is not used.
2. To verify that a poll is performed when only one PDU is available for retransmission, and the poll prohibit timer function is used, but inactive.

7.2.3.16.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC	First run	Second run
Polling info		
Timer_poll_prohibit	disabled	200
Last transmission PDU poll	FALSE	FALSE
Last retransmission PDU poll	TRUE	TRUE

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to (2 * AM_7_PayloadSize) - 1 bytes.

Test procedure

a) The SS transmits an RLC SDU of length (4 * AM_7_PayloadSize) - 1 bytes to the UE.

b) The SS checks the uplink RLC PDUs for a poll for status flag.

c) The SS transmits a STATUS PDU negatively acknowledging the first uplink RLC PDU as missing.

d) The SS waits for the RLC PDU to be retransmitted and then checks the uplink RLC PDU for a poll for status flag.

e) The SS may optionally release the radio bearer.

The test is repeated using the RLC parameters given in the Second run column of the configuration table for the initial conditions.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1
4	←		DOWNLINK RLC PDU	SDU 1
5	←		DOWNLINK RLC PDU	SDU 1 + Poll
6	→		STATUS PDU	
7	→		UPLINK RLC PDU	SDU 1, SN=0
8	→		UPLINK RLC PDU	SDU 1, SN=1
9	←		STATUS PDU	NAK: SN=0
10	…			Wait for retransmission
11	→		UPLINK RLC PDU	SDU 1, SN=0 + Poll
12	←		STATUS PDU	
13			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.3.16.5 Test requirements

The Poll bit shall be set in the AMD PDU header of the PDU returned in step 11. The poll bit shall not be set in the AMD PDU header of other PDUs.

7.2.3.17 Polling for status / Poll every Poll_PDU PDUs

7.2.3.17.1 Definition

This case tests that the UE will poll for a status request every Poll_PDU PDUs when that mode is enabled. Incorrect operation of polling will cause degradation of service, or at worst service failure.

7.2.3.17.2 Conformance requirement

VT(PDU).

This state variable is used when the "poll every Poll_PDU PDU" polling trigger is configured. It shall be incremented by 1 for each AMD PDU that is transmitted including both new and retransmitted AMD PDUs. When it becomes equal to the value Poll_PDU, a new poll shall be transmitted and the state variable shall be set to zero.

The initial value of this variable is 0.

Poll_PDU.

This protocol parameter indicates how often the transmitter shall poll the Receiver in the case where "polling every Poll_PDU PDU" is configured by upper layers. It represents the upper limit for the state variable VT(PDU). When VT(PDU) equals the value Poll_PDU a poll shall be transmitted to the peer entity.

Every Poll_PDU PDU.

The Sender triggers the Polling function for every Poll_PDU PDU. Both retransmitted and new AMD PDUs shall be counted.

The Sender shall:

- if a poll has been triggered by one or several poll triggers (see subclause 9.7.1):

- if polling is not prohibited, see subclause 9.5:
    - set the "Polling bit" in the AMD PDU header to "1";
- otherwise:
    - set the "Polling bit" in the AMD PDU header to "0".

Reference

TS 25.322 clauses 9.4, 9.6, 11.3.2.1.1 and 9.7.1.

7.2.3.17.3 Test purpose

1. To verify that a poll is performed when VT(PDU) reaches Poll_PDU.
2. To verify VT(PDU) is incremented for both new and retransmitted PDUs.

7.2.3.17.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC	
Polling info	
Poll_PDU	4
Last transmission PDU poll	FALSE
Last retransmission PDU poll	FALSE

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to AM_7_PayloadSize - 1 bytes.

Test procedure

Let the value of Poll_PDU be P:

a) The SS sends 3 * P - 2 RLC SDUs of size AM_7_PayloadSize - 1 bytes to the UE in PDUs with sequence numbers that are contiguous, starting from zero.

b) The SS checks the sequence numbers and polling bits of the RLC PDUs returned on the uplink.

c) The SS sends a STATUS PDU negatively acknowledging two RLC PDUs with a sequence numbers of already received PDUs. The other PDUs are acknowledged as received correctly.

d) The SS checks the sequence numbers and polling bits of the RLC SDUs returned on the uplink.

e) The SS terminates the connection.

Expected sequence

Step	Direction (UE SS)	Message	Comments
1	←	DOWNLINK RLC PDU	SDU 1
2	←	DOWNLINK RLC PDU	SDU 2
3	←	…	SS continues to transmit RLC SDUs
4	←	DOWNLINK RLC PDU	SDU 3P – 2
5	→	UPLINK RLC PDU	SDU 1, SN=0
6	→	UPLINK RLC PDU	SDU 2, SN=1
7	→	…	SS continues to receive RLC SDUs
8	→	UPLINK RLC PDU	SDU P, Poll
9	←	STATUS PDU	NAK SN=0 and SN=1
10	→	UPLINK RLC PDU	SDU 1, SN=0
11	→	UPLINK RLC PDU	SDU 2, SN=1
12	→	UPLINK RLC PDU	SDU P+1
13	→	…	SS continues to receive RLC SDUs
14	→	UPLINK RLC PDU	SDU 2P – 2, Poll
15	→	…	SS continues to receive RLC SDUs
16	→	UPLINK RLC PDU	SDU 3P – 2, Poll
17		RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes. NOTE 2: Due to retransmissions it is not possible to determine the exact PDU that a poll is received on. i.e. A poll may be received on a retransmitted PDU or a PDU transmitted for the first time.			

7.2.3.17.5 Test requirements

The SS shall receive a poll for status every Poll_PDU RLC PDUs sent on the uplink.

7.2.3.18 Polling for status / Poll every Poll_SDU SDUs

7.2.3.18.1 Definition

This case tests that the UE will poll for a status request every Poll_SDU SDUs when that mode is enabled. Incorrect operation of polling will cause degradation of service, or at worst service failure.

7.2.3.18.2 Conformance requirement

VT(SDU).

This state variable is used when the "poll every Poll_SDU SDU" polling trigger is configured. It shall be incremented by 1 for a given SDU when the AMD PDUs carrying the first segment of this SDU is scheduled to be transmitted for the first time. When it becomes equal to the value Poll_SDU a new poll shall be transmitted and the state variable shall be set to zero. The "Polling bit" shall be set to "1" in the first transmission of the AMD PDU that contains the “Length Indicator” indicating the end of the SDU.

The initial value of this variable is 0.

Poll_SDU.

This protocol parameter indicates how often the transmitter shall poll the Receiver in the case where "polling every Poll_SDU SDU" is configured by upper layers. It represents the upper limit for state variable VT(SDU). When VT(SDU) equals the value Poll_SDU a poll shall be transmitted to the peer entity.

Every Poll_SDU SDU.

The Sender triggers the Polling function for every Poll_SDU SDU. The poll shall be triggered for the first transmission of the AMD PDU that contains the "Length Indicator" indicating the end of the SDU.

The Sender shall:

- if a poll has been triggered by one or several poll triggers (see TS 25.322 subclause 9.7.1):
  - if polling is not prohibited, see TS 25.322 subclause 9.5:
    - set the "Polling bit" in the AMD PDU header to "1";
- otherwise:
  - set the "Polling bit" in the AMD PDU header to "0".

Reference

TS 25.322 clauses 9. 4, 9.6, 9.7.1 and 11.3.2.1.1.

7.2.3.18.3 Test purpose

1. To verify that a poll is performed when VT(SDU) reaches Poll_ SDU.
2. To verify that the poll is sent in the last PDU of the SDU.

7.2.3.18.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC Polling info Last transmission PDU poll Poll_SDU	 FALSE 1

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to (2 * AM_7_PayloadSize) - 1 bytes.

Let the value of Poll_SDU be P.

a) The SS sends 2 * P RLC SDUs of size AM_7_PayloadSize - 1 bytes to the UE in PDUs with sequence numbers that are contiguous, starting from zero.

b) The SS checks the sequence numbers and polling bits of the RLC SDUs returned on the uplink.

c) The SS terminates the connection.

The test is repeated with Poll_SDU set to 16.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	DOWNLINK RLC PDU	SDU 1
2	←	DOWNLINK RLC PDU	SDU 2
3	←	…	SS continues to transmit RLC SDUs
4	←	DOWNLINK RLC PDU	SDU 2P
5	→	UPLINK RLC PDU	SDU 1 Expanded to (2 *
6	→	UPLINK RLC PDU	AM_7_PayloadSize) - 1 bytes by test function
7	→	…	SS continues to receive RLC SDUs
8	→	UPLINK RLC PDU	SDU P, Poll
9	←	STATUS PDU	
10	→	UPLINK RLC PDU	SDU P+1 Expanded to (2 *
11	→	UPLINK RLC PDU	AM_7_PayloadSize) - 1 bytes by test function
12	→	…	SS continues to receive RLC SDUs
13	→	UPLINK RLC PDU	SDU 2P, Poll
14		RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.			

7.2.3.18.5 Test requirements

The UE shall return uplink PDUs that contain polls for status in sequence numbers 2 * P – 1 and 4 * P – 1. No other PDUs shall poll for status.

7.2.3.19 Polling for status / Timer triggered polling (Timer_Poll_Periodic)

7.2.3.19.1 Definition

This case tests that the UE will poll for a status request every Timer_Poll_Periodic ms when that mode is enabled. Incorrect operation of polling will cause degradation of service, or at worst service failure.

7.2.3.19.2 Conformance requirement

This timer shall only be used when "timer based polling" is configured by upper layers. The value of the timer is signalled by upper layers. The timer shall be started when the RLC entity is created. When the timer expires, the RLC entity shall:

- restart the timer;
- if AMD PDUs are available for transmission or retransmission (not yet acknowledged):
  - trigger a poll.

[...]

The Sender shall:

- if a poll has been triggered by one or several poll triggers (see TS 25.322 subclause 9.7.1):
  - if polling is not prohibited, see TS 25.322 subclause 9.5:
    - set the "Polling bit" in the AMD PDU header to "1";
- otherwise:

- set the "Polling bit" in the AMD PDU header to "0".

Reference

TS 25.322 clauses 9.5, 9.7.1 and 11.3.2.1.1.

7.2.3.19.3 Test purpose

1. To verify that the UE polls the SS in the next PDU to be transmitted or retransmitted each time the Timer_Poll_Periodic timer expires.

2. To verify that if there is no PDU to be transmitted or retransmitted, the timer is restarted, but no poll is sent.

7.2.3.19.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC	First run	Second run
Polling info		
Last retransmission PDU poll	FALSE	FALSE
Last transmission PDU poll	FALSE	FALSE
Timer_poll_periodic	500	2000

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to (AM_7_PayloadSize * ceil(T/(5*TTI))) - 1 bytes.

Test procedure

Let T be the value of Timer_Poll_Periodic:

a) The SS waits for at least 2*T ms before starting any transmissions, and monitors the uplink.

b) The SS sends five RLC SDUs of size floor (AM_7_PayloadSize/5) - 1 bytes to the UE. The SDUs are concatenated five SDUs to one PDU. The UE is expected to loop this data back in five RLC SDUs, segmented into a total of at least ceil(T/TTI) RLC PDUs.

c) The SS checks that at least one RLC PDU is received on the uplink with the P bit set and records the arrival time of the last RLC PDU received with the P bit set (T_1) . The SS does not send any STATUS PDUs in response to these poll requests.

d) The SS continues to receive RLC PDUs until all of the data has been received.

e) The SS waits for the UE to retransmit an RLC PDU in order to transmit a poll (this may be the PDU with SN VT(S) - 1, or a PDU that has not been acknowledged). The SS checks that the P bit is set, and records the arrival time (T_2).

f) The SS responds with a STATUS PDU acknowledging all received PDUs.

g) The SS waits for 2*T ms to ensure that no further polls are received from the UE.

h) Void

i) The SS may optionally release the radio bearer.

The Test is repeated using the parameters specified for the second run.

Expected sequence

Step	Direction UE	SS	Message	Comments
	UE	SS		
1	←		DOWNLINK RLC PDU	SDU 1, SDU2, SDU 3, SDU 4, SDU 5, SN=0
2	→		UPLINK RLC PDU	PDU 1, SN=0
3	→		UPLINK RLC PDU	PDU 2, SN=1
4	→		-	SS continues to receive RLC PDUs
5	→		UPLINK RLC PDU	Poll: Note T_1
6	→		-	SS continues to receive RLC PDUs
7	→		UPLINK RLC PDU	SN = ceil(T/TTI) - 1
8	→		UPLINK RLC PDU	Retransmission of VT(S)-1 or unacknowledged PDU in order to transmit a poll. Poll: Note T_2.
9	←		STATUS PDU	Normal
10	-		-	SS monitors uplink for 2*T ms
11			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.3.19.5 Test requirements

1. No PDUs shall be received from the UE for 2*T ms before step 1.

2. Time $T_2 - T_1$ shall be T.

3. No PDUs shall be received from the UE for 2*T ms after step 9.

7.2.3.20 Polling for status / Polling on Poll_Window% of transmission window

7.2.3.20.1 Definition

This case tests that the UE will poll for a status request when it has reached Poll_Window% of the transmission window, when that mode is enabled. Incorrect operation of polling will cause degradation of service, or at worst service failure.

This test applies to all UE.

7.2.3.20.2 Conformance requirement

1. A poll is triggered for each AMD PDU when J ≥ Poll_Window, where J is the window transmission percentage defined by

$$J = \frac{(4096+VT(S)+1-VT(A))\ \mathbf{mod}\ 4096}{VT(WS)} * 100\ ,$$

   where the constant 4096 is the modulus for AM described in 3GPP TS 25.322 subclause 9.4 and VT(S) is the value of the variable before the AMD PDU is submitted to lower layer.

2. The Polling function is used by the Sender to request the peer RLC entity for a status report. The "Polling bit" in the AMD PDU indicates the poll request. There are several triggers for initiating the Polling function. Which of the triggers shall be used is configured by upper layers for each RLC entity. The following triggers can be configured:

   …….

   6) Window based.

      The Sender triggers the Polling function when the condition described in subclause 9.6 d) ("Poll_Window") is fulfilled.

3. The Sender shall:

- if a poll has been triggered by one or several poll triggers (see subclause 9.7.1):
  - if polling is not prohibited, see subclause 9.5:
    - set the "Polling bit" in the AMD PDU header to "1".

Reference

25.322 clauses 9.6, 9.7.1 and 11.3.2.1.1.

7.2.3.20.3 Test purpose

To verify that the UE polls the SS when the window based polling condition J >= Poll_Window is fulfilled.

7.2.3.20.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC Polling info Last transmission PDU poll Poll_Window Transmission window size	 FALSE 50 8
Downlink RLC Receiving window size	 8

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1with the UL SDU size set to AM_7_PayloadSize - 1 bytes.

Test procedure

Let W be the size of the transmission window.

a) The SS transmits (W/2) + 2 RLC SDUs of size AM_7_PayloadSize - 1 bytes.

b) The SS checks the sequence number of the first three uplink PDUs received with the P bit set.

c) The SS sends another RLC SDU of size AM_7_PayloadSize - 1 bytes.

d) The SS checks the sequence number of the next uplink PDU received with the P bit set.

e) The SS waits until no more new PDUs are received.

f) The SS sends a STATUS PDU acknowledging the received RLC PDUs with SN = 0 through W/2, followed by two further RLC SDUs.

g) The SS checks the sequence number of the next uplink PDU received with the P bit set.

h) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	DOWNLINK RLC PDU	SDU 1
2	←	…	SS continues to transmit RLC SDUs
3	←	DOWNLINK RLC PDU	SDU W/2+2
4	→	UPLINK RLC PDU	SDU 1, SN=0
5	→	UPLINK RLC PDU	SDU 2, SN=1
6	→	…	SS continues to receive RLC PDUs
7	→	UPLINK RLC PDU	SN = W/2-1, Poll
7a	→	UPLINK RLC PDU	SN = W/2, Poll
7b	→	UPLINK RLC PDU	SN = W/2 +1, Poll
8	←	DOWNLINK RLC PDU	SDU W/2 + 3
9	→	UPLINK RLC PDU	SN = W/2 + 2, Poll
9a			SS waits 10 TTI periods to ensure no more new PDUs are received
10	←	STATUS PDU	ACK SN 0 to W/2 (UE sets VT(A) to W/2+1)
11	←	DOWNLINK RLC PDU	SDU W/2 + 4
12	←	DOWNLINK RLC PDU	SDU W/2 + 5
13	→	UPLINK RLC PDU	SN = W/2+3
14	→	UPLINK RLC PDU	SN = W/2+4, Poll
15		RB RELEASE	Optional step
NOTE: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.			

7.2.3.20.5 Test requirements

The SS shall receive RLC PDUs with the P bit set in PDUs with sequence numbers of 3, 4, 5, 6 and 8. No other PDUs shall have their P bits set.

7.2.3.21 Polling for status / Operation of Timer_Poll timer / Timer expiry

7.2.3.21.1 Definition

This case tests that the UE will retransmit a poll for status if it does not receive a STATUS PDU within Timer_Poll ms after a poll for status is transmitted. Incorrect operation of polling will cause degradation of service, or possible service failure.

7.2.3.21.2 Conformance requirement

Timer_Poll.

This timer shall only be used when so configured by upper layers. The value of the timer is signalled by upper layers. In the UE this timer shall be started when the successful or unsuccessful transmission of an AMD PDU containing a poll is indicated by lower layer. In UTRAN it should be started when an AMD PDU containing a poll is submitted to lower layer. If x is the value of the state variable VT(S) after the poll was submitted to lower layer, the timer shall be stopped upon receiving:

- positive acknowledgements for all the AMD PDUs with "Sequence Number" up to and including x - 1; or
- a negative acknowledgement for the AMD PDU with "Sequence Number" = x - 1.

If the timer expires and no STATUS PDU fulfilling the criteria above has been received:

- the Receiver shall be polled once more;
- the timer shall be restarted; and
- the new value of VT(S) shall be saved.

If a new poll is sent when the timer is active, the timer shall be restarted at the time specified above, and the value of VT(S) shall be saved.

[...]

The Sender shall:

- if a poll has been triggered by one or several poll triggers (see subclause 9.7.1):
  - if polling is not prohibited, see subclause 9.5:
    - set the "Polling bit" in the AMD PDU header to "1";
- otherwise:
  - set the "Polling bit" in the AMD PDU header to "0".

Reference

TS 25.322 clauses 11.3.2.1.1 and 11.3.4.1.

7.2.3.21.3 Test purpose

To verify that if the timer expires and no STATUS PDU containing an acknowledgement or negative acknowledgement of the AMD PDUs up to that which triggered the timer has been received, the receiver is polled once more.

7.2.3.21.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC	First run	Second run
Transmission window size	256	256
Polling info		
Last transmission PDU poll	FALSE	FALSE
Timer_poll	600	1000
Timer_Poll_Periodic	2000	2000

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1with the UL SDU size set to AM_7_PayloadSize - 1 bytes.

Test procedure

Let T be the value of the Timer_Poll_Periodic timer.

a) The SS transmits at least 2 * T / TTI SDUs of size AM_7_PayloadSize - 1 bytes.

b) The SS receives PDUs from the UE, and notes the time on receiving the first PDU with the P bit set, but does not respond. This time will be recorded as $T_{1.}$

c) The SS continues to receive PDUs from the UE and notes the time on receipt of the next PDU with the P bit set. This time will be recorded as T_2.

d) The SS continues to receive PDUs from the UE until all transmitted PDUs have been received. The SS responds to any PDU received with the P bit set by transmitting a STATUS PDU containing an acknowledgement of the AMD PDUs received.

e) The SS acknowledges the last Poll PDU from the UE.

f) The SS may optionally release the radio bearer.

The test case is run once for each set of initial RLC parameters.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		DOWNLINK RLC PDU	SDU 1
2	←		…	SS continues to transmit RLC SDUs
3	←		DOWNLINK RLC PDU	SDU ceil(2T/TTI)
4	→		UPLINK RLC PDU	SDU 1
5	→		UPLINK RLC PDU	SDU 2
6	→		…	SS continues to receive RLC PDUs
7	→		UPLINK RLC PDU	SN = n , Poll: Note T_1 (First PDU with P bit set)
8	→		UPLINK RLC PDU	SN = n+1
9	→		…	SS continues to receive RLC PDUs
9a	SS			No STATUS PDUs are sent by the SS between steps 7 and 10.
10	→		UPLINK RLC PDU	Poll: Note T_2 (Next PDU with P bit set)
11	→		…	SS continues to receive PDUs, acknowledging with STATUS PDUs when polled until all PDUs have been received and acknowledged
12			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes. NOTE 2: The SN value "n" identifies the current RLC sequence number of the first UL PDU with the Poll Bit set. This value is for informative purposes only				

7.2.3.21.5 Test requirements

For the first run, the measured time $T_2 - T_1$ shall be 600 ms.

For the second run, the measured time $T_2 - T_1$ shall be 1000 ms.

7.2.3.22 Polling for status / Operation of Timer_Poll timer / Stopping Timer_Poll timer

7.2.3.22.1 Definition

This case tests that the UE will stop the Timer_Poll timer if it receives a STATUS PDU within Timer_Poll ms after a poll for status is transmitted. Incorrect operation of polling will cause degradation of service, or possible service failure.

7.2.3.22.2 Conformance requirement

Timer_Poll.

This timer shall only be used when so configured by upper layers. The value of the timer is signalled by upper layers. In the UE this timer shall be started when the successful or unsuccessful transmission of an AMD PDU containing a poll is indicated by lower layer. In UTRAN it should be started when an AMD PDU containing a poll is submitted to lower layer. If x is the value of the state variable VT(S) after the poll was submitted to lower layer, the timer shall be stopped upon receiving:

- positive acknowledgements for all the AMD PDUs with "Sequence Number" up to and including x - 1; or
- a negative acknowledgement for the AMD PDU with "Sequence Number" = x - 1.

If the timer expires and no STATUS PDU fulfilling the criteria above has been received:

- the Receiver shall be polled once more;
- the timer shall be restarted; and
- the new value of VT(S) shall be saved.

If a new poll is sent when the timer is active, the timer shall be restarted at the time specified above, and the value of VT(S) shall be saved.

[...]

The Sender shall:

- if a poll has been triggered by one or several poll triggers (see subclause 9.7.1):
  - if polling is not prohibited, see subclause 9.5:
    - set the "Polling bit" in the AMD PDU header to "1";
- otherwise:
  - set the "Polling bit" in the AMD PDU header to "0".

Reference

TS 25.322 clause 9.5.

7.2.3.22.3 Test purpose

To verify that the Timer_Poll timer is stopped when receiving a STATUS PDU that acknowledges all AMD PDUs with SN up to and including VT(S)-1 at the time the poll was transmitted.

7.2.3.22.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC	First run	Second run
Tx_Window_Size	256	256
Polling info		
Last transmission PDU poll	FALSE	FALSE
Timer_poll	500	1000
Timer_Poll_Periodic	2000	2000

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to AM_7_PayloadSize - 1 bytes.

Test procedure

Let T be the value of the Timer_Poll_Periodic timer.

a) The SS transmits at least 2 * T / TTI SDUs of size AM_7_PayloadSize - 1 bytes.

b) The SS receives PDUs from the UE, and notes the time on receiving the first PDU with the P bit set. This time will be recorded as $T_{1.}$

c) The SS sends a STATUS PDU acknowledging all the PDUs up to and including the PDU carrying the poll request.

d) The SS continues to receive PDUs from the UE and notes the time on receipt of the next PDU with the P bit set. This time will be recorded as T_2.

e) The SS continues to receive PDUs from the UE until all transmitted PDUs have been received. The SS responds to any PDU received with the P bit set by transmitting a STATUS PDU containing an acknowledgement of the AMD PDUs received.

f) The SS acknowledges the last Poll PDU from the UE.

g) The SS may optionally release the radio bearer.

The test case is run once for each set of initial RLC parameters.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	DOWNLINK RLC PDU	SDU 1
2	←	…	SS continues to transmit RLC SDUs
3	←	DOWNLINK RLC PDU	SDU ceil(2T/TTI)
4	→	UPLINK RLC PDU	SDU 1
5	→	UPLINK RLC PDU	SDU 2
6	→	…	SS continues to receive RLC PDUs
7	→	UPLINK RLC PDU	SN = n , Poll: Note T_1 (First PDU with the P bit set).
8	←	STATUS PDU	ACK SN= 0 to SN =n
9	→	UPLINK RLC PDU	SN = n +1
10	→	…	SS continues to receive RLC PDUs
11	→	UPLINK RLC PDU	Poll: Note T_2 (Next PDU with the P bit set)
12	→	…	SS continues to receive PDUs, acknowledging with Status PDUs when polled until all PDUs have been received and acknowledged
13		RB RELEASE	Optional step

NOTE 1: The Expected Sequence shown is informative.
The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity.
Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.
NOTE 2: The SN value "n" identifies the current RLC sequence number of the first UL PDU with the Poll Bit set. This value is for informative purposes only

7.2.3.22.5 Test requirements

For both execution runs, the measured time $T_2 - T_1$ shall be 2000 ms.

7.2.3.23 Polling for status / Operation of Timer_Poll timer / Restart of the Timer_Poll timer

7.2.3.23.1 Definition

This case tests that the UE will restart the Timer_Poll timer if another poll request is transmitted whilst the timer is running. Incorrect operation of polling will cause degradation of service, or possible service failure.

This test applies to all UE.

7.2.3.23.2 Conformance requirement

Timer_Poll.

This timer shall only be used when so configured by upper layers. The value of the timer is signalled by upper layers. In the UE this timer shall be started when the successful or unsuccessful transmission of an AMD PDU containing a poll is indicated by lower layer. In UTRAN it should be started when an AMD PDU containing a poll is submitted to lower layer. If x is the value of the state variable VT(S) after the poll was submitted to lower layer, the timer shall be stopped upon receiving:

- positive acknowledgements for all the AMD PDUs with "Sequence Number" up to and including x - 1; or
- a negative acknowledgement for the AMD PDU with "Sequence Number" = x - 1.

If the timer expires and no STATUS PDU fulfilling the criteria above has been received:

- the Receiver shall be polled once more;
- the timer shall be restarted; and
- the new value of VT(S) shall be saved.

If a new poll is sent when the timer is active, the timer shall be restarted at the time specified above, and the value of VT(S) shall be saved.

[...]

The Sender shall:

- if a poll has been triggered by one or several poll triggers (see subclause 9.7.1):
  - if polling is not prohibited, see subclause 9.5:
    - set the "Polling bit" in the AMD PDU header to "1";
- otherwise:
  - set the "Polling bit" in the AMD PDU header to "0".

Reference

TS 25.322 clause 9.5.

7.2.3.23.3 Test purpose

To verify that if a new poll is sent when the timer is running it is restarted.

7.2.3.23.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC	
Polling info	
Last retransmission PDU poll	FALSE
Last transmission PDU poll	FALSE
Timer_poll	600
Poll_Window	60
Poll_PDU	16
Transmit window size	32

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to AM_7_PayloadSize - 1 bytes.

Test procedure

Let T be the value of the Timer_Poll timer.

a) The SS starts transmission of ceil(Tx_Window_Size * 60%) numbers of SDUs of size AM_7_PayloadSize - 1bytes.

b) Whilst transmitting, the SS receives PDUs from the UE, until it receives the second PDU with the P bit set. This time is recorded as T_1. (Note: poll due to Poll_Window).

c) Void.

d) Void.

e) The SS waits until a PDU is received with the poll bit set and notes the time when it was received. This time is recorded as T_2.

f) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	DOWNLINK RLC PDU	SDU 1
2	←	…	SS continues to transmit RLC SDUs
3	←	DOWNLINK RLC PDU	SDU ceil(Tx_Window_Size * 60%)
4	→	UPLINK RLC PDU	SDU 1
5	→	UPLINK RLC PDU	SDU 2
6	→	…	SS continues to receive RLC PDUs
7	→	UPLINK RLC PDU	SN = poll_PDU - 1, 1st Poll, Timer_Poll started
8	→	Void	
9		Void	
10	→	UPLINK RLC PDU	SS continues to receive RLC PDUs
11	→	UPLINK RLC PDU	SN= ceil(Tx_Window_Size * 60%)-1, 2nd Poll, Timer_Poll restarted. Note T1
12		Void	
13		Void	
14		Void	
15	→	UPLINK RLC PDU	SS waits for reception of PDU with poll bit set, 3rd Poll, Timer_Poll expired. Note T_2
16		RB RELEASE	Optional step
NOTE:	The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.		

7.2.3.23.5 Test requirements

The measured time $T_2 - T_1$ shall be 600 ms.

7.2.3.24 Polling for status / Operation of timer Timer_Poll_Prohibit

7.2.3.24.1 Definition

This case tests that the UE will not send a poll request within Timer_Poll_Prohibit ms of a previous poll request when this mode of operation is enabled. Incorrect operation of polling will cause degradation of service, or possible service failure.

7.2.3.24.2 Conformance requirement

The timers defined in this subclause are normative. The timers shall be considered active from the time they are started until the time they either expire or are stopped.

b) Timer_Poll_Prohibit.

This timer shall only be used when so configured by upper layers. It is used to prohibit transmission of polls within a certain period. The value of the timer is signalled by upper layers.

In the UE this timer shall be started when the successful or unsuccessful transmission of an AMD PDU containing a poll is indicated by lower layer. In UTRAN it should be started when an AMD PDU containing a poll is submitted to lower layer.

From the time a poll is triggered until the timer expires, polling is prohibited. If another poll is triggered while polling is prohibited, its transmission shall be delayed until the timer expires (see subclause 9.7.1). Only one poll shall be transmitted when Timer_Poll_Prohibit expires even if several polls were triggered in the meantime. This timer shall not be affected by the reception of STATUS PDUs.

When Timer_Poll_Prohibit is not configured by upper layers, polling is never prohibited.

The Sender shall:

- if a poll has been triggered by one or several poll triggers (see subclause 9.7.1):
  - if polling is not prohibited, see subclause 9.5:
    - set the "Polling bit" in the AMD PDU header to "1";
- otherwise:
  - set the "Polling bit" in the AMD PDU header to "0".

Reference

TS 25.322 clauses 9.5, 9.7.1 and 11.3.2.1.1.

7.2.3.24.3 Test purpose

1. To verify that no poll is transmitted if one or several polls are triggered when the Timer_Poll_Prohibit timer is active and has not expired.
2. To verify that the UE polls only once after Timer_Poll_Prohibit expires even though triggered several times during the prohibit time.

7.2.3.24.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC	
Transmission RLC discard	
MaxDAT	15
Polling info	
Timer_poll_prohibit	500
Last transmission PDU poll	FALSE
Poll_PDU	2
Poll_Window	50
Transmission window size	32
Downlink RLC	
Receiving window size	128

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to AM_7_PayloadSize - 1 bytes.

Test procedure

Let T be the value of the Timer_Poll_Prohibit timer.

a) The SS starts transmission of at least (2*Poll_PDU) + ceil(T / TTI) SDUs of size AM_7_PayloadSize - 1 bytes.

b) Whilst transmitting, the SS receives PDUs from the UE, and notes the time on receiving the first PDU with the P bit set. This time will be recorded as T_1.

c) The SS does not respond to the poll request.

d) The SS continues to receive PDUs from the UE and notes the time on receipt of the next PDU with the P bit set. This time will be recorded as T_2.

e) The SS waits for at least Timer_Poll_Prohibit to acknowledge any last Poll PDU from the UE.

f) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	DOWNLINK RLC PDU	SDU 1
2	←	…	SS continues to transmit RLC SDUs
3	←	DOWNLINK RLC PDU	SDU (2*Poll_PDU)+ ceil(T/TTI)
4	→	UPLINK RLC PDU	SDU 1
5	→	UPLINK RLC PDU	SDU 2
6	→	…	SS continues to receive RLC PDUs
7	→	UPLINK RLC PDU	SN = Poll_PDU - 1, Poll: Note T_1
8	→	…	SS continues to receive RLC PDUs
9		Void	
10	→	UPLINK RLC PDU	SN = (Transmission Window Size / 2) – 1, No Poll
11	→	…	SS continues to receive RLC PDUs
12	→	UPLINK RLC PDU	SN = Poll_PDU + ceil(T/TTI) - 1, Poll: Note T_2
12a	→	…	SS continues to receive RLC PDUs acknowledging with STATUS PDUs when polled until all PDUs have been received and acknowledged
13		RB RELEASE	Optional step
NOTE: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.			

7.2.3.24.5 Test requirements

1. The measured time $T_2 – T_1$ shall be Timer_poll_prohibit ms.

2. After step 12 no further poll shall be received from the UE for the next Timer_poll_prohibit ms.

7.2.3.25 Receiver Status Triggers / Detection of missing PDUs

7.2.3.25.1 Definition

This case tests that the UE transmits a status report whenever it detects that a PDU is missing, if this mode of operation is enabled. Incorrect operation of status reporting will cause degradation of service, or possible service failure.

7.2.3.25.2 Conformance requirement

Detection of missing PDU(s).

If the Receiver detects one or several missing AMD PDUs it shall trigger the transmission of a status report to the Sender.

Reference

TS 25.322 clause 9.7.2.

7.2.3.25.3 Test purpose

To verify that a status report is transmitted if there are one or more missing PDUs.

7.2.3.25.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

These settings apply to both the uplink and downlink DTCH.

Test procedure

a) The SS transmits 7 SDUs, each of size AM_7_PayloadSize - 1 bytes, in PDUs with consecutive sequence numbers starting from 0, followed by 5 SDUs in PDUs with consecutive sequence numbers starting from 8, followed by an SDU in a PDU with a sequence number of 15.

b) While transmitting, the SS monitors the uplink for STATUS PDUs.

c) The SS may optionally release the radio bearer

Expected sequence

Step	Direction UE	Direction SS	Message	Comments
1	←		DOWNLINK RLC PDU	SN = 0
2	←		…	SS continues to transmit RLC SDUs
3	←		DOWNLINK RLC PDU	SN = 6
4	←		DOWNLINK RLC PDU	SN = 8
5	→		STATUS PDU	SN = 7 missing
6	←		DOWNLINK RLC PDU	
7	←		…	SS continues to transmit RLC SDUs
8	←		DOWNLINK RLC PDU	SN = 12
9	←		DOWNLINK RLC PDU	SN = 15
10	→		STATUS PDU	SN = 7, 13, 14 missing
11			RB RELEASE	Optional step

NOTE: The Expected Sequence shown is informative.
The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity.
Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.

7.2.3.25.5 Test requirements

A STATUS PDU shall be received from the UE after step 4, indicating that the PDU with sequence number 7 was missing.

A STATUS PDU shall be received from the UE after step 9, indicating that the PDUs with sequence numbers 7, 13 and 14 were missing.

7.2.3.26 Receiver Status Triggers / Operation of timer Timer_Status_Periodic

7.2.3.26.1 Definition

This case tests that the UE transmits a status report every Timer_Status_Periodic ms when this mode of operation is enabled. Incorrect operation of status reporting will cause degradation of service, or possible service failure.

7.2.3.26.2 Conformance requirement

This timer shall only be used when timer based status reporting is configured by upper layers.

This timer shall be started when the RLC entity is created. When the timer expires the transmission of a status report shall be triggered and the timer shall be restarted.

Reference

TS 25.322 clauses 9.5, 9.7.2 and 11.5.2.

7.2.3.26.3 Test purpose

To verify that a status report is transmitted each time the Timer_Status_Periodic timer expires.

7.2.3.26.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Downlink RLC Timer_STATUS_periodic	400

These settings apply to both the uplink and downlink DTCH.

Test procedure

Let T be the value of the Timer_STATUS_periodic timer.

a) The SS starts transmission of at least ceil(2 * T / TTI) SDUs of size AM_7_PayloadSize - 1 bytes.

b) The SS waits to receive a STATUS PDU and notes the time. This time will be recorded as T_1.

c) The SS waits to receive a second STATUS PDU and notes the time. This time will be recorded as T_2.

d) The SS waits for at least Timer_Status_Periodic to receive any last STATUS PDU from the UE.

e) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		DOWNLINK RLC PDU	SDU 1
2	←		…	SS continues to transmit RLC SDUs
3	←		DOWNLINK RLC PDU	SDU m
4	→		STATUS PDU	Note T_1
5	←		DOWNLINK RLC PDU	
6	←		…	SS continues to transmit RLC SDUs
7	←		DOWNLINK RLC PDU	SDU m + ceil(T/TTI)
8	→		STATUS PDU	Note T_2
9			Void	
10	→		STATUS PDU	SS may receive STATUS PDUs
11			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.3.26.5 Test requirements

The measured time $T_2 – T_1$ shall be 400 ms.

7.2.3.27 Receiver Status Triggers / Operation of timer Timer_Status_Prohibit

7.2.3.27.1 Definition

This case tests that the UE does not transmit a status report more often than every Timer_Status_Prohibit ms when this mode of operation is enabled. Incorrect operation of status reporting will cause degradation of service, or possible service failure.

7.2.3.27.2 Conformance requirement

In the UE, this timer shall be started when the successful or unsuccessful transmission of the last STATUS PDU of an acknowledgement status report is indicated by lower layer

[...]

When a status report is triggered the Receiver shall:

- if transmission of status reports is not prohibited by any of the functions "STATUS prohibit" or "EPC mechanism":
  - assemble and transmit the status report to the Sender, as specified in subclauses TS 25.322 11.5.2.2 and 11.5.2.3.
- otherwise (if the status report is prohibited by at least one of the functions "STATUS prohibit" or "EPC mechanism"):

    [...]

  - if ACK, LIST, BITMAP, or RLIST SUFIs are required in the status report:

- delay sending these SUFIs until the prohibit function terminates.

[...]

Upon expiry of the timer Timer_Status_Prohibit [...], the Receiver shall:

- if at least one status report was triggered during the time the transmission of a status reports was prohibited that could not be transmitted due to prohibition; and
- if transmission of a status reports is no longer prohibited by any of the functions "STATUS prohibit" or "EPC mechanism":
  - transmit one status report to the Sender, using the procedure described in subclause TS 25.322 11.5.2.3.

Reference

TS 25.322 clause 9.7.2.

7.2.3.27.3 Test purpose

1. To verify that a status report is not transmitted while the Timer_Status_Prohibit timer is active.
2. To verify that only one status report is sent on the expiry of the Timer_Status_Prohibit timer if several triggers occur while it is active.

7.2.3.27.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Downlink RLC Timer_Status_Prohibit Timer_STATUS_periodic	 500 200

These settings apply to both the uplink and downlink DTCH.

Test procedure

Let T_{pro} be the value of the Timer_Status_Prohibit timer, and T_{per} be the value of the Timer_Status_Periodic timer.

a) The SS starts transmission of at least ceil(2 * T_{pro} / TTI) + ceil(T_{per}/TTI) SDUs of size AM_7_PayloadSize - 1 bytes.

b) Whilst transmitting, the SS monitors the uplink for a STATUS PDU and notes the time. This time will be recorded as T_1.

c) The SS sets the P bit in one of the next floor(T_{pro}/TTI) PDUs transmitted on the downlink.

d) The SS waits to receive a second STATUS PDU and notes the time. This time will be recorded as T_2.

e) The SS waits for at least Timer_Status_Prohibit to receive any last STATUS PDU from the UE.

f) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE	Direction SS	Message	Comments
1	←		DOWNLINK RLC PDU	SDU 1
2	←		…	SS continues to transmit RLC SDUs
3	←		DOWNLINK RLC PDU	SDU m
4	→		STATUS PDU	Note T_1
5	←		DOWNLINK RLC PDU	Poll
6	←		…	SS continues to transmit RLC PDUs
7	←		DOWNLINK RLC PDU	SDU m + ceil(T_{pro} / TTI)
8	→		STATUS PDU	Note T_2
9			Void	
10	→		STATUS PDU	SS may receive STATUS PDUs
11			RB RELEASE	Optional Step

NOTE 1: The Expected Sequence shown is informative.
The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity.
Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.

7.2.3.27.5 Test requirements

1. The measured time $T_2 - T_1$ shall be 500 ms.
2. Only one STATUS PDU shall be received in step 8 after (T1 + Tpro) and before (T1 + 2*Tpro).

7.2.3.28 Status reporting / Abnormal conditions / Reception of LIST SUFI with Length set to zero

7.2.3.28.1 Definition

Peer RLCs use STATUS PDUs to manage flow control and retransmission. On a STATUS report PDU with an invalid LIST SUFI the RLC must behave as specified. Incorrect behaviour may result in degradation of QoS, or failure of the UE to communicate.

7.2.3.28.2 Conformance requirement

The List super-field

The List Super-Field consists of a type identifier field (LIST), a list length field (LENGTH) and a list of LENGTH number of pairs as shown in figure 9.11 below:

Type = **LIST**
LENGTH
SN_1
L_1
SN_2
L_2
…
SN_{LENGTH}
L_{LENGTH}

Figure 9.11: The List fields in a STATUS PDU

LENGTH

Length: 4 bits

The number of (SN_i , L_i)-pairs in the super-field of type LIST. The value "0000" is invalid and the list is discarded.

Reference

TS 25.322 clause 9.2.2.11.4.

7.2.3.28.3 Test purpose

To verify that if a STATUS PDU is received with a LIST SUFI and the LENGTH field is set to "0000" that the list is discarded.

7.2.3.28.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC Polling info Poll_PDU	 4

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to (3 * Poll_PDU * AM_7_PayloadSize) – 1 bytes.

Test procedure

a) The SS sends an SDU of size (AM_7_PayloadSize) – 1.

b) The SS monitors the received (looped back) PDUs for a poll request.

c) The SS responds to the poll request by transmitting a STATUS PDU with a LIST SUFI. The list contains an indication that two PDUs were not received, but has the length field set to "0000".

d) The SS continues to monitor the received PDUs to verify that none are retransmitted.

e) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	DOWNLINK RLC PDU	SDU 1 (start)
2	←	…	SS continues to transmit RLC PDUs
3	←	DOWNLINK RLC PDU	SDU 1 (end)
4	→	UPLINK RLC PDU	SDU 1 (start)
5	→	UPLINK RLC PDU	
6	→	…	SS continues to receive RLC PDUs
7	→	UPLINK RLC PDU	SN = Poll_PDU - 1, Poll
8	←	STATUS PDU	LIST(LENGTH = "0000", SN = 1, SN = 2)
9	→	…	SS continues to receive RLC PDUs
10	→	UPLINK RLC PDU	Poll
11	←	STATUS PDU	Normal reply
12	→	…	SS continues to receive RLC PDUs
13	→	UPLINK RLC PDU	SDU 1 (end)
14		RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.			

7.2.3.28.5 Test requirements

No RLC PDUs shall be retransmitted by the UE.

7.2.3.29 Timer based discard, with explicit signalling / Expiry of Timer_Discard

7.2.3.29.1 Definition

This case tests that when the transmission of an SDU exceeds a time limit, the SDU is discarded by the sender, and the discard is signalled to the receiver. SDU discard is used to keep network delays within limits, and incorrect operation will effect the quality of service.

7.2.3.29.2 Conformance requirement

If the transmission time exceeds a predefined value for a SDU in acknowledged mode RLC, this SDU is discarded in the transmitter and a Move Receiving Window (MRW) command is sent to the receiver so that AMD PDUs carrying that SDU are discarded in the receiver and the receiver window is updated accordingly.

This procedure is initiated by the sender when the following conditions are fulfilled … Timer based SDU discard with explicit signalling is used, and Timer_Discard expires for an SDU.

This status report is sent even if the 'STATUS prohibit' is used and the timer 'Timer_Status_Prohibit' is active.

The STATUS PDUs have higher priority than data PDUs.

Reference

TS 25.322 clauses 9.7.3.1, 11.3.4.3.1 and 11.6.

7.2.3.29.3 Test purpose

1. To verify that if the transmission time for an SDU exceeds Timer_Discard, the SDU is discarded in the transmitter and the MRW procedure is invoked.

2. ...

7.2.3.29.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC Transmission RLC discard Timer based with explicit signalling Timer_MRW Timer_Discard MAX_MRW	 500 1000 4

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to AM_7_PayloadSize – 1 bytes.

Test procedure

a) The SS sends at least 2 RLC SDUs of size AM_7_PayloadSize – 1bytes.

b) The SS notes the time that the first RLC PDU is received on the uplink. This time will be recorded as T_1.

c) The SS checks the RLC PDUs received on the uplink and responds to all poll requests with a STATUS PDU, negatively acknowledging the RLC PDU with sequence number 0, and positively acknowledging all other RLC PDUs received.

d) The SS monitors received STATUS PDUs for the presence of a MRW SUFI, noting the time it was received. This time will be recorded as T_2.

e) The SS responds to the MRW command with a correct MRW_ACK.

f) Void.

g) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	DOWNLINK RLC PDU	SDU 1
2	←	DOWNLINK RLC PDU	SDU 2
3	→	UPLINK RLC PDU	SDU 1: Note T_1
4	→	…	SS continues to receive RLC PDUs
5	→	UPLINK RLC PDU	SDU 2 + Poll
6	←	STATUS PDU	NAK SN=0
7	→	…	SS continues to receive RLC PDU with SN=0 + Poll
8	←	…	STATUS PDU, SS continues to NAK PDU with SN=0
9	→	STATUS PDU	MRW Command: Note T_2
10	←	STATUS PDU	MRW_ACK
11		RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.			

7.2.3.29.5 Test requirements

1. The measured time $T_2 - T_1$ shall be 1000 ms.

2. The STATUS PDU received in step 9 shall contain a MRW SUFI indicating that the first three PDUs shall be discarded, and that the data indicated in the fourth PDU by the first LI shall also be discarded.

7.2.3.29a Timer based discard, with explicit signalling / Expiry of Timer_Discard when Timer_STATUS_prohibit is active

7.2.3.29a.1 Definition

This case tests that when the transmission of an SDU exceeds a time limit, the SDU is discarded by the sender, and the discard is signalled to the receiver while the Timer_STATUS_Prohibit is active. SDU discard is used to keep network delays within limits, and incorrect operation will effect the quality of service.

This test applies to all UE.

7.2.3.29a.2 Conformance requirement

If the transmission time exceeds a predefined value for a SDU in acknowledged mode RLC, this SDU is discarded in the transmitter and a Move Receiving Window (MRW) command is sent to the receiver so that AMD PDUs carrying that SDU are discarded in the receiver and the receiver window is updated accordingly.

Upon expiry of Timer_Discard the sender shall initiate the SDU discard with explicit signalling procedure.

This status report is sent even if the 'STATUS prohibit' is used and the timer 'Timer_Status_Prohibit' is active.

The STATUS PDUs have higher priority than data PDUs.

Reference

TS 25.322 clauses 9.7.3.1, 11.3.4.3.1 and 11.6.

7.2.3.29a.3 Test purpose

1. …

2. To verify that the MRW procedure status report is sent even if the 'STATUS prohibit' is used and the timer 'Timer_Status_Prohibit' is active.

7.2.3.29a.4 Method of test

TBD

7.2.3.29a.5 Test requirements

TBD

7.2.3.30 Timer based discard, with explicit signalling / Obsolete MRW_ACK

7.2.3.30.1 Definition

This case tests the ability of the receiving AM RLC entity to handle obsolete information that can be received during a failure of the SDU discard procedure. SDU discard is used to keep network delays within limits, and incorrect operation will effect the quality of service.

7.2.3.30.2 Conformance requirement

If Timer_MRW expires before the discard procedure is terminated, the MRW SUFI shall be retransmitted, VT(MRW) is incremented by one and Timer_MRW restarted. MRW SUFI shall be exactly the same as previously transmitted even though some new SDUs would have been discarded during the running of the Timer_MRW.

The received MRW_ACK shall be discarded in the following cases.

1. …

2. If the SN_ACK field in the received MRW_ACK < SN_MRW_{LENGTH} in the transmitted MRW SUFI.

3. If the SN_ACK field in the received MRW_ACK is equal to the SN_MRW_{LENGTH} in the transmitted MRW SUFI and the N field in the received MRW_ACK is not equal to the N_{LENGTH} field in the transmitted MRW SUFI

4. If the SN_ACK field in the received MRW_ACK > SN_MRW_{LENGTH} in the transmitted MRW SUFI and the N field in the received MRW_ACK is not equal to zero.

Reference

TS 25.322 clauses 11.6.5 and 11.6.6.3.

7.2.3.30.3 Test purpose

1. To verify that the MRW SUFI is retransmitted if Timer_MRW expires before a valid MRW_ACK is received.

2. To verify that the MRW_ACK is discarded if the SN_ACK field < SN_MRW_{LENGTH}.

3. To verify that the MRW_ACK is discarded if the N field is not equal to N_{LENGTH} transmitted in the MRW SUFI.

4. To verify that the MRW_ACK is discarded if the N field is not zero and the SN_ACK field > SN_MRW_{LENGTH} in the transmitted MRW SUFI.

7.2.3.30.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC	
Transmission RLC discard	
MaxDAT Retransmissions	
MaxDAT	40
Timer_MRW	500
MAX_MRW	4

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to AM_7_PayloadSize – 1bytes.

Test procedure

a) The SS sends at least 2 RLC SDUs of size AM_7_PayloadSize – 1bytes.

b) The SS checks the RLC PDUs received on the uplink and responds to all poll requests with a STATUS PDU, negatively acknowledging the RLC PDU with sequence number 0, and positively acknowledging all other RLC PDUs received.

c) The SS monitors received STATUS PDUs for the presence of a MRW SUFI, noting the time it was received. This time will be recorded as T_1.

d) The SS responds to the MRW command with an MRW_ACK with the SN_ACK field set to SN_MRW_{LENGTH} – 1.

e) The SS monitors received STATUS PDUs for another MRW SUFI, noting the time it was received. This time will be recorded as T_2.

f) The SS responds to the MRW command with an MRW_ACK with the SN_ACK field set to SN_MRW_{LENGTH}, and the N field set to (N_{LENGTH} + 1) modulo 4.

g) The SS monitors received STATUS PDUs for another MRW SUFI, noting the time it was received. This time will be recorded as T_3.

h) The SS responds to the MRW command with an MRW_ACK with the SN_ACK field set to SN_MRW_{LENGTH} + 1, and the N field set to 1.

i) The SS monitors received STATUS PDUs for another MRW SUFI.

j) The SS responds to the MRW command with a correct MRW_ACK.

k) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		DOWNLINK RLC PDU	SDU 1
2	←		DOWNLINK RLC PDU	SDU 2
3	→		UPLINK RLC PDU	SDU 1
4	→		UPLINK RLC PDU	SDU 2 + Poll
5	←		STATUS PDU	NAK SN=0
6	→		…	SS continues to receive RLC PDU with SN=0 + Poll
7	←		...	STATUS PDU, SS continues to NAK PDU with SN=0
8	→		STATUS PDU	MRW Command: Note T_1
9	←		STATUS PDU	MRW_ACK, SN_ACK = SN_MRW_{LENGTH} – 1
10	→		STATUS PDU	MRW Command: Note T_2
11	←		STATUS PDU	MRW_ACK, N field = (N_{LENGTH} + 1) modulo 4
12	→		STATUS PDU	MRW Command: Note T_3
13	←		STATUS PDU	MRW_ACK, SN_ACK = SN_MRW_{LENGTH} + 1, N field = 1
14	→		STATUS PDU	MRW Command
15	←		STATUS PDU	MRW_ACK
16			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.3.30.5 Test requirements

1. The measured time $T_2 – T_1$ shall be 500 ms.

2. The measured time $T_3 – T_2$ shall be 500 ms.

3. The STATUS PDUs received in steps 8, 10, 12 and 14 shall contain an identical MRW SUFI.

7.2.3.31 Timer based discard, with explicit signalling / Failure of MRW procedure

7.2.3.31.1 Definition

This case tests that if a failure occurs during the signalling of an SDU discard to the receiver, the retransmission protocol operates correctly. SDU discard is used to keep network delays within limits, and incorrect operation will effect the quality of service.

7.2.3.31.2 Conformance requirement

If VT(MRW) = MaxMRW, the Sender shall:

- terminate the SDU discard with explicit signalling procedure;
- stop the timer Timer_MRW if it was started;

- initiate the RLC RESET procedure (see clause 11.4).

If Timer_MRW expires before the discard procedure is terminated, the Sender shall:

- increment VT(MRW) by one;
- if VT(MRW)<MaxMRW:
  - set the MRW SUFI as previously transmitted (even if additional SDUs were discarded in the mean-time);
  - include the MRW SUFI in a new status report (if other SUFIs are included, their contents shall be updated);
  - transmit the status report by either including it in a STATUS PDU or piggybacked in an AMD PDU;
  - restart Timer_MRW for this discard procedure;
- else (if VT(MRW) = MaxMRW):
  - perform the actions specified in subclause 11.6.4a.

Reference

TS 25.322 clause 11.6.4a, 11.6.5.

7.2.3.31.3 Test purpose

1. To verify that when the number of retransmissions of a MRW command reaches MaxMRW, an error indication is passed to RRC and RESET procedure is initiated.

7.2.3.31.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC	
Transmission RLC discard	
Timer based with explicit signalling	
Timer_MRW	500
Timer_Discard	500
Max_MRW	4
Polling info	
Poll_PDU	2

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1with the UL SDU size set to (2 * AM_7_PayloadSize) – 1bytes.

Test procedure

a) The SS sends 4 RLC SDUs of size (2 * AM_7_PayloadSize) – 1bytes.

b) The SS checks the RLC PDUs received on the uplink and responds to all poll requests as follows: While the VR(H) is 4 or less, with a STATUS PDU, negatively acknowledging the RLC PDU with sequence number 0, and positively acknowledging all other RLC PDUs received. While the VR(H) is greater than 4, a STATUS PDU negatively acknowledging RLC PDUs with sequence numbers 0 and 4, and positively acknowledging all others.

c) The SS monitors received STATUS PDUs for the presence of an MRW SUFI, noting the time it was received. This time will be recorded as T_1.

d) The SS makes no response, but monitors for the next STATUS PDU containing an MRW SUFI, noting the time it was received. This time will be recorded as T_2.

e) The SS sends a STATUS PDU with an MRW_ACK indicating the discard of SDU 1 moving VR(R) to 4.

f) The SS monitors for further STATUS PDUs containing an MRW SUFI, or for a RESET PDU. The SS records the number of STATUS PDUs it received with MRW SUFI before it received the RESET PDU.

g) The SS checks any RLC SDUs reassembled from the uplink.

h) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE	SS	Message	Comments
1	←		DOWNLINK RLC PDU	SDU 1
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 2
4	←		…	SS continues to send RLC PDUs
5	←		DOWNLINK RLC PDU	SDU 4
6	→		UPLINK RLC PDU	SDU 1
7	→		…	SS continues to receive RLC PDUs
8	→		UPLINK RLC PDU	Poll
9	←		STATUS PDU	NAK SN=0
10	→		…	SS continues to receive RLC PDUs
11	→		UPLINK RLC PDU	Poll
12	←		STATUS PDU	NAK SN=0, 4
13	→		…	SS continues to receive RLC PDUs
14	→		STATUS PDU	MRW Command: Note T_1
15	→		STATUS PDU	MRW Command: Note T_2
16	←		STATUS PDU	MRW_ACK indicating VR(R) = 4
17	→		STATUS PDU	MRW Command, discard SDU 3
18	→		STATUS PDU	MRW Command
19	→		STATUS PDU	MRW Command
20	→		STATUS PDU	MRW Command
21	→		RESET PDU	
22	←		RESET ACK PDU	
23			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.3.31.5 Test requirements

The measured time $T_2 - T_1$ shall be 500 ms.

After step 17, the SS shall detect 3 repeats of the MRW command sent in step 17 before a RESET PDU is sent.

7.2.3.32 SDU discard after MaxDAT-1 number of transmissions

7.2.3.32.1 Definition

This case tests that if a PDU is unsuccessfully transmitted MaxDAT-1 times, the SDU it carries, and therefore all other associated PDUs, are discarded by the transmitter and receiver. This mode of SDU discard is used to minimize data loss, and incorrect operation will effect the quality of service.

7.2.3.32.2 Conformance requirement

1. There shall be one VT(DAT) for each PDU and each shall be incremented every time the corresponding AMD PDU is scheduled to be transmitted. The initial value of this variable is 0.

2. If the number of times an AMD PDU is scheduled for transmission reaches MaxDAT, the Sender shall:

   - discard all SDUs segments of which are contained in the AMD PDU; and

- utilise explicit signalling to inform the Receiver according to clause 11.6.

3. If VT(DAT) = MaxDAT, the Sender shall:

   - if "No_discard after MaxDAT number of transmissions" is configured:

     ….

   - if "SDU discard after MaxDAT number of transmissions" is configured:

     - initiate the "SDU discard with explicit signalling" procedure for the corresponding SDU, see subclause 11.6.

4. Upon initiation of the SDU discard with explicit signalling procedure, the Sender shall:

   …..

   - if "SDU discard after MaxDAT number of transmissions" is configured:

     - discard all SDUs that have segments in AMD PDUs with "Sequence Number" SN inside the interval VT(A) ≤ SN ≤ X, where X is the value of the "Sequence Number" of the AMD PDU with VT(DAT) ≥ MaxDAT.

   - discard all AMD PDUs including segments of the discarded SDUs, unless they also carry a segment of a SDU whose timer has not expired;

   - if more than 15 discarded SDUs are to be informed to the Receiver (see subclause 11.6.2.2):

     ….

   - otherwise (less than or equal to 15 discarded SDUs are to be informed to the Receiver):

     - assemble an MRW SUFI with the discard information of the SDUs.

   - schedule and submit to lower layer a STATUS PDU/piggybacked STATUS PDU containing the MRW SUFI;

   ….

Reference

TS 25.322 clauses 9.4, 9.7.3.3, 11.3.3a and 11.6.

7.2.3.32.3 Test purpose

1. To verify that if VT(DAT) = MaxDAT for any PDU the sender initiates the SDU discard with explicit signalling procedure.

7.2.3.32.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to (2 * AM_7_PayloadSize) – 1 bytes.

Test procedure

a) The SS sends 2 RLC SDUs of size (2 * AM_7_PayloadSize) – 1 bytes.

b) The SS checks the RLC PDUs received on the uplink and responds to all poll requests with a STATUS PDU negatively acknowledging the RLC PDU with sequence number 0, and positively acknowledging all other RLC PDUs received.

c) The SS monitors received STATUS PDUs for the presence of an MRW SUFI.

d) The SS responds with a STATUS PDU containing a valid MRW_ACK SUFI.

e) The SS checks any RLC SDUs reassembled from the uplink.

f) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		DOWNLINK RLC PDU	SDU 1
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 2
4	←		DOWNLINK RLC PDU	SDU 2
5	→		UPLINK RLC PDU	SDU 1
6	→		…	SS continues to receive RLC PDUs
7	→		UPLINK RLC PDU	SDU 2, Poll
8	←		STATUS PDU	NAK SN=0
9	→		UPLINK RLC PDU	Retransmit SN=0, Poll
10	←		STATUS PDU	NAK SN=0
11	→		UPLINK RLC PDU	Retransmit SN=0, Poll
12	←		STATUS PDU	NAK SN=0
13			Void	
14			Void	
15	→		STATUS PDU	MRW Command
16	←		STATUS PDU	MRW_ACK
17			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.3.32.5 Test requirements

The uplink RLC PDU with sequence number 0 shall be retransmitted twice, then the SS shall detect a STATUS PDU with an MRW command.

7.2.3.33 Operation of the RLC Reset procedure / UE Originated

7.2.3.33.1 Definition

This case tests that when the maximum number of retransmissions is exceeded, the UE initiates and performs the RLC Reset procedure. Incorrect operation of this procedure may cause loss of service.

7.2.3.33.2 Conformance requirement

The Sender shall:

- if one of the following triggers is detected:

1) "No_Discard after MaxDAT number of transmissions" is configured and VT(DAT) equals the value MaxDAT (see TS 25.322 subclause 9.7.3.4);

…

  - stop transmitting any AMD PDU or STATUS PDU;
  - increment VT(RST) by 1;
  - if VT(RST) = MaxRST:
    - the Sender may submit to the lower layer a RESET PDU;

- perform the actions specified in TS 25.322 subclause 11.4.4a.

- else (if VT(RST) < MaxRST):

  - submit a RESET PDU to the lower layer;

  - start the timer Timer_RST.

NOTE: If the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the RLC entity may delay the RLC reset procedure until the end of the next TTI.

When a reset procedure has been initiated it can only be ended upon reception of a RESET ACK PDU with the same RSN value as in the corresponding RESET PDU, or upon request of re-establishment or release from upper layer, a reset procedure is not interrupted by the reception of a RESET PDU from the peer entity.

[...]

The Sender shall:

- set the HFNI field to the currently highest used HFN (DL HFN when the RESET PDU is sent by UTRAN or UL HFN when the RESET PDU is sent by the UE);
- set the RSN field to the sequence number of the RESET PDU. The sequence number of the first RESET PDU after the AM entity is established or re-established shall be "0". This sequence number is incremented every time a new RESET PDU is transmitted, but not when a RESET PDU is retransmitted.

[...]

Upon reception of a RESET ACK PDU, the Sender shall:

- if the Sender has already transmitted a RESET PDU which has not been yet acknowledged by a RESET ACK PDU:
  - if the received RSN value is the same as the one in the corresponding RESET PDU:
    - set the HFN value (DL HFN when the RESET ACK PDU is received in UE or UL HFN when the RESET ACK PDU is received in UTRAN) to the HFNI field of the received RESET ACK PDU;
    - reset the state variables described in subclause 9.4 to their initial values;
    - stop all the timers described in subclause 9.5;
    - reset configurable parameters to their configured values;
    - discard all RLC PDUs in the receiving side of the AM RLC entity;
    - discard all RLC SDUs that were transmitted before the reset in the transmitting side of the AM RLC entity;
    - increase with one the UL HFN and DL HFN, and the updated HFN values shall be used for the first transmitted and received AMD PDUs after the reset procedure;
  - otherwise (if the received RSN value is not the same as the one in the corresponding RESET PDU):
    - discard the RESET ACK PDU;
- otherwise (if the Sender has not transmitted a RESET PDU which has not been yet acknowledged by a RESET ACK PDU):
  - discard the RESET ACK PDU.

NOTE: If the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the RLC entity may delay the RLC SDUs discard in the transmitting side until the end of the next TTI.

[...]

If Timer_RST expires before the reset procedure is terminated, the Sender shall:

- increment VT(RST) by one;
- if VT(RST)<MaxRST:
  - set the RESET PDU as previously transmitted (even if additional SDUs were discarded in the mean-time);
  - transmit RESET PDU;
  - restart Timer_RST.

Reference

TS 25.322 clause 11.4.2, 11.4.2.1, 11.4.4, 11.4.5.1.

7.2.3.33.3 Test purpose

1. To verify that the Reset procedure is initiated when the maximum number of retransmissions has been exceeded (Reset trigger condition 1) in subclause 11.4.2 of 3GPP TS 25.322 (R1999).
2. To verify that the sender resets state variables to their initial value and resets configurable parameters to their configured value.
3. To verify that RSN is updated correctly.
4. To verify operation of Timer_RST.

7.2.3.33.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC Transmission RLC discard No discard Max_DAT	 4

These settings apply to both the uplink and downlink DTCH.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to (2 * AM_7_PayloadSize) – 1 bytes.

Test procedure

a) The SS sends 2 RLC SDUs of size (2 * AM_7_PayloadSize) – 1 bytes.

b) The SS checks the RLC PDUs received on the uplink and responds to all poll requests with a STATUS PDU negatively acknowledging the RLC PDU with sequence number 0, and positively acknowledging all other RLC PDUs received.

c) The SS notes the time that the RESET PDU is received. This time will be recorded as T_1. The SS notes the value of the RSN bit.

d) The SS makes no response, and notes the time that the next RESET PDU is received. This time will be recorded as T_2. The SS notes the value of the RSN bit.

e) The SS sends a RESET ACK PDU with the RSN bit set to the same value as received in the RESET PDU received in step d).

f) The SS sends an RLC SDU of size (2 * AM_7_PayloadSize) – 1bytes. The data contents of this RLC SDU shall be different from the contents of the RLC SDUs sent in procedure step a) above.

g) The SS checks the RLC PDUs received on the uplink and responds to all poll requests with a STATUS PDU negatively acknowledging the RLC PDU with sequence number 0, and positively acknowledging all other RLC PDUs received.

h) The SS notes the value of the RSN bit of the RESET PDU received.

i) The SS sends a RESET ACK PDU with the RSN bit set to the value received in the RESET PDU in step c (the incorrect value).

j) The SS waits to receive another RESET PDU and checks the RSN bit.

k) The SS sends a RESET ACK PDU with the correct RSN bit.

l) The SS checks any RLC SDU received on the uplink.

m) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	DOWNLINK RLC PDU	SDU 1
2	←	DOWNLINK RLC PDU	SDU 1
3	←	DOWNLINK RLC PDU	SDU 2
4	←	DOWNLINK RLC PDU	SDU 2
5	→	UPLINK RLC PDU	SDU 1
6	→	…	SS continues to receive RLC PDUs
7	→	UPLINK RLC PDU	SDU, Poll The Poll may appear in returned PDU for either SDU 1 or 2
8	←	STATUS PDU	NAK SN=0
9	→	UPLINK RLC PDU	Retransmit PDU SN=0, Poll
10	←	STATUS PDU	NAK SN=0
11	→	UPLINK RLC PDU	Retransmit PDU SN=0, Poll
12	←	STATUS PDU	NAK SN=0
13		Void	
14		Void	
15	→	RESET PDU	Note T_1
16	→	RESET PDU	Note $T_{2,}$ check RSN
17	←	RESET ACK PDU	
18	←	DOWNLINK RLC PDU	SDU 3
19	←	DOWNLINK RLC PDU	SDU 3
20	→	UPLINK RLC PDU	SDU 3, check PDU has SN=0
21	→	UPLINK RLC PDU	SDU 3, Poll
22	←	STATUS PDU	NAK SN=0
23	→	UPLINK RLC PDU	Retransmit SN=0, Poll
24	←	STATUS PDU	NAK SN=0
25	→	UPLINK RLC PDU	Retransmit SN=0, Poll
26	←	STATUS PDU	NAK SN=0
27		Void	
28		Void	
29	→	RESET PDU	Check RSN
30	←	RESET ACK PDU	RSN = 0
31	→	RESET PDU	Check RSN
32	←	RESET ACK PDU	RSN = 1
33		RB RELEASE	Optional step
NOTE: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.			

7.2.3.33.5 Test requirements

1. The measured time $T_2 - T_1$ shall be 500 ms.

2. In steps 20 to 21 the SS shall receive an RLC SDU with contents that match the third RLC SDU sent to the UE. The first RLC PDU containing that SDU shall have sequence number 0.

3. The RSN bit of the first and second RESET PDUs received shall be set to 0. The RSN bit of the third and fourth RESET PDU shall be set to 1.

7.2.3.34 Operation of the RLC Reset procedure / UE Terminated

7.2.3.34.1 Definition

This case tests that the UE responds correctly to the RLC Reset procedure initiated by the network. Incorrect operation of this procedure may cause loss of service.

7.2.3.34.2 Conformance requirement

Upon reception of a RESET PDU the Receiver shall:

- if the RSN value in the RESET PDU is the same as the RSN value in the last received RESET PDU:
  - either only submit a RESET ACK PDU to the lower layer with the contents set exactly as in the last transmitted RESET ACK PDU (i.e., in this case the RLC entity is not reset); or
  - perform the actions specified below as if the RSN value was different from the RSN value in the last received RESET PDU.
- otherwise, if the RESET PDU is the first RESET PDU received since the entity was (re-)established or the RSN value is different from the RSN value in the last received RESET PDU:
  - submit a RESET ACK PDU to the lower layer with the content set as specified in subclause 11.4.3.1;
  - reset the state variables described in subclause 9.4 except VT(RST) to their initial values;
  - stop all the timers described in subclause 9.5 except Timer_RST;
  - reset configurable parameters to their configured values;
  - discard all RLC PDUs in the receiving side of the AM RLC entity;
  - discard all RLC SDUs that were transmitted before the reset in the transmitting side of the AM RLC entity;
  - set the HFN (DL HFN when the RESET PDU is received in UE or UL HFN when the RESET PDU is received in UTRAN) equal to the HFNI field in the received RESET PDU;
  - increase with one the UL HFN and DL HFN, and the updated HFN values shall be used for the first transmitted and received AMD PDUs after the reset procedure.

NOTE: If the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the RLC entity may delay the RLC SDUs discard in the transmitting side of the AM RLC entity until the end of the next TTI.

Reference

TS 25.322 clause 11.4.3.

7.2.3.34.3 Test purpose

1. To verify that upon reception of a RESET PDU the receiver responds with a RESET ACK PDU.

2. To verify that the receiver resets its state variables to their initial value and resets configurable parameters to their configured value.

7.2.3.34.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The following RLC parameter values are used in place of the values in clause 7.2.3.1:

Uplink RLC Transmission RLC discard No discard MaxDAT	 4

These settings apply to both the uplink and downlink DTCH.

Test procedure

a) The SS sends 2 RLC SDUs of size (2 * AM_7_PayloadSize) – 1 bytes, and polls on the last PDU sent.

b) The SS checks the STATUS PDUs received on the uplink until both SDUs have been acknowledged.

c) The SS transmits a RESET PDU.

d) The SS monitors the uplink for a RESET ACK PDU.

e) The SS sends an RLC SDU of size (2 * AM_7_PayloadSize) – 1 bytes, and polls on the last PDU sent.

f) The SS checks for STATUS PDUs received on the uplink until the SDU has been acknowledged.

g) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction UE SS	Message	Comments
1	←	DOWNLINK RLC PDU	SDU 1
2	←	DOWNLINK RLC PDU	SDU 1
3	←	DOWNLINK RLC PDU	SDU 2
4	←	DOWNLINK RLC PDU	SDU 2, poll
5	→	STATUS PDU	ACK SN=0, 1, 2 and 3
6	←	RESET PDU	
7	→	RESET ACK PDU	
8	←	DOWNLINK RLC PDU	SDU 3
9	←	DOWNLINK RLC PDU	SDU 3, poll
10	→	STATUS PDU	ACK SN=0 and 1
11		RB RELEASE	Optional step
NOTE: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.			

7.2.3.34.5 Test requirements

1. The SS shall receive a RESET ACK PDU in step 7.

2. The SS shall receive a STATUS PDU in step 10 acknowledging for the third RLC SDU transmitted with PDUs starting at SN=0.

7.2.3.35 Reconfiguration of RLC parameters by upper layers

7.2.3.35.1 Definition

This case verifies the UE behaviour after a reconfiguration of RLC parameters on an established RLC AM entity.

7.2.3.35.2 Conformance requirement

Upon reception of the IE "RLC Info", the UE shall:

1> configure the transmitting and receiving RLC entities in the UE for that radio bearer accordingly;

1> if the IE "Polling info" is present in the IE "RLC info":

2> for each present IE in the IE "Polling info":

3> configure RLC to use the corresponding function according to the value of the IE.

2> for each absent IE in the IE "Polling info":

3> configure RLC to not use the corresponding function.

1> if the IE "Polling info" is absent:

2> configure RLC to not use the polling functionality.

1> if the IE "Downlink RLC STATUS info" is present in the IE "RLC info" (this IE is present for AM RLC):

2> for each present IE in the IE "Downlink RLC STATUS info":

3> configure RLC to use the corresponding function according to value of the IE.

a) Timer_Poll.

This timer shall only be used when so configured by upper layers. The value of the timer is signalled by upper layers. In the UE this timer shall be started when the successful or unsuccessful transmission of an AMD PDU containing a poll is indicated by lower layer.

f) Timer_Status_Prohibit.

This timer shall only be used when so configured by upper layers. It is meant to prohibit the Receiver from sending consecutive acknowledgement status reports. A status report is an acknowledgement status report if it contains any of the SUFIs LIST, BITMAP, RLIST or ACK. The value of the timer is signalled by upper layers.

In the UE, this timer shall be started when the successful or unsuccessful transmission of the last STATUS PDU of an acknowledgement status report is indicated by lower layer.

Reference

TS 25.331 clause 8.6.4.9, 25.322 clause 9.5.

7.2.3.35.3 Test purpose

To verify that the UE starts to use the new set of RLC parameters when an already established AM RLC radio bearer is reconfigured.

7.2.3.35.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.

The Radio Bearer is placed in UE test loop mode 1 with the UL SDU size set to (AM_7_PayloadSize) - 1 bytes.

Test procedure

a) After establishing the radio bearer with default settings, SS reconfigures RLC parameters for an AM RLC entity by sending a RADIO BEARER RECONFIGURATION RRC message to the UE.

b) Let T_{poll} be the value of the Timer_Poll_Periodic timer, T_{pro} the value of the Timer_Status_Prohibit timer, and T_{per} the value of the Timer_Status_Periodic timer.

c) The SS transmits at least 2 * T_{poll} / TTI SDUs of size AM_7_PayloadSize - 1 bytes.

d) Whilst transmitting, the SS monitors the uplink for a STATUS PDU and notes the time. This time will be recorded as T_1.

e) The SS sets the P bit in one of the next floor(T_{pro}/TTI) PDUs transmitted on the downlink.

f) The SS waits to receive a second STATUS PDU and notes the time. This time will be recorded as T_2.

g) The SS receives PDUs from the UE, and notes the time on receiving the first PDU with the P bit set, but does not respond. This time will be recorded as T_3.

h) The SS continues to receive PDUs from the UE and notes the time on receipt of the next PDU with the P bit set. This time will be recorded as T_4.

i) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		RADIO BEARER RECONFIGURATION	RRC
2	→		RADIO BEARER RECONFIGURATION COMPLETE	RRC
3	←		DOWNLINK RLC PDU	SDU 1
4	←		…	SS continues to transmit RLC SDUs
5	←		DOWNLINK RLC PDU	SDU m
6	→		STATUS PDU	Note T_1
7	←		DOWNLINK RLC PDU	Poll
8	←		…	SS continues to transmit RLC PDUs
9	←		DOWNLINK RLC PDU	SDU m + ceil(T_{pro} / TTI)
10	→		STATUS PDU	Note T_2
11	←		DOWNLINK RLC PDU	SDU ceil(2T_{poll}/TTI)
12	→		UPLINK RLC PDU	SDU 1
13	→		UPLINK RLC PDU	SDU 2
14	→		…	SS continues to receive RLC PDUs
15	→		UPLINK RLC PDU	SN = ceil(T_{poll}/TTI), First Poll: Note T_3
16	→		UPLINK RLC PDU	SN = ceil(T_{poll}/TTI)+1
17	→		…	SS continues to receive RLC PDUs
18	→		UPLINK RLC PDU	Second Poll: Note T_4
18a	←		STATUS PDU	
18b	→		…	SS continues to receive PDUs, acknowledging with STATUS PDUs when polled until all PDUs have been received and acknowledged
19			RB RELEASE	Optional step
NOTE 1: The Expected Sequence shown is informative. The UPLINK and DOWNLINK PDU flows may overlap, but are shown separate for clarity. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

Specific message contents

RADIO BEARER RECONFIGURATION (step 1)

The default RADIO BEARER RECONFIGURATION message as defined in TS 34.108 is used, except for the following:

RB information to reconfigure list - RB information to reconfigure - RB identity	 Referring to the radio bearer defined for AM 7-bit "Length Indicator" tests in clause 7.2.3.1.
- Downlink RLC Info - Timer_Status_Prohibit - Timer_STATUS_periodic	 500 200
- Uplink RLC Info - Polling info - Last retransmission PDU poll - Last transmission PDU poll - Timer_poll - Timer_Poll_Periodic	 FALSE FALSE 600 1000

7.2.3.35.5 Test requirements

The measured time $T_2 – T_1$ shall be 500 ms.

The measured time $T_4 – T_3$ shall be 600 ms.

7.2.3.36 Flexible handling of RLC PDU sizes for AM RLC

7.2.3.36.1 Definition

When flexible "RLC PDU size" is configured in downlink, RLC SDUs are segmented if the SDU is larger than the maximum RLC PDU size. Concatenation may be performed up to the maximum RLC PDU size. If flexible RLC PDU size is configured, the downlink AMD PDU size is variable up to the maximum RLC PDU size.

7.2.3.36.2 Conformance requirement

Unless the "Extension bit" indicates that a UMD PDU contains a complete SDU which is not segmented, concatenated or padded, or the HE field indicates that an AMD PDU contains the last octet of the RLC SDU, a "Length Indicator" is used to indicate the last octet of each RLC SDU ending within the PDU

[…]

This two-bit [Header extension type (HE)] field indicates if the next octet is data or a "Length Indicator" and E bit.

Value	Description
00	The succeeding octet contains data
01	The succeeding octet contains a length indicator and E bit
10	If "Use special value of the HE field" is configured, the succeeding octet contains data and the last octet of the PDU is the last octet of an SDU. Otherwise, this coding is reserved (PDUs with this coding will be discarded by this version of the protocol).
11	Reserved (PDUs with this coding will be discarded by this version of the protocol).

[…]

if "flexible RLC PDU size" has been configured (only applicable for UTRAN in downlink):

- segment, and if possible concatenate the RLC SDUs into AMD PDUs with a size not larger than the maximum RLC PDU size.
- set a "Length Indicator" field for each SDU that ends in the AMD PDU according to subclause 9.2.2.8, except for the SDUs where the end of the SDU has been indicated by the HE field according to subclause 9.2.2.7;

[…]

Upon reception of an AMD PDU, the Receiver shall:

[…]

- reassemble the received AMD PDUs into RLC SDUs;

- if "In-Sequence Delivery" is configured:

- deliver the RLC SDUs in-sequence (i.e. in the same order as the RLC SDUs were originally transmitted by the peer entity) to upper layers through the AM-SAP

Reference(s)

TS 25.322 clauses 9.2.2.8, 11.3.2 and 11.3.3.

7.2.3.36.3 Test purpose

1. To test that a large SDU is correctly received for varying RLC PDU sizes up to the maximum RLC PDU size
2. To test that a segmented is SDU reassembled correctly and delivered to higher layers

7.2.3.36.4 Method of test

Initial conditions

No specific as included in the test procedure (steps a and b) for each test execution

Downlink length indicators of size 15 shall be used

Test procedure

Table 7.2.3.36.4.1 Max_RLC_PDU_size values for different test executions

Test execution	1	2	3
Max_RLC_PDU_size [octets]	90	300	1500

Let Max_RLC_PDU_size be equal to the value for execution 1 in table 7.2.3.36.4.1.

a) The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Bearer is replaced with the RB according to 34.108 clause 6.10.2.4.5.1 (Interactive or background / UL:64 DL: [max bit rate depending on UE category] / PS RAB + UL:3.4 DL:3.4 kbps SRBs for DCCH) configured according to alt3 (Flexible RLC + MAC-ehs) .

b) The radio bearer is placed into UE test loop mode 1 and configured to return UL RLC SDUs of the same size as received in DL.

c) The SS transmits two RLC SDUs of size 40 octets. The SDUs are sent in two separate RLC PDUs. The SS sets the HE field to “10”. No length indicators are used.

d) The SS checks the length and content of the received RLC SDUs

e) The SS transmits two RLC SDUs of size 80 octets. The SDUs are segmented and/or concatenated into successive RLC PDUs where no RLC PDU is larger than Max_RLC_PDU_size. A length indicator is used to indicate the end of each SDU.

f) The SS checks the length and content of the received RLC SDUs

g) The SS transmits two RLC SDUs of size 320 octets. The SDUs are segmented into successive RLC PDUs where no RLC PDU is larger than Max_RLC_PDU_size. In the RLC PDU containing the last data octet of an RLC SDU the SS sets the HE field to “10”.

h) The SS checks the length and content of the received RLC SDUs

i) For test execution 1 skip steps j) and k). See Note 1

j) The SS transmits two RLC SDUs of size 1500 octets. The SDUs are segmented into successive RLC PDUs where no RLC PDU is larger than Max_RLC_PDU_size. In the RLC PDU containing the last data octet of an RLC SDU the SS sets the HE field to "10".

k) The SS checks the length and content of the received RLC SDUs

l) The SS opens the UE test loop and release the radio bearer.

m) Repeat steps a) to k) for the different values of Max_RLC_PDU_size parameter according to table 7.2.3.36.4.1 (test execution 2 and 3).

NOTE 1 The test steps using RLC SDU size of 1500 octets is skipped for test execution 1 as the maximum number of reordering SDUs per TTI (26) would otherwise have been exceeded.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures,
2			Close UE test loop	
3	←		DOWNLINK RLC PDUs (SDU1, SDU2)	DL RLC SDU size = 40 Octets The number of RLC PDUs depends on the test run. All PDUs are transmitted in the same TTI. NOTE 2.
4	→		UPLINK RLC PDUs (SDU1, SDU2)	The SS checks length and content of received RLC SDUs. The number of received RLC PDUs depends on the test run
5	←		DOWNLINK RLC PDUs (SDU1, SDU2)	DL RLC SDU size = 80 Octets The number of RLC PDUs depends on the test run. All PDUs are transmitted in the same TTI. NOTE 2.
6	→		UPLINK RLC PDUs (SDU1, SDU2)	The SS checks length and content of received RLC SDUs. The number of received RLC PDUs depends on the test run
7	←		DOWNLINK RLC PDUs (SDU1, SDU2)	DL RLC SDU size = 320 Octets The number of RLC PDUs depends on the test run. All PDUs are transmitted in the same TTI. NOTE 2.
8	→		UPLINK RLC PDUs (SDU1, SDU2)	The SS checks length and content of received RLC SDUs. The number of received RLC PDUs depends on the test run
9				For test execution 1 skip steps 10 and 11
10	←		DOWNLINK RLC PDUs (SDU1, SDU2)	DL RLC SDU size = 1500 Octets The number of RLC PDUs depends on the test run. All PDUs are transmitted in the same TTI. NOTE 2.
11	→		UPLINK RLC PDUs (SDU1, SDU2)	The SS checks length and content of received RLC SDUs. The number of received RLC PDUs depends on the test run
12			Open UE test loop	
13			RB RELEASE	
14				Repeat steps 1 to 13 for test execution 2 and 3
NOTE 1: The Expected Sequence shown is informative. The number of transmitted RLC PDUs in downlink and uplink varies with the test run. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes. NOTE 2: Depending upon the UE category and the number of bits of an HS-DSCH transport block to be transmitted more than one TTI may be required. This will be done respecting table 5.1a of 3GPP TS 25.306. The HS-DSCH TB table size as provided in the bit aligned table of 3GPP TS 25.321 Annex A will be used.				

7.2.3.36.5 Test requirements

For each execution of the test procedure:

1. In steps 4, the UE shall return two RLC SDUs with the same size and content as the transmitted SDUs

2. In steps 6, the UE shall return two RLC SDUs with the same size and content as the transmitted SDUs
3. In steps 8, the UE shall return two RLC SDUs with the same size and content as the transmitted SDUs
4. For test execution 2 and 3: In steps 11, the UE shall return two RLC SDUs with the same size and content as the transmitted SDUs

7.2.3.37 RLC PDU Size Adaptation in Uplink

7.2.3.37.1 Definition and applicability

Applicable for all UEs supporting MAC-i/is.

7.2.3.37.2 Conformance Requirement

[..]

For the Unacknowledged mode data and Acknowledged mode data, if MAC-i/is has been configured on the uplink:

- if the UE pre-generates RLC PDUs for transmission in a later TTI:
  - provided that the UE has sufficient amount of data available for transmission, the size of the data field of the RLC PDU shall be chosen so that each RLC PDU to be multiplexed to the MAC-i/is PDU matches the maximum amount of data allowed to be transmitted by the applicable current grant (scheduled or non-scheduled) for the current TTI.
  - RLC PDUs may only be pre-generated if the amount of data in outstanding pre-generated RLC PDUs for this logical channel is less than or equal to four times the maximum amount of data allowed to be transmitted by the applicable current grant (scheduled or non-scheduled) for the current TTI.
- else:
  - the size of the data field of the RLC PDU shall be chosen so that the RLC PDU size matches the data requested for this logical channel by the current E-TFC selection.

[..]

Reference(s)

TS 25.322 clause 9.2.2.9

7.2.3.37.3 Test purpose

1. To verify that the UE adapts the RLC PDU size according to the current radio conditions and current grant.

7.2.3.37.4 Method of test

Initial conditions

System Simulator:

1 cell, default parameters, Ciphering Off

User Equipment:

The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Bearer is replaced with the RB according to 34.108 clause 6.10.2.4.6.1 configured according to Alt 3 (Flexible RLC + MAC-i/is).

Logical Channel ID	MAC-d flow (UL)	Priority	Comment
7(LCH 1)	1	1	RB25

The UE is placed into UE test loop mode 1 with the UL SDU size for LCH 1 set to (1500-2) octets.

Test procedure

The UE is configured with one logical channel LCH 1 mapped to MAC-d flow 1.

a) The SS has not issued a scheduled grant for E-DCH on MAC-d flow 1 (LCH 1)

b) The SS transmits 1 SDU of size 1498 bytes on LCH 1

c) The SS waits for an SI to be received indicating that there is data available on LCH 1.

d) The SS issues an absolute grant with signalling value 5.

e) The SS receives data from LCH 1 and checks that the RLC PDU size is maximum possible for the grant allowed.

f) After receiving 4 RLC PDUs, the SS reduces the absolute grant to signalling value of 4.

g) The SS counts the number of received RLC PDUs on LCH1 which are of the maximum possible size for the previous grant (5). This number should be less than or equal to 5.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		1 RLC SDU on LCH 1	SDU size is 1498 bytes
2	→		SI indicating data on LCH 1	
3	←		Absolute grant allowing the UE to transmit on LCH 1	Signalling value 5
4	→		RLC PDU on LCH 1	
5	←		Reduces the absolute grant allowing the UE to transmit on LCH 1	Signalling Value 4
6	→		RLC PDUs on LCH 1	
7	←		Removal of absolute grant	Signalling value 1

Specific Message Contents

None

7.2.3.37.5 Test requirements

1. In step 4, the SS shall receive RLC PDUs of the maximum possible size for the absolute grant (value 5) allowed.

2. In step 6, the SS shall receive between 0 and 5 RLC PDUs on LCH1 of the maximum possible size for the previous grant (5) allowed. All other RLC PDUs shall be of the maximum possible size for the current absolute grant (value 4) allowed.

7.2.3.38 Flexible handling of RLC PDU sizes for AM RLC in uplink

7.2.3.38.1 Definition

If flexible RLC PDU size is configured in uplink, RLC SDUs are segmented and/or concatenated to create RLC PDUs larger than or equal to the Minimum UL RLC PDU size and smaller than or equal to the largest UL AMD PDU size. If data to be transmitted is not enough to create an AMD PDU of the minimum size, it is allowed to create an AMD PDU including all data to be transmitted, even if the resulting size is smaller than the Minimum UL RLC PDU size. For each transmission the RLC entity constructs an RLC PDU with a size that matches the size indicated by the MAC layer

7.2.3.38.2 Conformance requirement

- if "Flexible RLC PDU size" is configured:

[…]

  - in uplink, the last segment of an RLC SDU shall be concatenated with the first segment of the next RLC SDU in order to fill the data field at least up to the Minimum UL RLC PDU size. It is allowed to concatenate up to the largest UL AMD PDU size for Acknowledged mode data and largest UMD PDU size for Unacknowledged mode data. The "Length Indicator" field is used to point the borders between RLC SDUs (see subclause 9.2.2.8).

- in uplink, if MAC-i/is has been configured:

  - if the UE pre-generates RLC PDUs for transmission in a later TTI:

- provided that the UE has sufficient amount of data available for transmission, the size of the data field of the RLC PDU shall be chosen so that each RLC PDU to be multiplexed to the MAC-i/is PDU matches the maximum amount of data allowed to be transmitted by the applicable current grant (scheduled or non-scheduled) for the current TTI.
- RLC PDUs may only be pre-generated if the amount of data in outstanding pre-generated RLC PDUs for this logical channel is less than or equal to four times the maximum amount of data allowed to be transmitted by the applicable current grant (scheduled or non-scheduled) for the current TTI.

- else:
  - the size of the data field of the RLC PDU shall be chosen so that the RLC PDU size matches the data requested for this logical channel by the current E-TFC selection.

[…]

- if "flexible RLC PDU size" has been configured:

- the last segment of an RLC SDU shall be concatenated with the first segment of the next RLC SDU in order to fill the data field at least up to the Minimum UL RLC PDU size. If data to be transmitted is not enough to create an AMD PDU of the minimum size, it is allowed to create an AMD PDU including all data to be transmitted, even if the resulting size is smaller than the Minimum UL RLC PDU size.

Reference(s)

TS 25.322 clauses 4.2.1.3.1, 9.2.2.9 and 11.3.2.

7.2.3.38.3 Test purpose

1. To test that SDUs are correctly concatenated/segmented into RLC PDUs not smaller than “Minimum UL RLC PDU size” (unless there is no other data in the buffer) and not larger than “Largest UL RLC PDU size”

7.2.3.38.4 Method of test

Initial conditions

The following parameters are specific for this test case:

Parameter	Value
Minimum UL RLC PDU size	320 bit
Largest UL RLC PDU size	640 bit

a) The generic procedure for Radio Bearer establishment (clause 7.1.3 of TS 34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Bearer is replaced with the RB according to 34.108 clause 6.10.2.4.6.1 configured according to Alt 3 (Flexible RLC + MAC-i/is) with MAC-d flow#1 configured for scheduled transmissions.

b) The radio bearer is placed into UE test loop mode 1 and configured to return UL RLC SDUs of size 80 octets

c) The SS has not issued any grant to the UE for E-DCH.

d) The SS transmits 4 RLC SDUs of size 80 octets. RLC PDUs are created by adding an AMD header (the SDUs are not segmented or concatenated). In each RLC PDU the HE field is set to “10”.

e) The SS waits for a SI to be received.

f) The SS issues an absolute grant correspondent to a Maximum allowed RLC PDU size below the configured “Minimum UL RLCPDU size” (signalling value 3). See note 1.

g) The SS checks the content of the received RLC SDUs, the size of the AMD PDUs.

h) The SS removes the scheduling grant for the UE.

i) The SS transmits 4 RLC SDUs of size 80 octets. RLC PDUs are created by adding an AMD header (the SDUs are not segmented or concatenated). In each RLC PDU the HE field is set to “10”

j) The SS issues an absolute grant correspondent to a Maximum allowed RLC PDU size above the "Largest UL RLC PDU size" (signalling value 5) See note 2.

k) The SS checks the content of the received RLC SDUs and the size of the AMD PDUs.

l) The SS opens the UE test loop and releases the radio bearer.

NOTE 1: Signalled absolute grant of 3 enable the UE to transmit a maximum MAC-i PDU size of 235 bits (10ms TTI, Reference E-TFCI=11 Signalled power offset=4), which is less than the configured "Minimum UL RLC PDU size" of 320 bits.

NOTE 2: Signalled absolute grant of 5 enable the UE to transmit a maximum MAC-i PDU size of 752 bits (10ms TTI, Reference E-TFCI=11 Signalled power offset=4), which is larger than the configured "Largest UL RLC PDU size" of 640 bits.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures,
2			Close UE test loop	
3	←		DOWNLINK RLC PDU (SDUs)	SN=0,1,2,3, RLC SDU size = 80 Octets.
4	→		SI indicating data	
5	←		Absolute grant	Grant value 3.
6	→		UPLINK RLC PDU (SDUs)	The SS checks the content of received RLC SDUs and the size of the AMD PDUs.
7	←		Absolute grant	Grant value 1, removal of SG.
8	←		DOWNLINK RLC PDU (SDUs)	SN=4,5,6,7, RLC SDU size = 80 Octets.
9	→		SI indicating data	
10	←		Absolute grant	Grant value 5.
11	→		UPLINK RLC PDU (SDUs)	The SS checks the content of received RLC SDUs and the size of the AMD PDUs.
12			Open UE test loop	
13			RB RELEASE	
Note 1: The Expected Sequence shown is informative. Information such as SDU, PDU or Sequence numbers given in the comments column shall be considered informative only, for test case development purposes.				

7.2.3.38.5 Test requirements

For each execution of the test procedure:

1. In step 6, the UE shall return 4 RLC SDUs with the same content as the transmitted SDUs. The size of all AMD PDUs, except the final AMD PDU, shall be equal to "Minimum UL RLC PDU size". The size of the last AMD PDU can be less than or equal to the "Minimum UL RLC PDU size".

2. In step 11, the UE shall return 4 RLC SDUs with the same content as the transmitted SDUs. The size of all AMD PDUs shall be less than or equal to "Largest UL RLC PDU size".

7.2.4 MBMS

7.2.4.1 Void

7.2.4.2 MTCH duplicate avoidance and reordering / MBMS Broadcast Service

7.2.4.2.1 Definition

This test is applicable for Rel-6 UEs supporting MBMS broadcast services.

7.2.4.2.2 Conformance requirement

The receiving UM-RLC entity receives UMD PDUs through the configured logical channels from the lower layer. When duplicate avoidance and reordering is configured there may be one or more than one input from the lower layer. Inputs can be added or removed without changing the buffer contents, state variables or timers within the receiving UM

RLC entity. Where duplicate avoidance and reordering is not configured there is only one input from the lower layer and it is not reconfigured.

When configured, duplicate avoidance and reordering is the first receive function that is applied to the input UMD PDU streams in the receiving UM RLC entity. It can only be configured in a UE, it is not used in UTRAN. It completes duplicate detection and re-ordering of the UMD PDUs that are received from the one or more inputs to produce a single ordered sequence of PDUs that is passed to the next in sequence RLC receiver function.

…

The duplicate avoidance and reordering function can be configured for use within a receiving UM RLC entity in the UE. It combines PDU sequences received from several sources and/or repeat transmissions from a single source to form a single ordered PDU sequence that is passed to the header removal and reassembly functions. It completes duplicate detection, discard and re-ordering based on the UM PDU sequence number. Where the UM RLC receives input from several sources, inputs can be added or removed without changing the buffer contents, state variables and timers associated with the duplicate avoidance and reordering function or any subsequent UM RLC function.

The duplicate avoidance and reordering function makes use of the state variable VR(UDR) and a receive window whose span is from VR(UDH) – DAR_Window_Size + 1 to VR(UDH) inclusively. For re-ordering the function uses a buffer for the temporary storage of PDUs.

For each PDU received, the duplicate avoidance and reordering function shall (in the following SN denotes the sequence number of each PDU):

Setting initial values of state variables:

- If the PDU is the first PDU received by the duplicate avoidance and reordering function:
  - VR(UDH) is assigned the value SN;
  - VR(UDR) is assigned the value VR(UDH) – DAR_Window_Size + 1.

Duplicate detection and re-ordering:

- if SN is within the receive window:
  - if SN < VR(UDR) or if a PDU with sequence number SN is already stored in the buffer:
    - the PDU shall be discarded;
  - else:
    - the PDU shall be stored in the buffer.
- if SN is outside of the receive window:
  - the PDU shall be stored in the buffer;
  - VR(UDH) shall be assigned the value SN, thereby advancing the receive window;
  - for any stored PDUs with sequence numbers < VR(UDH) – DAR_Window_Size + 1, i.e. outside the receive window after its position is updated, remove the PDU from the buffer and deliver them to the higher RLC function to perform the actions specified in subclause 11.2.3;
  - if VR(UDR) < VR(UDH) – DAR_Window_Size + 1, i.e. VR(UDR) is outside the updated receive window;
    - VR(UDR) shall be assigned the value VR(UDH) – DAR_Window_Size + 1.
- if PDU with sequence number VR(UDR) is stored in the buffer:
  - for this PDU and any sequence of stored PDUs with consecutive sequence numbers starting at VR(UDR) + 1, remove the PDUs from the buffer and deliver them to the higher RLC function to perform the actions specified in subclause 11.2.3;
  - VR(UDR) shall be assigned the value of x + 1 where x is the sequence number of the highest numbered PDU that was delivered to the higher RLC function.

Timer operation:

- if Timer_DAR is not active when a PDU is stored by the duplicate avoidance and reordering function:
  - Timer_DAR shall be started;
  - VR(UDT) shall be assigned the value of the sequence number of the PDU.
- Timer_DAR shall be stopped:
  - if the PDU with sequence number VR(UDT) is removed from the buffer before Timer_DAR expires.
- if Timer_DAR expires:
  - for all stored PDUs with sequence numbers lower or equal to VR(UDT) and for any sequence of stored PDUs with consecutive sequence numbers starting at VR(UDT) + 1, remove the PDUs from the buffer and deliver them to the higher RLC function to perform the actions specified in subclause 11.2.3;
  - VR(UDR) shall be assigned the value x + 1 where x is the sequence number of the highest numbered PDU that was delivered to the higher RLC function.
- When Timer_DAR is stopped or expires, and there remain PDUs stored by the duplicate avoidance and reordering function:
  - Timer_DAR shall be started;
  - VR(UDT) shall be assigned the sequence number of the highest numbered stored PDU.

Reference

1) 3GPP TS 25.322 clauses 4.2.1.2.2, and 9.7.10

7.2.4.2.3 Test purpose

To verify the MTCH duplicate avoidance and reordering procedure

7.2.4.2.4 Method of test

Initial condition

System Simulator: 1 MBMS Cell

User Equipment:

The UE is in CELL_FACH state as specified in clause 7.6 of TS 34.108.

The UE is interested in the broadcast service to be provided by the SS (included in MBMS_ACTIVATED_SERVICES variable).

The following parameters are specific for this test case:

Parameter	Value
Timer_DAR	5120 milliseconds
DAR_Window_Size	16

Related ICS/IXIT statements:

MBMS Broadcast service application available on UE yes/no

Test procedure

In this test procedure each SDU of size 322 octets will be formed of 4 RLC PDUs. The first of the 4 PDUs making up one SDU is of size 80 octets + 1 octet LI indicating the start of a PDU (SN= 0, 4, 8..). Every 4th PDU making up one SDU is of size 80 octets + 1 octet LI indicating the end of the SDU (SN=3, 7, 11..). The 2nd and 3rd PDUs are of size 81 octets.

a) SS indicates on MICH and modifies the MCCH to indicate the start of service 1. The UE begins reception of the MBMS service using the 64.8kbps radio bearer configuration as specified in TS 34.108, clause 6.10.2.4.3.5.

b) The radio bearer is placed into UE test loop mode 3.

c) The SS transmits PDUs with RLC sequence number = 3, 3, 2, 2, 1, 1, 0, 0, 19

d) The SS checks that the loopback mode 3 SDU count = 1. (The purpose of SN=19 is in order that the 4 PDUS with sequence numbers < VR(UDH) – DAR_Window_Size + 1, are delivered to higher RLC function, and these 4 PDUs form 1 SDU)

e) The SS transmits PDUs with the RLC sequence number = 19, 18, 17, 16, 15, 14, 13, 12

f) The SS waits 5s for Timer_DAR to expire. PDUs sent in step c are submitted to the higher RLC function. UE sets V(UDR) = 20.

g) The SS checks that the loopback mode 3 SDU count = 3. (2 more SDUs are received, once Timer_DAR expires and the UE empties the DAR buffer)

h) The SS transmits PDUs with the RLC sequence number = 7, 6, 5, 4, 3, 2, 1, 0

i) The SS checks that the loopback mode 3 SDU count = 3. (the data PDUs with SN of 7, 6, 5, 4 in step h is discarded in the UE, because VR(UDR) shall be assigned the value 20. The data PDUs with SN 3, 2, 1, 0 are stored in the buffer because these are inside the new receive window)

j) The SS transmits PDUs with the RLC sequence number = 27, 26, 25, 24, 23, 22, 21, 20, 19, 18, 17, 16, 15, 14, 13, 12

k) The SS checks that the loopback mode 3 SDU count = 8. (Four more complete SDU's are formed from RLC PDUs with SN of 12, 13, 14, 15 and 16, 17, 18, 19 and 20, 21, 22, 23 and 24, 25, 26, 27. One more complete SDU is formed and delivered from the data stored in step h with the PDUs with SN 0, 1, 2, 3)

Expected Sequence

Step	Direction UE SS	Message	Comments
1	←	ACTIVATE RB TEST MODE	
2	→	ACTIVATE RB TEST MODE COMPLETE	
3	←	MBMS MODIFIED SERVICES INFORMATION	MCCH message combination C4 for 1 modification period, then combination C2. The SS waits for the UE to establish the 64.8kbps radio bearer configuration as specified in TS 34.108 clause 6.10.2.4.3.5.
4	←	CLOSE UE TEST LOOP	UE test loop mode 3 setup
5	→	CLOSE UE TEST LOOP COMPLETE	
6	←	9 * RLC PDUs	SN = 3, 3, 2, 2, 1, 1, 0, 0, 19
7	←	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
8	→	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	SDU count = 1.
9	←	8 * RLC PDUs	SN = 19, 18, 17, 16, 15, 14, 13, 12
10			SS waits 5120 ms for Timer_DAR to expire
11	←	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
12	→	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	SDU count = 3.
13	←	8 * RLC PDUs	SN = 7, 6, 5, 4, 3, 2, 1, 0
14	←	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
15	→	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	SDU count = 3.
16	←	16 * RLC PDUs	SN = 27, 26, 25, 24, 23, 22, 21, 20, 19, 18, 17, 16, 15, 14, 13, 12
17	←	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
18	→	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	SDU count = 8.
19	←	OPEN UE TEST LOOP	
20	→	OPEN UE TEST LOOP COMPLETE	

Specific message contents

None.

7.2.4.2.5 Test requirements

In step d the UE shall report the loopback mode 3 SDU count as 1.

In steps g and i the UE shall report the loopback mode 3 SDU count as 3.

In step k the UE shall report the loopback mode 3 SDU count as 8.

7.2.4.2a MTCH duplicate avoidance and reordering / MBSFN (FDD)

7.2.4.2a.1 Definition

This test is applicable for Rel-7 UEs supporting MBSFN for FDD.

7.2.4.2a.2 Conformance requirement

The receiving UM-RLC entity receives UMD PDUs through the configured logical channels from the lower layer. When duplicate avoidance and reordering is configured there may be one or more than one input from the lower layer. Inputs can be added or removed without changing the buffer contents, state variables or timers within the receiving UM RLC entity. Where duplicate avoidance and reordering is not configured there is only one input from the lower layer and it is not reconfigured.

When configured, duplicate avoidance and reordering is the first receive function that is applied to the input UMD PDU streams in the receiving UM RLC entity. It can only be configured in a UE, it is not used in UTRAN. It completes duplicate detection and re-ordering of the UMD PDUs that are received from the one or more inputs to produce a single ordered sequence of PDUs that is passed to the next in sequence RLC receiver function.

…

The duplicate avoidance and reordering function can be configured for use within a receiving UM RLC entity in the UE. It combines PDU sequences received from several sources and/or repeat transmissions from a single source to form a single ordered PDU sequence that is passed to the header removal and reassembly functions. It completes duplicate detection, discard and re-ordering based on the UM PDU sequence number. Where the UM RLC receives input from several sources, inputs can be added or removed without changing the buffer contents, state variables and timers associated with the duplicate avoidance and reordering function or any subsequent UM RLC function.

The duplicate avoidance and reordering function makes use of the state variable VR(UDR) and a receive window whose span is from VR(UDH) – DAR_Window_Size + 1 to VR(UDH) inclusively. For re-ordering the function uses a buffer for the temporary storage of PDUs.

For each PDU received, the duplicate avoidance and reordering function shall (in the following SN denotes the sequence number of each PDU):

Setting initial values of state variables:

- If the PDU is the first PDU received by the duplicate avoidance and reordering function:
  - VR(UDH) is assigned the value SN;
  - VR(UDR) is assigned the value VR(UDH) – DAR_Window_Size + 1.

Duplicate detection and re-ordering:

- if SN is within the receive window:
  - if SN < VR(UDR) or if a PDU with sequence number SN is already stored in the buffer:
    - the PDU shall be discarded;
  - else:
    - the PDU shall be stored in the buffer.
- if SN is outside of the receive window:
  - the PDU shall be stored in the buffer;
  - VR(UDH) shall be assigned the value SN, thereby advancing the receive window;
  - for any stored PDUs with sequence numbers < VR(UDH) – DAR_Window_Size + 1, i.e. outside the receive window after its position is updated, remove the PDU from the buffer and deliver them to the higher RLC function to perform the actions specified in subclause 11.2.3;
  - if VR(UDR) < VR(UDH) – DAR_Window_Size + 1, i.e. VR(UDR) is outside the updated receive window;
    - VR(UDR) shall be assigned the value VR(UDH) – DAR_Window_Size + 1.
- if PDU with sequence number VR(UDR) is stored in the buffer:
  - for this PDU and any sequence of stored PDUs with consecutive sequence numbers starting at VR(UDR) + 1, remove the PDUs from the buffer and deliver them to the higher RLC function to perform the actions specified in subclause 11.2.3;
  - VR(UDR) shall be assigned the value of x + 1 where x is the sequence number of the highest numbered PDU that was delivered to the higher RLC function.

Timer operation:

- if Timer_DAR is not active when a PDU is stored by the duplicate avoidance and reordering function:

  - Timer_DAR shall be started;
  - VR(UDT) shall be assigned the value of the sequence number of the PDU.
- Timer_DAR shall be stopped:
  - if the PDU with sequence number VR(UDT) is removed from the buffer before Timer_DAR expires.
- if Timer_DAR expires:
  - for all stored PDUs with sequence numbers lower or equal to VR(UDT) and for any sequence of stored PDUs with consecutive sequence numbers starting at VR(UDT) + 1, remove the PDUs from the buffer and deliver them to the higher RLC function to perform the actions specified in subclause 11.2.3;
  - VR(UDR) shall be assigned the value x + 1 where x is the sequence number of the highest numbered PDU that was delivered to the higher RLC function.
- When Timer_DAR is stopped or expires, and there remain PDUs stored by the duplicate avoidance and reordering function:
  - Timer_DAR shall be started;
  - VR(UDT) shall be assigned the sequence number of the highest numbered stored PDU.

Reference

1) 3GPP TS 25.322 clauses 4.2.1.2.2, and 9.7.10

7.2.4.2a.3 Test purpose

To verify the MTCH duplicate avoidance and reordering procedure

7.2.4.2a.4 Method of test

Initial condition

System Simulator: 1 MBMS Cell

User Equipment:

The UE is in CELL_FACH state as specified in clause 7.6 of TS 34.108.

The UE is interested in the broadcast service to be provided by the SS (included in MBMS_ACTIVATED_SERVICES variable).

The following parameters are specific for this test case:

Parameter	Value
Timer_DAR	5120 milliseconds
DAR_Window_Size	16

Related ICS/IXIT statements:

MBMS Broadcast service application available on UE yes/no

Test procedure

In this test procedure each SDU of size 322 octets will be formed of 4 RLC PDUs. The first of the 4 PDUs making up one SDU is of size 80 octets + 1 octet LI indicating the start of a PDU (SN= 0, 4, 8..). Every 4th PDU making up one SDU is of size 80 octets + 1 octet LI indicating the end of the SDU (SN=3, 7, 11..). The 2nd and 3rd PDUs are of size 81 octets.

a) SS indicates on MICH and modifies the MCCH to indicate the start of service 1. The UE begins reception of the MBMS service using the 64.8kbps radio bearer configuration as specified in TS 34.108, clause 6.10.2.4.3.5.

b) The radio bearer is placed into UE test loop mode 3.

c) The SS transmits PDUs with RLC sequence number = 3, 3, 2, 2, 1, 1, 0, 0, 19

d) The SS checks that the loopback mode 3 SDU count = 1. (The purpose of SN=19 is in order that the 4 PDUS with sequence numbers < VR(UDH) – DAR_Window_Size + 1, are delivered to higher RLC function, and these 4 PDUs form 1 SDU)

e) The SS transmits PDUs with the RLC sequence number = 19, 18, 17, 16, 15, 14, 13, 12

f) The SS waits 5s for Timer_DAR to expire. PDUs sent in step c are submitted to the higher RLC function. UE sets V(UDR) = 20.

g) The SS checks that the loopback mode 3 SDU count = 3. (2 more SDUs are received, once Timer_DAR expires and the UE empties the DAR buffer)

h) The SS transmits PDUs with the RLC sequence number = 7, 6, 5, 4, 3, 2, 1, 0

i) The SS checks that the loopback mode 3 SDU count = 3. (the data PDUs with SN of 7, 6, 5, 4 in step h is discarded in the UE, because VR(UDR) shall be assigned the value 20. The data PDUs with SN 3, 2, 1, 0 are stored in the buffer because these are inside the new receive window)

j) The SS transmits PDUs with the RLC sequence number = 27, 26, 25, 24, 23, 22, 21, 20, 19, 18, 17, 16, 15, 14, 13, 12

k) The SS checks that the loopback mode 3 SDU count = 8. (Four more complete SDU's are formed from RLC PDUs with SN of 12, 13, 14, 15 and 16, 17, 18, 19 and 20, 21, 22, 23 and 24, 25, 26, 27. One more complete SDU is formed and delivered from the data stored in step h with the PDUs with SN 0, 1, 2, 3)

Expected Sequence

Step	Direction UE SS	Message	Comments
1	←	ACTIVATE RB TEST MODE	
2	→	ACTIVATE RB TEST MODE COMPLETE	
3	←	MBMS MODIFIED SERVICES INFORMATION	MCCH message combination C4 for 1 modification period, then combination C2. The SS waits for the UE to establish the 64.8kbps radio bearer configuration as specified in TS 34.108 clause 6.10.2.4.3.5.
4	←	CLOSE UE TEST LOOP	UE test loop mode 3 setup
5	→	CLOSE UE TEST LOOP COMPLETE	
6	←	9 * RLC PDUs	SN = 3, 3, 2, 2, 1, 1, 0, 0, 19
7	←	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
8	→	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	SDU count = 1.
9	←	8 * RLC PDUs	SN = 19, 18, 17, 16, 15, 14, 13, 12
10			SS waits 5120 ms for Timer_DAR to expire
11	←	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
12	→	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	SDU count = 3.
13	←	8 * RLC PDUs	SN = 7, 6, 5, 4, 3, 2, 1, 0
14	←	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
15	→	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	SDU count = 3.
16	←	16 * RLC PDUs	SN = 27, 26, 25, 24, 23, 22, 21, 20, 19, 18, 17, 16, 15, 14, 13, 12
17	←	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
18	→	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	SDU count = 8.
19	←	OPEN UE TEST LOOP	
20	→	OPEN UE TEST LOOP COMPLETE	

Specific message contents

None.

7.2.4.2a.5 Test requirements

In step d the UE shall report the loopback mode 3 SDU count as 1.

In steps g and i the UE shall report the loopback mode 3 SDU count as 3.

In step k the UE shall report the loopback mode 3 SDU count as 8.

7.2.4.2b-l Void

7.2.4.2m MTCH duplicate avoidance and reordering / MBMS Multicast Service

7.2.4.2m.1 Definition

This test is applicable for Rel-6 UEs supporting MBMS multicast services.

7.2.4.2m.2 Conformance requirement

Same conformance requirement as in clause 7.2.4.2.2.

Reference

1) 3GPP TS 25.322 clauses 4.2.1.2.2, and 9.7.10

7.2.4.2m.3 Test purpose

Same test purpose as in clause 7.2.4.2.3.

7.2.4.2m.4 Method of test

Initial condition

System Simulator: 1 MBMS Cell

User Equipment:

The UE is in Idle Mode as specified in clause 7.6 of TS 34.108.

The UE has joined the multicast service to be provided by the SS (included in MBMS_ACTIVATED_SERVICES variable).

Same setting of Timer_DAR and DAR_Window_Size as in clause 7.2.4.2.4.

Related ICS/IXIT statements:

MBMS Multicast service application available on UE yes/no

Test procedure

Same test purpose as in clause 7.2.4.2.4.

Expected Sequence

Same expected sequence as in clause 7.2.4.2.4.

Specific message contents

None.

7.2.4.2m.5 Test requirements

Same test requirements as in clause 7.2.4.2.5.

7.2.4.3 MCCH Out Of Sequence Delivery handling / MBMS Broadcast Service

7.2.4.3.1 Definition

This test is applicable for Rel-6 UEs supporting MBMS broadcast services.

7.2.4.3.2 Conformance requirement

To enable the recovery of SDUs from UMD PDUs that are received in different transmissions the receiving function shall store PDUs until all SDUs that are associated with the PDU can be reconstructed or until they are discarded in accordance with the procedures described below. SDUs are transferred to the upper layers as soon as all PDUs that contain the segments of the SDU and the "Length Indicator" indicating the end of the SDU have been received.

Upon delivery of a set of UMD PDUs from the lower layer, the Receiver shall for each PDU (in the following SN denotes the sequence number of each PDU):

- If the PDU is the first PDU received (after the receiving entity is established or re-established or after Timer_OSD expires):
  - VR(UOH) shall be assigned the value SN-1.
- if VR(UOH) ≥ SN > VR(UOH) – OSD_Window_Size then:
  - if a PDU with sequence number SN is already stored:

- discard the PDU;

- else:

  - store the PDU in sequence number order.

- else:

  - VR(UOH) shall be assigned the value SN, thereby advancing the storage window;

  - store the PDU in sequence number order;

  - remove from storage any PDUs whose sequence numbers, SN, are outside of the storage window VR(UOH) ≥ SN > VR(UOH) – OSD_Window_Size;

  - if Timer_OSD is active then Timer_OSD shall be stopped;

  - Timer_OSD shall be started.

- if a PDU with sequence number SN was stored:

  - if the PDU contains one or more complete SDUs and/or if the PDU contains segments of SDUs for which all the remaining segments and length indicators are contained in stored PDUs:

    - re-assemble the SDUs;

    - submit the SDUs to upper layers through the UM-SAP;

    - remove from storage any PDUs which do not contain any segment of a SDU that has not been re-assembled, and do not contain one of the special length indicators "0000 000", "0000 0000 0000 000" or "1111 1111 1111 011" that indicate the end of a SDU that has not been re-assembled.

NOTE 0: If PDUs are removed from storage after SDU recovery then retransmitted PDUs may result in the duplicate transfer of SDUs to the higher layers.

- if Timer_OSD expires:

  - remove from storage all stored PDUs.

NOTE 1: When configured for out of sequence SDU delivery, the transmitter should consider the possibility that a loss of a number of 128 – OSD_Window_Size consecutively numbered PDUs may result in an undetected protocol error in the receiver, if the transmit state variable VT(US), at the end of a time interval equal to the duration of Timer_OSD, is greater than 128 + SN – OSD_Window_Size + 1, where SN is the lowest sequence number of any PDU transmitted or retransmitted within that time interval.

NOTE 2: The transmitter should not concatenate within a single PDU, SDUs or fractions of SDUs that contain MBMS Access Information messages with SDUs or fractions of SDUs that contain other MCCH message types.

NOTE 3: SDUs are contained within consecutively numbered PDUs. To enable SDUs containing MBMS Access Information messages to be transmitted at their designated times, the transmitter may transmit PDUs out of sequence order.

NOTE 4: The transmitter should not transmit within a single PDU, SDUs or fractions of SDUs that contain MBMS Access Information messages with the special length indicator "0000 000","0000 0000 0000 000", and "1111 1111 1111 011".

Reference

1) 3GPP TS 25.322, clause 11.2.3.2

7.2.4.3.3 Test purpose

To verify MCCH Out Of Sequence Delivery handling.

7.2.4.3.4 Method of test

Initial condition

System Simulator: 1 MBMS Cell.

User Equipment:

The UE is in CELL_FACH state as specified in clause 7.6 of TS 34.108, with the following exception: MCCH Default2 scheduling as specified in TS 34.108 clause 11.1

The UE has a valid IMSI.

The UE is interested in the broadcast service to be provided by the SS (included in MBMS_ACTIVATED_SERVICES variable).

The following parameters are specific for this test case:

Parameter	Value
OSD_Window_Size	64 (to contain the entire MBMS CONTROL INFORMATION on MCCH)

Related ICS/IXIT statements:

MBMS Broadcast service application available on UE yes/no

Test procedure

a) The SS commands UE into RB Test Mode.

b) SS indicates on MICH and modifies the MCCH to indicate the start of service 1. In this step the SS shall send MCCH information as follows:

The RLC is configured at the SS as TM mode. This is in order to be able to replace encoded PDUs and header information with an invalid LI .

On the first repetition period for all critical MCCH messages, only the odd numbered RLC PDU SN are transmitted correctly, an invalid LI is inserted into the RLC header of the even numbered PDUs.

On the second repetition period for all critical MCCH messages, only the even numbered RLC PDU SN are transmitted correctly, an invalid LI is inserted into the RLC header of the odd numbered PDUs.

SS waits for the UE to begin reception of the MBMS service using the 64.8kbps radio bearer configuration specified in TS 34.108, clause 6.10.2.4.3.5.

c) The radio bearer is placed into UE test loop mode 3.

d) The SS transmits 10 * RLC SDUs of size 80 octets. (PDU is 80 octets + 1 octet special LI)

e) The SS checks that the loopback mode 3 SDU count is greater than 0.

Expected Sequence

Step	Direction UE SS	Message	Comments
1	←	ACTIVATE RB TEST MODE	
2	→	ACTIVATE RB TEST MODE COMPLETE	
3	←	MCCH MESSAGES	For all MCCH messages using message combination C4 for 1 modification period: on the first repetition period, only the odd numbered RLC PDU SN are transmitted correctly. On the second repetition period only the even numbered RLC PDU SN are transmitted correctly. Other PDUs have an invalid LI in the RLC header. Those messages requiring specific contents are shown in steps 4-6, other messages have the default contents.
4	←	MBMS MODIFIED SERVICES INFORMATION	SS indicates to the UE to Acquire PTM RB info.
5	←	MBMS COMMON P-T-M RB INFORMATION	Contains configuration for the 64.8kbps radio bearer configuration as specified in TS 34.108 clause 6.10.2.4.3.5.
6	←	MBMS CURRENT CELL P-T-M RB INFORMATION	Indicates the radio bearer configuration to be used for reception of the service. The SS waits for the UE to establish the MTCH, according to the activation time.
7	←	MCCH MESSAGES	SS transmits PDUs using message combination C2. For all MCCH messages using message combination C2 for 1 modification period: on the first repetition period, only the odd numbered RLC PDU SN are transmitted correctly. On the second repetition period only the even numbered RLC PDU SN are transmitted correctly. Other PDUs have an invalid LI in the RLC header. After this modification period, the SS stops sending MCCH messages.
8	←	CLOSE UE TEST LOOP	UE test loop mode 3 setup
9	→	CLOSE UE TEST LOOP COMPLETE	
10	←	10 * RLC SDU	SS sends 10*RLC SDUs on MTCH
11	←	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
12	→	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	SDU counter response > 0.
13	←	OPEN UE TEST LOOP	
14	→	OPEN UE TEST LOOP COMPLETE	

Specific message contents

Those PDUs indicated to have an invalid LI in the RLC header, shall encode the LI to be invalid according to TS 25.322 clause 11.2.4.2.

7.2.4.3.5 Test requirements

In step e the UE shall report the loopback mode 3 SDU count to be greater than 0.

7.2.4.3a MCCH Out Of Sequence Delivery handling / MBSFN (FDD)

7.2.4.3a.1 Definition

This test is applicable for Rel-7 UEs supporting MBSFN for FDD.

7.2.4.3a.2 Conformance requirement

To enable the recovery of SDUs from UMD PDUs that are received in different transmissions the receiving function shall store PDUs until all SDUs that are associated with the PDU can be reconstructed or until they are discarded in accordance with the procedures described below. SDUs are transferred to the upper layers as soon as all PDUs that contain the segments of the SDU and the "Length Indicator" indicating the end of the SDU have been received.

Upon delivery of a set of UMD PDUs from the lower layer, the Receiver shall for each PDU (in the following SN denotes the sequence number of each PDU):

- If the PDU is the first PDU received (after the receiving entity is established or re-established or after Timer_OSD expires):
    - VR(UOH) shall be assigned the value SN-1.
- if VR(UOH) ≥ SN > VR(UOH) – OSD_Window_Size then:
    - if a PDU with sequence number SN is already stored:
        - discard the PDU;
    - else:
        - store the PDU in sequence number order.
- else:
    - VR(UOH) shall be assigned the value SN, thereby advancing the storage window;
    - store the PDU in sequence number order;
    - remove from storage any PDUs whose sequence numbers, SN, are outside of the storage window VR(UOH) ≥ SN > VR(UOH) – OSD_Window_Size;
    - if Timer_OSD is active then Timer_OSD shall be stopped;
    - Timer_OSD shall be started.
- if a PDU with sequence number SN was stored:
    - if the PDU contains one or more complete SDUs and/or if the PDU contains segments of SDUs for which all the remaining segments and length indicators are contained in stored PDUs:
        - re-assemble the SDUs;
        - submit the SDUs to upper layers through the UM-SAP;
        - remove from storage any PDUs which do not contain any segment of a SDU that has not been re-assembled, and do not contain one of the special length indicators "0000 000", "0000 0000 0000 000" or "1111 1111 1111 011" that indicate the end of a SDU that has not been re-assembled.

NOTE 0: If PDUs are removed from storage after SDU recovery then retransmitted PDUs may result in the duplicate transfer of SDUs to the higher layers.

- if Timer_OSD expires:
    - remove from storage all stored PDUs.

NOTE 1: When configured for out of sequence SDU delivery, the transmitter should consider the possibility that a loss of a number of 128 – OSD_Window_Size consecutively numbered PDUs may result in an undetected protocol error in the receiver, if the transmit state variable VT(US), at the end of a time interval equal to the duration of Timer_OSD, is greater than 128 + SN – OSD_Window_Size + 1, where SN is the lowest sequence number of any PDU transmitted or retransmitted within that time interval.

NOTE 2: The transmitter should not concatenate within a single PDU, SDUs or fractions of SDUs that contain MBMS Access Information messages with SDUs or fractions of SDUs that contain other MCCH message types.

NOTE 3: SDUs are contained within consecutively numbered PDUs. To enable SDUs containing MBMS Access Information messages to be transmitted at their designated times, the transmitter may transmit PDUs out of sequence order.

NOTE 4: The transmitter should not transmit within a single PDU, SDUs or fractions of SDUs that contain MBMS Access Information messages with the special length indicator "0000 000","0000 0000 0000 000", and "1111 1111 1111 011".

Reference

1) 3GPP TS 25.322, clause 11.2.3.2

7.2.4.3a.3 Test purpose

To verify MCCH Out Of Sequence Delivery handling.

7.2.4.3a.4 Method of test

Initial condition

System Simulator: 1 MBMS Cell.

User Equipment:

The UE is in CELL_FACH state as specified in clause 7.6 of TS 34.108, with the following exception: MCCH Default2 scheduling as specified in TS 34.108 clause 11.1

The UE has a valid IMSI.

The UE is interested in the broadcast service to be provided by the SS (included in MBMS_ACTIVATED_SERVICES variable).

The following parameters are specific for this test case:

Parameter	Value
OSD_Window_Size	64 (to contain the entire MBMS CONTROL INFORMATION on MCCH)

Related ICS/IXIT statements:

MBMS Broadcast service application available on UE yes/no

Test procedure

a) The SS commands UE into RB Test Mode.

b) SS indicates on MICH and modifies the MCCH to indicate the start of service 1. In this step the SS shall send MCCH information as follows:

The RLC is configured at the SS as TM mode. This is in order to be able to replace encoded PDUs and header information with an invalid LI .

On the first repetition period for all critical MCCH messages, only the odd numbered RLC PDU SN are transmitted correctly, an invalid LI is inserted into the RLC header of the even numbered PDUs.

On the second repetition period for all critical MCCH messages, only the even numbered RLC PDU SN are transmitted correctly, an invalid LI is inserted into the RLC header of the odd numbered PDUs.

SS waits for the UE to begin reception of the MBMS service using the 64.8kbps radio bearer configuration specified in TS 34.108, clause 6.10.2.4.3.5.

c) The radio bearer is placed into UE test loop mode 3.

d) The SS transmits 10 * RLC SDUs of size 80 octets. (PDU is 80 octets + 1 octet special LI)

e) The SS checks that the loopback mode 3 SDU count is greater than 0.

Expected Sequence

Step	Direction UE / SS	Message	Comments
1	←	ACTIVATE RB TEST MODE	
2	→	ACTIVATE RB TEST MODE COMPLETE	
3	←	MCCH MESSAGES	For all MCCH messages using message combination C4 for 1 modification period: on the first repetition period, only the odd numbered RLC PDU SN are transmitted correctly. On the second repetition period only the even numbered RLC PDU SN are transmitted correctly. Other PDUs have an invalid LI in the RLC header. Those messages requiring specific contents are shown in steps 4-6, other messages have the default contents.
4	←	MBMS MODIFIED SERVICES INFORMATION	SS indicates to the UE to Acquire PTM RB info.
5	←	MBMS COMMON P-T-M RB INFORMATION	Contains configuration for the 64.8kbps radio bearer configuration as specified in TS 34.108 clause 6.10.2.4.3.5.
6	←	MBMS CURRENT CELL P-T-M RB INFORMATION	Indicates the radio bearer configuration to be used for reception of the service.
			The SS waits for the UE to establish the MTCH, according to the activation time.
7	←	MCCH MESSAGES	SS transmits PDUs using message combination C2. For all MCCH messages using message combination C2 for 1 modification period: on the first repetition period, only the odd numbered RLC PDU SN are transmitted correctly. On the second repetition period only the even numbered RLC PDU SN are transmitted correctly. Other PDUs have an invalid LI in the RLC header. After this modification period, the SS stops sending MCCH messages.
8	←	CLOSE UE TEST LOOP	UE test loop mode 3 setup
9	→	CLOSE UE TEST LOOP COMPLETE	
10	←	10 * RLC SDU	SS sends 10*RLC SDUs on MTCH
11	←	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
12	→	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	SDU counter response > 0.
13	←	OPEN UE TEST LOOP	
14	→	OPEN UE TEST LOOP COMPLETE	

Specific message contents

Those PDUs indicated to have an invalid LI in the RLC header, shall encode the LI to be invalid according to TS 25.322 clause 11.2.4.2.

7.2.4.3a.5 Test requirements

In step e the UE shall report the loopback mode 3 SDU count to be greater than 0.

7.2.4.3b-l Void

7.2.4.3m MCCH Out Of Sequence Delivery handling / MBMS Multicast Service

7.2.4.3m.1 Definition

This test is applicable for Rel-6 UEs supporting MBMS multicast services.

7.2.4.3m.2 Conformance requirement

Same conformance requirement as in clause 7.2.4.3.2.

Reference

1) 3GPP TS 25.322, clause 11.2.3.2

7.2.4.3m.3 Test purpose

Same test purpose as in clause 7.2.4.3.3.

7.2.4.3m.4 Method of test

Initial condition

System Simulator: 1 MBMS Cell.

User Equipment:

The UE is in CELL_FACH state as specified in clause 7.6 of TS 34.108, with the following exception: MCCH Default2 scheduling as specified in TS 34.108 clause 11.1

The UE has a valid IMSI.

The UE has joined the multicast service to be provided by the SS (included in MBMS_ACTIVATED_SERVICES variable).

Same setting of OSD_Window_Size as in clause 7.2.4.3.4.

Related ICS/IXIT statements:

MBMS Multicast service application available on UE yes/no

Test procedure

Same test procedure as in clause 7.2.4.3.4.

Specific message contents

Same specific message contents in clause 7.2.4.3.4.

7.2.4.3m.5 Test requirements

Same test requirements as in clause 7.2.4.3.5.

7.2.4.3n-r Void

7.2.4.3s MCCH Out Of Sequence Delivery handling / MBMS Broadcast Service (TDD MBSFN) (non-IMB)

7.2.4.3s.1 Definition

This test is applicable for Rel-7 UEs supporting MBMS broadcast services over MBSFN.

7.2.4.3s.2 Conformance requirement

To enable the recovery of SDUs from UMD PDUs that are received in different transmissions the receiving function shall store PDUs until all SDUs that are associated with the PDU can be reconstructed or until they are discarded in accordance with the procedures described below. SDUs are transferred to the upper layers as soon as all PDUs that contain the segments of the SDU and the "Length Indicator" indicating the end of the SDU have been received.

Upon delivery of a set of UMD PDUs from the lower layer, the Receiver shall for each PDU (in the following SN denotes the sequence number of each PDU):

- If the PDU is the first PDU received (after the receiving entity is established or re-established or after Timer_OSD expires):

  - VR(UOH) shall be assigned the value SN-1.
- if VR(UOH) ≥ SN > VR(UOH) – OSD_Window_Size then:
  - if a PDU with sequence number SN is already stored:
    - discard the PDU;
  - else:
    - store the PDU in sequence number order.
- else:
  - VR(UOH) shall be assigned the value SN, thereby advancing the storage window;
  - store the PDU in sequence number order;
  - remove from storage any PDUs whose sequence numbers, SN, are outside of the storage window VR(UOH) ≥ SN > VR(UOH) – OSD_Window_Size;
  - if Timer_OSD is active then Timer_OSD shall be stopped;
  - Timer_OSD shall be started.
- if a PDU with sequence number SN was stored:
  - if the PDU contains one or more complete SDUs and/or if the PDU contains segments of SDUs for which all the remaining segments and length indicators are contained in stored PDUs:
    - re-assemble the SDUs;
    - submit the SDUs to upper layers through the UM-SAP;
    - remove from storage any PDUs which do not contain any segment of a SDU that has not been re-assembled, and do not contain one of the special length indicators "0000 000", "0000 0000 0000 000" or "1111 1111 1111 011" that indicate the end of a SDU that has not been re-assembled.

NOTE 0: If PDUs are removed from storage after SDU recovery then retransmitted PDUs may result in the duplicate transfer of SDUs to the higher layers.

- if Timer_OSD expires:
  - remove from storage all stored PDUs.

NOTE 1: When configured for out of sequence SDU delivery, the transmitter should consider the possibility that a loss of a number of 128 – OSD_Window_Size consecutively numbered PDUs may result in an undetected protocol error in the receiver, if the transmit state variable VT(US), at the end of a time interval equal to the duration of Timer_OSD, is greater than 128 + SN – OSD_Window_Size + 1, where SN is the lowest sequence number of any PDU transmitted or retransmitted within that time interval.

NOTE 2: The transmitter should not concatenate within a single PDU, SDUs or fractions of SDUs that contain MBMS Access Information messages with SDUs or fractions of SDUs that contain other MCCH message types.

NOTE 3: SDUs are contained within consecutively numbered PDUs. To enable SDUs containing MBMS Access Information messages to be transmitted at their designated times, the transmitter may transmit PDUs out of sequence order.

NOTE 4: The transmitter should not transmit within a single PDU, SDUs or fractions of SDUs that contain MBMS Access Information messages with the special length indicator "0000 000","0000 0000 0000 000", and "1111 1111 1111 011".

Reference

1) 3GPP TS 25.322, clause 11.2.3.2

7.2.4.3s.3 Test purpose

To verify MCCH Out Of Sequence Delivery handling.

7.2.4.3s.4 Method of test

Initial condition

System Simulator:

Unicast carrier: 1 cell, Cell 1 with default configuration.

- MBSFN carriers: 1 cell, Cell 31 has default parameters. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 and Default2 MCCH scheduling (No ongoing session) according to subclause 11.2 of TS 34.108.

  The configuration of the S-CCPCH which will carry the MTCH is based upon that specified in TS 34.108 clause 6.11.1c (3.84 Mcps TDD), 6.11.1d (7.68 Mcps TDD) and 6.11.5.4.4.13 (1.28 Mcps TDD) 8kbps RB for MBSFN MTCH.

The following parameters are specific for this test case:

Parameter	Value
OSD_Window_Size	64 (to contain the entire MBMS CONTROL INFORMATION on MCCH)

User Equipment:

- On the unicast carrier cell the UE is in registered Idle Mode on PS (state 3) if the UE only supports PS domain or registered Idle Mode on CS/PS (state 7) if the UE supports both CS and PS domains, as specified in clause 7.2.2 of TS 34.108.

- The UE is in MBSFN Idle mode with one activated service as specified in clause 7.6.4 of TS 34.108. The UE has selected (i.e. it is included in MBMS_ACTIVATED_SERVICES variable) a national service for which there will be a session starting on MBSFN Cell 31 (see TS 34.108 clause 11.2.4).

Related ICS/IXIT statements

- MBMS Broadcast services in MBSFN mode available on UE Yes/No.

- Support of TDD transmit and receive functions available on UE Yes/No.

- Support of TDD MBSFN receive only function available on UE Yes/No.

Test procedure

a) The UE is camping on Cell 1 and Cell 31. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 (no session ongoing) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108.

b) The SS sends ACTIVATE RB TEST MODE on the unicast carrier and the UE responds with ACTIVATE RB TEST MODE COMPLETE.

c) The SS sends CLOSE UE TEST LOOP to activate RLC SDU counting on Cell 31 MTCH (Transmission identity indicating the MBMS activated service).

d) SS indicates on MICH and modifies the MCCH to indicate the start of the national service. In this step the SS shall send MCCH information as follows:

   The RLC is configured at the SS as TM mode. This is in order to be able to replace encoded PDUs and header information with an invalid LI .

   On the first repetition period for all critical MCCH messages, only the odd numbered RLC PDU SN are transmitted correctly, an invalid LI is inserted into the RLC header of the even numbered PDUs.

   On the second repetition period for all critical MCCH messages, only the even numbered RLC PDU SN are transmitted correctly, an invalid LI is inserted into the RLC header of the odd numbered PDUs.

e) SS waits for the UE to begin reception of the MBMS service using the 8kbps radio bearer configuration specified in TS 34.108, clause 6.11.1c (3.84 Mcps TDD) or 6.11.1d (7.68 Mcps TDD) or 6.11.5.4.4.13 (1.28 Mcps TDD). The UE closes the test loop. The UE sends CLOSE UE TEST LOOP COMPLETE.

f) The SS transmits 10 * RLC SDUs of size 40 octets. (PDU is 40 octets + 1 octet special LI)

g) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is > 0.

Expected sequence

Step	Direction UE SS	Carrier	Message	Comment
1	←	U	ACTIVATE RB TEST MODE	
2	→	U	ACTIVATE RB TEST MODE COMPLETE	
3	←	U	CLOSE UE TEST LOOP	Loop back mode 3 is activated on Cell 31 for the selected national service on MTCH.
4	←	M	MBMS MCCH Message Configuration C4	For all MCCH messages using message combination C4 for 1 modification period: on the first repetition period, only the odd numbered RLC PDU SN are transmitted correctly. On the second repetition period only the even numbered RLC PDU SN are transmitted correctly. Other PDUs have an invalid LI in the RLC header. Those messages requiring specific contents are shown in steps 6-8, other messages have the default contents.
5	←	M	MBMS MODIFIED SERVICES INFORMATION	Includes the national service activated at UE in the modified services list for one modification period. SS indicates to the UE to Acquire PTM RB info.
6	←	M	MBMS COMMON P-T-M RB INFORMATION	Contains configuration for the 8kbps radio bearer configuration
7	←	M	MBMS CURRENT CELL P-T-M RB INFORMATION	Indicates the radio bearer configuration to be used for reception of the service.
8	←	M	MBMS MCCH Message Configuration C2	SS transmits PDUs using message combination C2. For all MCCH messages using message combination C2 for 1 modification period: on the first repetition period, only the odd numbered RLC PDU SN are transmitted correctly. On the second repetition period only the even numbered RLC PDU SN are transmitted correctly. Other PDUs have an invalid LI in the RLC header. After this modification period, the SS stops sending MCCH messages.
9	←	M	MBMS COMMON P-T-M RB INFORMATION	Contains configuration for the 8kbps radio bearer configuration
10	←	M	MBMS CURRENT CELL P-T-M RB INFORMATION	Indicates the radio bearer configuration to be used for reception of the service.
11	→	U	CLOSE UE TEST LOOP COMPLETE	The UE establishes the MTCH according to the activation time and closes the test loop.
12	←	M	10 * RLC SDU	SS sends 10*RLC SDUs on MTCH
13	←	U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
14	→	U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is greater than zero.
15	←	U	OPEN UE TEST LOOP	
16	→	U	OPEN UE TEST LOOP COMPLETE	
17	←	U	DEACTIVATE RB TEST MODE	
18	→	U	DEACTIVATE RB TEST MODE COMPLETE	

Specific message contents

Those PDUs indicated to have an invalid LI in the RLC header, shall encode the LI to be invalid according to TS 25.322 clause 11.2.4.2.

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

MBMS COMMON P-T-M RB INFORMATION (Step 6 and Step 9) (3.84 Mcps)

Information Element	Value/remark	Version
Message type		Rel-6
RB information list	1 entry in the list	Rel-6
- RB identity		
- MBMS Common RB identity	14	
- PDCP info		
- Support for lossless SRNS relocation	Not Present	
- Max PDCP SN window size	Not Present	
- PDCP PDU header	absent	
- Header compression information	Not Present	

Information Element	Value/remark	Version
- RLC info		
- DL UM RLC LI size	7	
- DL Duplication Avoidance and Reordering info	Not Present	
- DL Out of sequence delivery info	Not Present	
TrCh information for each TrCh	1 entry in the list	Rel-6
- Transport channel identity		
- MBMS Common TrCh identity	1	
- TFS		
- CHOICE *Transport channel type*	Common transport channels	
- Dynamic Transport Format Information		
- RLC Size	Reference to clause 6.11.1c	
- Number of TBs and TTI List	(This IE is repeated for each TFI)	
- Number of Transport blocks	Reference to clause 6.11.1c	
- CHOICE *mode*	TDD	
- Transmission Time Interval	Not Present	
- CHOICE *Logical Channel List*	ALL	
- no data		
- Semi-static Transport Format information		
- Transmission time interval	Reference to clause 6.11.1c	
- Type of channel coding	Turbo	
- Coding Rate	Not Present	
- Rate matching attribute	Reference to clause 6.11.1c	
- CRC size	Reference to clause 6.11.1c	
TrCh information for each CCTrCh	Not Present (Default TFCS applies for each CCTrCh)	Rel-6
PhyCh information	1 entry in list	Rel-6
- PhyCh identity		
- MBMS Common PhyCh identity	23	
- Secondary CCPCH info MBMS		
- CHOICE *mode*	1.28/3.84 Mcps TDD	
- Common timeslot info MBMS		
- 2nd interleaving mode	Frame	
- TFCI coding	Reference to clause 6.11.1c	
- Puncturing limit	Reference to clause 6.11.1c	
- Downlink Timeslots and Codes		
- First individual timeslot info		
- Timeslot number		
- CHOICE *TDD option*	3.84 Mcps	
- Timeslot number	1	
- TFCI existence	TRUE	
- Midamble Shift and burst type		
- CHOICE *TDD option*	3.84 Mcps TDD	
- CHOICE Burst Type	MBSFN Burst Type	Rel-7
- no data		Rel-7
- CHOICE *TDD option*	3.84Mcps TDD	
- no data		
- First timeslot channelisation codes		
- CHOICE *codes representation*	Consecutive codes	
- First channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- Last channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- CHOICE *more timeslots*	No more timeslots	
- no data		
- Modulation	Reference to clause 6.11.1c	Rel-7

MBMS COMMON P-T-M RB INFORMATION (Step 6 and Step 9) (7.68 Mcps)

Information Element	Value/remark	Version
Message type		Rel-7
RB information list	1 entry in the list	Rel-7
- RB identity		
- MBMS Common RB identity	14	
- PDCP info		
- Support for lossless SRNS relocation	Not Present	
- Max PDCP SN window size	Not Present	
- PDCP PDU header	absent	
- Header compression information	Not Present	

Information Element	Value/remark	Version
- RLC info		
- DL UM RLC LI size	7	
- DL Duplication Avoidance and Reordering info	Not Present	
- DL Out of sequence delivery info	Not Present	
TrCh information for each TrCh	1 entry in the list	Rel-7
- Transport channel identity		
- MBMS Common TrCh identity	1	
- TFS		
- CHOICE *Transport channel type*	Common transport channels	
- Dynamic Transport Format Information		
- RLC Size	Reference to clause 6.11.1d	
- Number of TBs and TTI List	(This IE is repeated for each TFI)	
- Number of Transport blocks	Reference to clause 6.11.1d	
- CHOICE *mode*	TDD	
- Transmission Time Interval	Not Present	
- CHOICE *Logical Channel List*	ALL	
- no data		
- Semi-static Transport Format information		
- Transmission time interval	Reference to clause 6.11.1d	
- Type of channel coding	Turbo	
- Coding Rate	Not Present	
- Rate matching attribute	Reference to clause 6.11.1d	
- CRC size	Reference to clause 6.11.1d	
TrCh information for each CCTrCh	Not Present (Default TFCS applies for each CCTrCh)	Rel-7
PhyCh information	1 entry in list	Rel-7
- PhyCh identity		
- MBMS Common PhyCh identity	23	
- Secondary CCPCH info MBMS		
- CHOICE *mode*	7.68 Mcps TDD	
- Common timeslot info MBMS		
- 2nd interleaving mode	Frame	
- TFCI coding	Reference to clause 6.11.1d	
- Puncturing limit	Reference to clause 6.11.1d	
- Downlink Timeslots and Codes VHCR		
- First Individual timeslot info		
- Timeslot number		
- CHOICE *TDD option*	7.68 Mcps option	
Timeslot number	1	
- TFCI existence	TRUE	
- Midamble Shift and burst type		
- CHOICE *TDD option*	7.68 Mcps TDD	
- CHOICE *Burst Type*	MBSFN Burst Type	
- no data	Default	
- CHOICE *TDD option*	7.68Mcps TDD	
- no data		
- First timeslot channelisation codes VHCR		
- CHOICE *codes representation*	Consecutive codes	
- First channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- Last channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- CHOICE more timeslots	No more timeslots	
- no data		
- Modulation	Reference to clause 6.11.1d	

MBMS COMMON P-T-M RB INFORMATION (Step 6 and Step 9) (1.28 Mcps)

Information Element	Value/remark	Version
Message type		Rel-6
RB information list	1 entry in the list	Rel-6
- RB identity		
- MBMS Common RB identity	14	
- PDCP info		
- Support for lossless SRNS relocation	Not Present	
- Max PDCP SN window size	Not Present	
- PDCP PDU header	absent	
- Header compression information	Not Present	

Information Element	Value/remark	Version
- RLC info		
- DL UM RLC LI size	7	
- DL Duplication Avoidance and Reordering info	Not Present	
- DL Out of sequence delivery info	Not Present	
TrCh information for each TrCh	1 entry in the list	Rel-6
- Transport channel identity		
- MBMS Common TrCh identity	1	
- TFS		
- CHOICE *Transport channel type*	Common transport channels	
- Dynamic Transport Format Information		
- RLC Size	Reference to clause 6.11.5.4.4.13	
- Number of TBs and TTI List	(This IE is repeated for each TFI)	
- Number of Transport blocks	Reference to clause 6.11.5.4.4.13	
- CHOICE *mode*	TDD	
- Transmission Time Interval	Not Present	
- CHOICE *Logical Channel List*	ALL	
- no data		
- Semi-static Transport Format information		
- Transmission time interval	Reference to clause 6.11.5.4.4.13	
- Type of channel coding	Turbo	
- Coding Rate	Not Present	
- Rate matching attribute	Reference to clause 6.11.5.4.4.13	
- CRC size	Reference to clause 6.11.5.4.4.13	
TrCh information for each CCTrCh	Not Present (Default TFCS applies for each CCTrCh)	Rel-6
PhyCh information	1 entry in list	Rel-6
- PhyCh identity		
- MBMS Common PhyCh identity	23	
- Secondary CCPCH info MBMS		
- CHOICE *mode*	1.28/3.84 Mcps TDD	
- Common timeslot info MBMS		
- 2nd interleaving mode	Frame	
- TFCI coding	Reference to clause 6.11.5.4.4.13	
- Puncturing limit	Reference to clause 6.11.5.4.4.13	
- Downlink Timeslots and Codes		
- First individual timeslot info		
- Timeslot number		
- CHOICE *TDD option*	1.28 Mcps	
- Timeslot number	1	
- TFCI existence	TRUE	
- Midamble Shift and burst type		
- CHOICE *TDD option*	1.28 Mcps TDD	
- Midamble Allocation Mode	Common midamble	
- Midamble configuration	2	
- CHOICE *TDD option*	1.28Mcps TDD	
- Modulation	Reference to clause 6.11.5.4.4.13	
- SS-TPC Symbols	1	
- Additional TPC-SS Symbols	Not Present	
- First timeslot channelisation codes		
- CHOICE *codes representation*	Consecutive codes	
- First channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- Last channelisation code	Reference clause 5.5.2 "Downlink physical channels code allocation for signalling"	
- CHOICE *more timeslots*	No more timeslots	
- no data		
- MBSFN Special Time Slot	TS7	Rel-7
- Modulation	Reference to clause 6.11.5.4.4.13	Rel-7
LCR TDD MBSFN information	Not Present	Rel-7

MBMS CURRENT CELL P-T-M RB INFORMATION (Step 7 and Step 10)

Information Element	Value/remark	Version
Message type		Rel-6
S-CCPCH list	Contains 1 S-CCPCH	Rel-6
- S-CCPCH identity	Not Present	
- Secondary CCPCH info	23	
- MBMS Soft Combining Timing Offset	Not Present	
- TrCh information common for all TrCh	Not Present (MD)	
- TrCH information list		
- TrCh information	1	
- RB information list		
- RB information		
- RB information	14	
- MBMS short transmission ID	Reference to the service which is being provided on this RB.	
- MBMS logical channel identity	1	
- L1 combining status	Not Present	
- MSCH configuration information	Not Present	
S-CCPCH in SIB type 5	Not Present	Rel-6
MBSFN TDM Info List	Not Present	Rel-7

7.2.4.3s.5 Test requirements

1) At step 14, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a count > 0 for Cell 31 MTCH.

7.2.4.3t MCCH Out Of Sequence Delivery handling / MBMS Broadcast Service (IMB)

7.2.4.3t.1 Definition

This test is applicable for 3.84 Mcps TDD IMB UE.

7.2.4.3t.2 Conformance requirement

To enable the recovery of SDUs from UMD PDUs that are received in different transmissions the receiving function shall store PDUs until all SDUs that are associated with the PDU can be reconstructed or until they are discarded in accordance with the procedures described below. SDUs are transferred to the upper layers as soon as all PDUs that contain the segments of the SDU and the "Length Indicator" indicating the end of the SDU have been received.

Upon delivery of a set of UMD PDUs from the lower layer, the Receiver shall for each PDU (in the following SN denotes the sequence number of each PDU):

- If the PDU is the first PDU received (after the receiving entity is established or re-established or after Timer_OSD expires):
  - VR(UOH) shall be assigned the value SN-1.
- if VR(UOH) $\geq$ SN > VR(UOH) – OSD_Window_Size then:
  - if a PDU with sequence number SN is already stored:
    - discard the PDU;
  - else:
    - store the PDU in sequence number order.
- else:
  - VR(UOH) shall be assigned the value SN, thereby advancing the storage window;
  - store the PDU in sequence number order;
  - remove from storage any PDUs whose sequence numbers, SN, are outside of the storage window VR(UOH) $\geq$ SN > VR(UOH) – OSD_Window_Size;

- if Timer_OSD is active then Timer_OSD shall be stopped;
- Timer_OSD shall be started.

- if a PDU with sequence number SN was stored:
  - if the PDU contains one or more complete SDUs and/or if the PDU contains segments of SDUs for which all the remaining segments and length indicators are contained in stored PDUs:
    - re-assemble the SDUs;
    - submit the SDUs to upper layers through the UM-SAP;
    - remove from storage any PDUs which do not contain any segment of a SDU that has not been re-assembled, and do not contain one of the special length indicators "0000 000", "0000 0000 0000 000" or "1111 1111 1111 011" that indicate the end of a SDU that has not been re-assembled.

NOTE 0: If PDUs are removed from storage after SDU recovery then retransmitted PDUs may result in the duplicate transfer of SDUs to the higher layers.

- if Timer_OSD expires:
  - remove from storage all stored PDUs.

NOTE 1: When configured for out of sequence SDU delivery, the transmitter should consider the possibility that a loss of a number of 128 – OSD_Window_Size consecutively numbered PDUs may result in an undetected protocol error in the receiver, if the transmit state variable VT(US), at the end of a time interval equal to the duration of Timer_OSD, is greater than 128 + SN – OSD_Window_Size + 1, where SN is the lowest sequence number of any PDU transmitted or retransmitted within that time interval.

NOTE 2: The transmitter should not concatenate within a single PDU, SDUs or fractions of SDUs that contain MBMS Access Information messages with SDUs or fractions of SDUs that contain other MCCH message types.

NOTE 3: SDUs are contained within consecutively numbered PDUs. To enable SDUs containing MBMS Access Information messages to be transmitted at their designated times, the transmitter may transmit PDUs out of sequence order.

NOTE 4: The transmitter should not transmit within a single PDU, SDUs or fractions of SDUs that contain MBMS Access Information messages with the special length indicator "0000 000","0000 0000 0000 000", and "1111 1111 1111 011".

Reference

1) 3GPP TS 25.322, clause 11.2.3.2

7.2.4.3t.3 Test purpose

To verify MCCH Out Of Sequence Delivery handling.

7.2.4.3t.4 Method of test

Initial condition

System Simulator:

Unicast carrier: 1 cell, Cell 1 with default configuration.

- MBSFN carriers: 1 cell, Cell 31 has default parameters. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 and Default2 MCCH scheduling (No ongoing session) according to subclause 11.2 of TS 34.108.

  The configuration of the S-CCPCH which will carry the MTCH is based upon that specified in TS 34.108 clause 6.11.1e (3.84 Mcps TDD IMB) 8kbps RB for MBSFN MTCH.

The following parameters are specific for this test case:

Parameter	Value
OSD_Window_Size	64 (to contain the entire MBMS CONTROL INFORMATION on MCCH)

User Equipment:

- On the unicast carrier cell the UE is in registered Idle Mode on PS (state 3) if the UE only supports PS domain or registered Idle Mode on CS/PS (state 7) if the UE supports both CS and PS domains, as specified in clause 7.2.2 of TS 34.108.
- The UE is in MBSFN Idle mode with one activated service as specified in clause 7.6.4 of TS 34.108. The UE has selected (i.e. it is included in MBMS_ACTIVATED_SERVICES variable) a national service for which there will be a session starting on MBSFN Cell 31 (see TS 34.108 clause 11.2.4).

Related ICS/IXIT statements

- MBMS Broadcast services in MBSFN mode available on UE Yes/No.
- Support of MBSFN receive only function available on UE Yes/No.

Test procedure

a) The UE is camping on FDD unicast carrier cell 1 and IMB cell 31. In addition to broadcasting System Information, MCCH messages are transmitted by the SS on Cell 31 using MBMS configuration C1 (no session ongoing) and Default1 MCCH scheduling according to clause 11.2 of TS 34.108.

b) The SS sends ACTIVATE RB TEST MODE on the unicast carrier and the UE responds with ACTIVATE RB TEST MODE COMPLETE.

c) The SS sends CLOSE UE TEST LOOP to activate RLC SDU counting on Cell 31 MTCH (Transmission identity indicating the MBMS activated service).

d) SS indicates on MICH and modifies the MCCH to indicate the start of the national service. In this step the SS shall send MCCH information as follows:

   The RLC is configured at the SS as TM mode. This is in order to be able to replace encoded PDUs and header information with an invalid LI .

   On the first repetition period for all critical MCCH messages, only the odd numbered RLC PDU SN are transmitted correctly, an invalid LI is inserted into the RLC header of the even numbered PDUs.

   On the second repetition period for all critical MCCH messages, only the even numbered RLC PDU SN are transmitted correctly, an invalid LI is inserted into the RLC header of the odd numbered PDUs.

e) SS waits for the UE to begin reception of the MBMS service using the 8kbps radio bearer configuration specified in TS 34.108, clause 6.11.1e (3.84 Mcps TDD IMB). The UE closes the test loop. The UE sends CLOSE UE TEST LOOP COMPLETE.

f) The SS transmits 10 * RLC SDUs of size 40 octets. (PDU is 40 octets + 1 octet special LI)

g) The SS sends UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST. The SS waits for the UE to respond with UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE. The SS shall check that the counter returned by the UE for the MTCH of the activated service in the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE is > 0.

Expected sequence

Step	Direction UE SS	Carrier	Message	Comment
1	←	U	ACTIVATE RB TEST MODE	
2	→	U	ACTIVATE RB TEST MODE COMPLETE	
3	←	U	CLOSE UE TEST LOOP	Loop back mode 3 is activated on Cell 31 for the selected national service on MTCH.
4	←	M	MBMS MCCH Message Configuration C4	For all MCCH messages using message combination C4 for 1 modification period: on the first repetition period, only the odd numbered RLC PDU SN are transmitted correctly. On the second repetition period only the even numbered RLC PDU SN are transmitted correctly. Other PDUs have an invalid LI in the RLC header. Those messages requiring specific contents are shown in steps 6-8, other messages have the default contents.
5	←	M	MBMS MODIFIED SERVICES INFORMATION	Includes the national service activated at UE in the modified services list for one modification period. SS indicates to the UE to Acquire PTM RB info.
6	←	M	MBMS COMMON P-T-M RB INFORMATION	Contains configuration for the 8kbps radio bearer configuration
7	←	M	MBMS CURRENT CELL P-T-M RB INFORMATION	Indicates the radio bearer configuration to be used for reception of the service.
8	←	M	MBMS MCCH Message Configuration C2	SS transmits PDUs using message combination C2. For all MCCH messages using message combination C2 for 1 modification period: on the first repetition period, only the odd numbered RLC PDU SN are transmitted correctly. On the second repetition period only the even numbered RLC PDU SN are transmitted correctly. Other PDUs have an invalid LI in the RLC header. After this modification period, the SS stops sending MCCH messages.
9	←	M	MBMS COMMON P-T-M RB INFORMATION	Contains configuration for the 8kbps radio bearer configuration
10	←	M	MBMS CURRENT CELL P-T-M RB INFORMATION	Indicates the radio bearer configuration to be used for reception of the service.
11	→	U	CLOSE UE TEST LOOP COMPLETE	The UE establishes the MTCH according to the activation time and closes the test loop.
12	←	M	10 * RLC SDU	SS sends 10*RLC SDUs on MTCH
13	←	U	UE TEST LOOP MODE 3 RLC SDU COUNTER REQUEST	
14	→	U	UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE	The SS checks that the number of reported RLC SDUs received on the MTCH is greater than zero.
15	←	U	OPEN UE TEST LOOP	
16	→	U	OPEN UE TEST LOOP COMPLETE	
17	←	U	DEACTIVATE RB TEST MODE	
18	→	U	DEACTIVATE RB TEST MODE COMPLETE	

Specific message contents

Those PDUs indicated to have an invalid LI in the RLC header, shall encode the LI to be invalid according to TS 25.322 clause 11.2.4.2.

With the following exceptions, all messages have the same content as defined in TS 34.108 clause 9.1.3 for the MBSFN carriers and in TS 34.108 clause 9.1.1 or 9.1.2 for the unicast carrier:

MBMS COMMON P-T-M RB INFORMATION (Step 6 and Step 9) (3.84 Mcps TDD IMB)

Information Element	Value/remark	Version
Message type		Rel-6
RB information list	1 entry in the list	Rel-6
- RB identity		Rel-6
- MBMS Common RB identity	14	
- PDCP info		
- Support for lossless SRNS relocation	Not Present	
- Max PDCP SN window size	Not Present	
- PDCP PDU header	absent	
- Header compression information	Not Present	
- RLC info		
- DL UM RLC LI size	15	
- DL Duplication Avoidance and Reordering info	Not Present	
- DL Out of sequence delivery info	Not Present	
TrCh information for each TrCh	1 entry in the list	Rel-6
- Transport channel identity		Rel-6
- MBMS Common TrCh identity	1	
- TFS		
- CHOICE *Transport channel type*	Common transport channels	
- Dynamic Transport format information		
- RLC Size	Reference to clause 6.11.1e	
- Number of TBs and TTI List	(This IE is repeated for TFI number.)	
- Number of Transport blocks	Reference to clause 6.11.1e	
- CHOICE mode	FDD	
- CHOICE *Logical channel list*	All	
- no data		
- Semi-static Transport Format information		
- Transmission time interval	Reference to clause 6.11.1e	
- Type of channel coding	Turbo Code	
- Coding Rate	Not present	
- Rate matching attribute	Reference to clause 6.11.1e	
- CRC size	Reference to clause 6.11.1e	
TrCh information for each CCTrCh	Not Present (Default TFCS applies for each CCTrCh)	Rel-6
PhyCh information	1 entry in list	Rel-6
- PhyCh identity		Rel-6
- MBMS Common PhyCh identity	23	
CHOICE mode	3.84 Mcps TDD IMB	
- Secondary CCPCH frame type 2 info		Rel-8
- Sub-frame number	2(check in 5.5.2)	Rel-8
- Downlink channelisation codes		Rel-8
- First channelisation code	Reference to clause 6.11.1e	
- Last channelisation code	Reference to clause 6.11.1e	
- CHOICE modulation	Reference to clause 6.11.1e	Rel-8
- CPICH secondary CCPCH power offset	0dB	Rel-8
LCR TDD MBSFN information	Not present	Rel-7

MBMS CURRENT CELL P-T-M RB INFORMATION (Step 7 and Step 10)

Information Element	Value/remark	Version
Message type		Rel-6
S-CCPCH list	Contains 1 S-CCPCH	Rel-6
- S-CCPCH identity	Not Present	
- Secondary CCPCH info	23	
- MBMS Soft Combining Timing Offset	Not Present	
- TrCh information common for all TrCh	Not Present (MD)	
- TrCH information list		
- TrCh information	1	
- RB information list		
- RB information		
- RB information	14	
- MBMS short transmission ID	Reference to the service which is being provided on this RB.	
- MBMS logical channel identity	1	
- L1 combining status	Not Present	
- MSCH configuration information	Not Present	
S-CCPCH in SIB type 5	Not Present	Rel-6
MBSFN TDM Info List	Not Present	Rel-7

7.2.4.3t.5 Test requirements

1) At step 14, the UE TEST LOOP MODE 3 RLC SDU COUNTER RESPONSE message shall report a count > 0 for Cell 31 MTCH.

7.3 PDCP

7.3.1 General

7.3.1.1 General assumptions

If not otherwise mentioned, the same procedures as used in RRC test specification (TS 34.123-1) or in the Generic procedure (TS 34.108) applies to reach Initial conditions for PDCP testing. In this test description, common test sequences for PDCP (clause 7.3.1.2) are defined and are applied either as preamble or post amble to establish or release a Packet Switched (PS) connection for a test case.

If not explicitly described, the same message contents and settings are applied as described in the RRC test description default settings.

Detailed IP header compression coding mechanism as well as mechanism related error recovery and packet reordering described in IETF RFC 2507 are not verified.

For PDCP testing TCP/IP data type and UDP/IP data type as Non-TCP/IP data types are applied for IP data.

The IP data packet size shall be limited to 1500 bytes as defined in 3GPP TS 23.107, clause 6.5.1and 6.5.2 (range of QoS attributes).

An UE supporting IP Header compression protocol RFC 2507 shall be capable to store a header compression context of at least 512 bytes (Integer).

It shall be possible to reconfigure PDCP settings while UE test loop mode 1. With the applied test method using UE test loop mode 1, the UE as Originator and Receiver of PDCP SDUs (concurrent transmission) is tested.

7.3.1.2 Common Test sequences and Default message contents for PDCP

General

The settings and parameter used in the "Common Test sequences for PDCP" are described in the "Default PDCP Message Contents". If not explicitly shown there, the message contents are identical with the default contents for the same message type of layer 3 messages for RRC tests, to establish a packet switched session or connection. The contents of test case specific message parameters are described in the test case (Expected Sequence). If not explicitly shown, default settings and parameter are used as message content for all Common Test sequences.

7.3.1.2.1 Common Test sequences for PDCP

7.3.1.2.1.1 Setup a UE terminated PS session using IP Header compression in AM RLC (using UE Test loop test mode 1)

Initial Conditions

UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108.

Test procedure

After having received the System Information, the SS starts to setup a RRC connection. After connection establishment and Radio Bearer Setup, the UE test loop mode 1 is activated and the UE test loop mode 1 is closed.

Expected Sequence

Step	Direction UE SS	Message	Comments
1	←	SYSTEM INFORMATION	
2	←	PAGING TYPE 1	CN domain identity: PS domain Paging cause: interactive session
3	→	RRC CONNECTION REQUEST	
4	←	RRC CONNECTION SETUP	Connection Setup message PS sessions in AM RLC used in RRC testing matches here
5	→	RRC CONNECTION SETUP COMPLETE	
5a	←	AUTHENTICATION AND CIPHERING REQUEST	As defined in TS 34.108, clause 7.4.2.6a
5b	→	AUTHENTICATION AND CIPHERING RESPONSE	As defined in TS 34.108, clause 7.4.2.6a
5c	←	SECURITY MODE COMMAND	As defined in TS 34.108, clause 7.4.2.6a
5d	→	SECURITY MODE COMPLETE	As defined in TS 34.108, clause 7.4.2.6a
6	←	ACTIVATE RB TEST MODE	
7	→	ACTIVATE RB TEST MODE COMPLETE	
8	←	RADIO BEARER SETUP	The Radio Bearer configuration is as described in TS 34.108, clause 6.10, Prioritised RAB No. 23: QoS parameter: Traffic Class: Interactive or Background, max. UL:64 kbps max. DL:64 kbps, Residual BER as described in TS 34.108, clause: 6.10.
9	→	RADIO BEARER SETUP COMPLETE	
10	←	CLOSE UE TEST LOOP	The SS initiates UE test loop mode 1, indicated by the Parameter: "UE test loop mode" 1 (X1=0 and X2=0) The "DCCH dummy transmission" not used: disabled: (Y1=0)
11	→	CLOSE UE TEST LOOP COMPLETE	After having received the test mode acknowledgement, the UE test loop mode 1 is activated.

Specific message contents

The contents of test case specific message parameters are described in the test case (Expected Sequence). Default contents of messages are described in the clause Default PDCP Message Contents.

7.3.1.2.1.2 Setup a UE terminated PS session using IP Header compression in UM RLC (using UE Test loop test mode 1)

Initial Conditions

UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108.

Test procedure

After having received the System Information, the SS starts to setup a RRC connection. After connection establishment and Radio Bearer Setup, the UE test loop mode 1 is activated and the UE test loop mode 1 is closed.

Expected Sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		SYSTEM INFORMATION	
2	←		PAGING TYPE 1	CN domain identity: PS domain Paging cause: interactive session
3	→		RRC CONNECTION REQUEST	
4	←		RRC CONNECTION SETUP	Connection Setup message PS sessions in UM RLC used in RRC testing matches here
5	→		RRC CONNECTION SETUP COMPLETE	
5a	←		AUTHENTICATION AND CIPHERING REQUEST	As defined in TS 34.108, clause 7.4.2.6a
5b	→		AUTHENTICATION AND CIPHERING RESPONSE	As defined in TS 34.108, clause 7.4.2.6a
5c	←		SECURITY MODE COMMAND	As defined in TS 34.108, clause 7.4.2.6a
5d	→		SECURITY MODE COMPLETE	As defined in TS 34.108, clause 7.4.2.6a
6	←		ACTIVATE RB TEST MODE	
7	→		ACTIVATE RB TEST MODE COMPLETE	
8	←		RADIO BEARER SETUP	The Radio Bearer configuration is as described in TS 34.108, clause 6.10, Prioritised RAB No. 23: QoS parameter: Traffic Class: Interactive or Background, max. UL:64 kbps max. DL:64 kbps, Residual BER as described in TS 34.108, clause: 6.10.
9	→		RADIO BEARER SETUP COMPLETE	
10	←		CLOSE UE TEST LOOP	The SS initiates UE test loop mode 1, indicated by the Parameter: "UE test loop mode"1 (X1=0 and X2=0) The "DCCH dummy transmission" not used: disabled: (Y1=0)
11	→		CLOSE UE TEST LOOP COMPLETE	After having received the test mode acknowledgement, the UE test loop mode 1 is activated.

Specific message contents

The contents of test case specific message parameters are described in the test case (Expected Sequence) Default contents of messages are described in the clause Default PDCP Message Contents.

7.3.1.2.1.3 Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)

Initial Conditions

UE is in connected mode, a UE test loop mode 1 for PDCP is activated, and the UE loop mode 1 is "closed".

Test procedure

The UE opens the UE test loop mode 1, deactivates the test mode and the PS session, releases the Radio Bearer and enters Idle mode.

Expected Sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		OPEN UE TEST LOOP	The SS terminates the UE test loop mode 1, (see described parameter)
2	→		OPEN UE TEST LOOP COMPLETE	After having received the test mode acknowledgement, the test loop mode 1 is deactivated.
3	←		DEACTIVATE RB TEST MODE	SS deactivates the RB test mode
4	→		DEACTIVATE RB TEST MODE COMPLETE	UE shall confirm the previous message. Afterwards, the UE returns to normal operation
5	←		RRC CONNECTION RELEASE	SS terminates the connection
6	→		RRC CONNECTION RELEASE COMPLETE	UE confirms the connection release and returns to Idle mode

Specific message contents

The contents of test case specific message parameter is described in the test case (Expected Sequence). Default contents of messages are described in the clause Default PDCP Message Contents.

7.3.1.2.1.4 (Activate closed loop mode1 in CELL_DCH and CELL_FACH states

Initial Conditions

UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108.

Test procedure

After having received the System Information, the SS starts to setup a RRC connection. After connection establishment and Radio Bearer Setup, the UE test loop mode 1 is activated and the UE test loop mode 1 is closed.

Expected Sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		ACTIVATE RB TEST MODE	
2	→		ACTIVATE RB TEST MODE COMPLETE	
2a	←		RADIO BEARER SETUP	RRC RAB SETUP
2b	→		RADIO BEARER SETUP COMPLETE	RRC
3	←		CLOSE UE TEST LOOP	The SS initiates UE test loop mode 1, indicated by the Parameter: "UE test loop mode" 1 (X1=0 and X2=0) The "DCCH dummy transmission" not used: disabled: (Y1=0)
4	→		CLOSE UE TEST LOOP COMPLETE	After having received the test mode acknowledgement, the UE test loop mode 1 is activated.

7.3.1.2.1.4.1 Specific message contents

For step 2a, the messages in clause 9 of TS 34.108 are used. To execute the procedure for the CELL_DCH case, use the message titled "Packet to CELL_DCH from CELL_DCH in PS". To execute the procedure for the CELL_FACH case, use the message titled "Packet to CELL_FACH from CELL_FACH in PS".

Specific message contents

The contents of test case specific message parameters are described in the test case (Expected Sequence). Default contents of messages are described in the clause Default PDCP Message Contents.

7.3.1.2.1.5 Setup a UE terminated CS session in UM RLC (using UE Test loop test mode 1)

Initial Conditions

UE is in Idle mode (state 2 or state 7) as specified in clause 7.4 of TS 34.108.

Test procedure

After having received the System Information, the SS starts to setup a RRC connection. After connection establishment and Radio Bearer Setup, the UE test loop mode 1 is activated and the UE test loop mode 1 is closed.

Expected Sequence

Step	Direction UE	Direction SS	Message	Comments
1	←		SYSTEM INFORMATION	
2	←		PAGING TYPE 1	CN domain identity: CS domain Paging cause: Terminating Conversational Call
3	→		RRC CONNECTION REQUEST	
4	←		RRC CONNECTION SETUP	Connection Setup message CS sessions in UM RLC used in RRC testing matches here
5	→		RRC CONNECTION SETUP COMPLETE	
5a	←		AUTHENTICATION AND CIPHERING REQUEST	As defined in TS 34.108, clause 7.4.2.6a
5b	→		AUTHENTICATION AND CIPHERING RESPONSE	As defined in TS 34.108, clause 7.4.2.6a
5c	←		SECURITY MODE COMMAND	As defined in TS 34.108, clause 7.4.2.6a
5d	→		SECURITY MODE COMPLETE	As defined in TS 34.108, clause 7.4.2.6a
6	←		ACTIVATE RB TEST MODE	
7	→		ACTIVATE RB TEST MODE COMPLETE	
8	←		RADIO BEARER SETUP	The Radio Bearer configuration is as described in TS 34.108, clause 6.10.2.2, combination No. 9: Conversational / speech / UL:(12.2, 7.95, 5.9, 4.75) kbps DL: (12.2, 7.95, 5.9, 4.75) kbps / CS RAB on E-DCH and HS-DSCH + UL: [max bit rate depending on UE category and TTI] DL: [max bit rate depending on UE category] SRBs for DCCH on E-DCH and HS-DSCH
9	→		RADIO BEARER SETUP COMPLETE	
10	←		CLOSE UE TEST LOOP	The SS initiates UE test loop mode 1, indicated by the Parameter: "UE test loop mode"1 (X1=0 and X2=0) The "DCCH dummy transmission" not used: disabled: (Y1=0)
11	→		CLOSE UE TEST LOOP COMPLETE	After having received the test mode acknowledgement, the UE test loop mode 1 is activated.

Specific message contents

Default contents of messages are described in the clause Default PDCP Message Contents, except for the contents of the RADIO BEARER SETUP which are as described in TS 34.108, clause 9.1.1 with condition A23.

The contents of test case specific message parameters are described in the test case (Expected Sequence).

7.3.1.2.2 Default PDCP Message Contents

This clause contains the default values of RRC messages used for PDCP testing, other than those specified in TS 34.108 clauses 6 and 9, and default values of PDCP messages. Unless indicated otherwise in specific test cases, only PDCP related specific message contents are described here which shall be transmitted by the system simulator in RRC messages, and which are required to be received from the UE under test. If not explicitly described, the message contents are identical with the default contents for the same message type of layer 3 messages for RRC tests, to establish a packet switched session or connection.

The necessary L3 messages are listed in alphabetic order, with the exception of the SYSTEM INFORMATION messages, where it is the information elements which are listed in alphabetic order (this is because some information elements occur in several SYSTEM INFORMATION types).

In this clause, decimal values are normally used. However, sometimes a hexadecimal value, indicated by an "H", or a binary value, indicated by a "B" is used.

Default SYSTEM INFORMATION:

NOTE: SYSTEM INFORMATION BLOCK TYPE 1 (except for PLMN type "GSM-MAP"), SYSTEM INFORMATION BLOCK TYPE 8, SYSTEM INFORMATION BLOCK TYPE 9, SYSTEM INFORMATION BLOCK TYPE 10, SYSTEM INFORMATION BLOCK TYPE 14, SYSTEM INFORMATION BLOCK TYPE 15 and INFORMATION BLOCK TYPE 16 messages are not used.

Contents of CONNECTION SETUP message:

Information Element	Value/remark
Capability update requirement	
- UE radio access capability update requirement	TRUE
- System specific capability update requirement list	UE only supports 1 system

Contents of CONNECTION SETUP COMPLETE message:

Information Element	Value/remark
UE radio access capability	Value will be checked. Stated capability must be compatible with 34.123-2 (c.f. PICS/PIXIT statements in GSM) and the user settings
- Conformance test compliance	
- PDCP Capability	
- Max PDCP SN	
- Support of lossless SRNS relocation	
- Support for RFC2507	
- Max HC context space	(TCP_SPACE + NON_TCP_SPACE))
- Support for CS Voice over HSPA	Shall be present for Rel-8 and later UEs. May be present for Rel-7 UEs
- RLC Capability	
- Transport channel capability	
- RF Capability	
- Physical channel capability	
- UE multi-mode/multi-RAT capability	
- Security Capability	
- LCS Capability	
- Measurement capability	
UE system specific capability	Value will be checked. UE must include the classmark information for the supported system

Contents of RB RECONFIGURATION COMPLETE message:

Information Element	Value/remark
- Downlink counter synchronisation info - RB with PDCP information list - RB with information	Value will be checked. Stated capability must be compatible with 34.123-2 (c.f. PICS/PIXIT statements in GSM) and the user settings

Contents of ACTIVATE RB TEST MODE message:

Information Element	Value/remark
Protocol Discriminator	TS 24.007, 11.2.3.1.1
Skip indicator	TS 24.007, 11.2.3.1.2
Message type	01000100B

Contents of ACTIVATE RB TEST MODE COMPLETE message:

Information Element	Value/remark
Protocol Discriminator	TS 24.007, 11.2.3.1.1
Skip indicator	TS 24.007, 11.2.3.1.2
Message type	01000101B

Contents of DEACTIVATE RB TEST MODE message:

Information Element	Value/remark
Protocol Discriminator	TS 24.007, 11.2.3.1.1
Skip indicator	TS 24.007, 11.2.3.1.2
Message type	01000110B

Contents of DEACTIVATE RB TEST MODE COMPLETE message:

Information Element	Value/remark
Protocol Discriminator	TS 24.007, 11.2.3.1.1
Skip indicator	TS 24.007, 11.2.3.1.2
Message type	01000111B

Contents of CLOSE UE TEST LOOP message:

Information Element	Value/remark
Protocol Discriminator	TS 24.007, 11.2.3.1.1
Skip indicator	TS 24.007, 11.2.3.1.2
Message type	01000000B
UE test loop mode	000000100B (X2=0 and X1=0 for UE test mode 1, Y1=0 DCCH dummy transmission disabled)
UE test loop mode 1 LB setup	
- Length of UE loop mode 1 LB setup IE	4 octets
- LB setup list	
- LB setup RAB subflow #1	
- Z13…Z0 (Uplink RLC SDU size in bits)	0…16383 (binary coded, Z13 most significant bit); value as negotiated

Contents of CLOSE UE TEST LOOP COMPLETE message:

Information Element	Value/remark
Protocol Discriminator	TS 24.007, 11.2.3.1.1
Skip indicator	TS 24.007, 11.2.3.1.2
Message type	01000001B

Contents of OPEN UE TEST LOOP message:

Information Element	Value/remark
IE Identifier (only in AM)	1000xxxx
Protocol Discriminator	TS 24.007, 11.2.3.1.1
Skip indicator	TS 24.007, 11.2.3.1.2
Message type	01000010B

Contents of OPEN UE TEST LOOP COMPLETE message:

Information Element	Value/remark
Protocol Discriminator	TS 24.007, 11.2.3.1.1
Skip indicator	TS 24.007, 11.2.3.1.2
Message type	01000011B

7.3.2 IP Header Compression and PID assignment

7.3.2.1 UE in RLC AM

7.3.2.1.1 Transmission of uncompressed Header

7.3.2.1.1.1 Definition and applicability

Applicable for all UEs supporting RLC AM and a Radio Bearer as described in the Common Test Sequences. The UE shall be capable to deal with TCP/IP and UDP/IP data packets with uncompressed IP header.

7.3.2.1.1.2 Conformance requirement

1. The Packet Data Convergence Protocol shall perform the following functions:

- transfer of user data. This function is used for conveyance of data between users of PDCP services.

2. Depending on the configuration by upper layers (i.e. PDCP PDU type to be used and header compressor protocol), the PDCP sublayer shall be able to:

- identify the correct header compression protocol; and
- distinguish different types of header compression packets within a header compression protocol.

The mapping of the PID values shall follow the general rules listed below:

- PID value "0" shall indicate "no compression". PID value "0" shall be used in a PDCP PDU containing in its Data field a PDCP SDU that is unchanged by the Sender and that shall not be decompressed by the Receiver;

Reference(s)

TS 25.323 clause 5.

TS 25.323 clause 5.1.1.

7.3.2.1.1.3 Test purpose

The test case consists of two test procedures:

The first test procedure verifies, that the "PDCP Data" PDU is used for uncompressed IP header packets, if no IP header compression is configured by higher layers. The second test procedure verifies, that the "PDCP No header" PDU is used for uncompressed IP header packets, if no IP header compression is configured by higher layers.

1. To verify, that the UE transmits and receives in acknowledged mode (RLC AM) TCP/IP and UDP/IP data packets without IP header compression as configured by higher layers.
2. To verify, that PID assignment rules are correctly applied, if usage of "PDCP Data" PDU are negotiated, i.e. the UE shall recognize PID value = 0 for a received TCP/IP and UDP/IP data packet and it shall use PID=0 to transmit IP data packets, if no IP header compression is negotiated. If usage of "PDCP No Header" PDU is negotiated, no PID assignment is used for transmitting and receiving TCP/IP and UDP/IP data packets.

7.3.2.1.1.4 Method of test

Initial conditions

UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108.

Test procedure 1: Usage of "PDCP Data" PDU and no IP header compression is configured.

Test procedure 2: No IP header compression is configured.

Related ICS/IXIT Statement(s)

Support of PS – Yes/No

PIXIT: Test_PDCP_TCP/IP_Packet1

PIXIT: Test_PDCP_UDP/IP_Packet1

Proc 1 Test procedure 1: Transmission of uncompressed IP header packets using PDCP Data PDU

a) The SS setups a packet switched session including radio bearer and UE test loop mode 1 in RLC AM using Common test procedures for mobile terminated PS switched sessions. Usage of "PDCP Data" PDU has been configured by higher layers.
b) The SS sends a TCP/IP data packet with uncompressed IP Header.
c) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PDCP PDU type and shall handle the received data packet with the appropriate decoding method. Then it forwards the data to its

Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration using PDCP Data PDU.

d) The SS receives and decodes the TCP/IP data packet. The decoded data packet shall be identical with the data as sent before.

e) Step b) to d) shall be repeated by using a UDP/IP data packet with uncompressed IP Header.

The SS deactivates the UE test loop mode and terminates the connection.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
Setup a UE terminated PS session using IP Header compression in AM RLC (using UE test loop mode 1)				
1	←		PDCP Data	The SS creates a TCP/IP packet without IP header compression (PDCP Data PDU). The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.

Step	Direction UE / SS	Message	Comments
2	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
3	←	PDCP Data	The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU). The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described UDP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU and recognizes with PID value = 0, there was no IP header compression applied for the UDP/IP packet. Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to the Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
4	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received UDP/IP packet After reception of this UDP/IP data packet, the SS decodes the received data
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)			

Specific Message Contents

RRC CONNECTION SETUP message

The contents of the RRC CONNECTION SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in AM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for AM) with the following exceptions:

Information Element	Value/remark
Capability update requirement - UE radio access capability update requirement	 TRUE NOTE: Value will be checked. Stated capability must be compatible with 34.123-2 (c.f. PICS/PIXIT statements in GSM) and the user settings

RADIO BEARER SETUP message

The contents of the RADIO BEARER SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in AM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for AM) which fits to the below described parameters with the following exceptions:

Information Element	Value/remark
RAB information for setup - RAB info - RAB identity	 No. # 23 as described in TS 34.108, Table 6.10.2.1.1 Prioritised RABs. QoS parameter: Traffic Class: Interactive or Background, max. UL: 64 kbps and max. DL: 64 kbps as described in TS 34.108, including described physical channel parameters, configuration for AM RLC Residual BER as described in TS 34.108, clause: 6.10 Related Signalling RB UL: 3.4 kbps, DL: 3.4 kbps DCCH, No. #2 (as described in TS 34.108)
- CN domain identity	PS domain
- RB information to setup	
- RB identity	20
- PDCP info	
- Support of lossless SRNS relocation	False (IE "Support of lossless SRNS relocation" only present, if RLC "In-sequence delivery" is TRUE and in AM)
- PDCP PDU header	present
- RLC info	
- Downlink RLC mode	(AM RLC)
- Uplink RLC mode	(AM RLC)

Content of PDCP Data PDU (Step 1)

Information Element	Value/remark
PDU type	000
PID	00000 (No header compression, PID = 0)
Data	PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

Content of PDCP Data PDU (Step 3)

Information Element	Value/remark
PDU type	000
PID	00000 (No header compression, PID = 0)
Data	PDCP test data type #2: UDP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

Proc 2: Test procedure 2: Transmission of uncompressed IP header packets using No Header PDU

a) The SS setups a packet switched session including radio bearer and UE test loop mode 1 in RLC AM using Common test procedures for mobile terminated PS switched sessions. Usage of "PDCP No Header" PDU has been configured by higher layers.

b) The SS sends a TCP/IP data packet with uncompressed IP Header.

c) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PDCP PDU type and shall handle the received data packet with the appropriate decoding method. Then it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration using PDCP No Header PDU.

d) The SS receives and decodes the TCP/IP data packet. The decoded data packet shall be identical with the data as sent before.

e) Step b) to d) shall be repeated by using a UDP/IP data packet with uncompressed IP Header.

f) The SS deactivates the UE test loop mode and terminates the connection.

Expected sequence

Step	Direction UE	SS	Message	Comments
Setup a UE terminated PS session using IP Header compression in AM RLC (using UE test loop mode 1)				
				The SS creates a TCP/IP packet without IP header compression (PDCP No Header PDU).
1	←		PDCP No Header	The SS sends a PDCP No Header PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: data: below described TCP/IP packet After having received the PDCP No Header PDU, the UE decodes the PDU and recognizes, there was no PID applied for the TCP/IP packet. Therefore, no IP header decompression shall be applied for this packet. Then, the data packet is forwarded via PDCP-SAP to the Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP No Header	The UE sends a PDCP No Header PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
				The SS creates a UDP/IP packet without IP header compression (PDCP No Header PDU).

Step	Direction UE | SS	Message	Comments
3	←	PDCP No Header	The SS sends a PDCP No Header PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: data: below described UDP/IP packet After having received the PDCP No Header PDU, the UE decodes the PDU and recognizes, there was no PID applied for the UDP/IP packet. Therefore, no IP header decompression shall be applied for this packet. Then, the data packet is forwarded via PDCP-SAP to the Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
4	→	PDCP No Header	The UE sends a PDCP No Header PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received UDP/IP packet After reception of this UDP/IP data packet, the SS decodes the received data
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1).			

Specific Message Contents

RRC CONNECTION SETUP message

The contents of the RRC CONNECTION SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in AM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for AM) with the following exceptions:

Information Element	Value/remark
Capability update requirement - UE radio access capability update requirement	 TRUE NOTE: Value will be checked. Stated capability must be compatible with 34.123-2 (c.f. PICS/PIXIT statements in GSM) and the user settings

RADIO BEARER SETUP message

The contents of the RADIO BEARER SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in AM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for AM) which fits to the below described parameters with the following exceptions:

Information Element	Value/remark
RAB information for setup - RAB info - RAB identity	 No. # 23 as described in TS 34.108, Table 6.10.2.1.1 Prioritised RABs. QoS parameter: Traffic Class: Interactive or Background, max. UL: 64 kbps and max. DL: 64 kbps as described in TS 34.108, including described physical channel parameters, configuration for AM RLC Residual BER as described in TS 34.108, clause: 6.10 Related Signalling RB UL: 3.4 kbps, DL: 3.4 kbps DCCH, No. #2 (as described in TS 34.108)
- CN domain identity	PS domain
- RB information to setup	
- RB identity	20
- PDCP info	
- Support of lossless SRNS relocation	False (IE "Support of lossless SRNS relocation" only present, if RLC "In-sequence delivery" is TRUE and in AM)
- PDCP PDU header	absent
- RLC info	
- Downlink RLC mode	(AM RLC)
- Uplink RLC mode	(AM RLC)

Content of PDCP No Header PDU (Step 1)

Information Element	Value/remark
Data	PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

Content of PDCP No Header PDU (Step 3)

Information Element	Value/remark
Data	PDCP test data type #2: UDP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

7.3.2.1.1.5 Test requirements

Test requirements 1 (Proc 1): Transmission of uncompressed IP header packets using PDCP Data PDU

> The UE shall return the TCP/IP and UDP/IP data packets as indication, that the previous packets have been received and handled correctly (PDCP Data PDU). This verifies, that the PDCP configuration on UE side works as negotiated by the RRC. An invalid PDU type as well as unconfigured PID values shall not be received by SS.

Test requirements 2 (Proc 1): Transmission of uncompressed IP header packets using PDCP No Header PDU (Proc 2)

> The UE shall return the TCP/IP and UDP/IP data packets as indication, that the previous packets have been received and handled correctly (PDCP No Header PDU). This verifies, that the PDCP configuration on UE side works as negotiated by the RRC. An invalid PDU type as well as unconfigured PID values shall not be received by SS.

7.3.2.1.2 Transmission of compressed Header

7.3.2.1.2.1 Definition and applicability

Applicable for all UEs supporting RLC AM and a Radio Bearer as described in the Common Test Sequences.

The UE shall be capable to deal with compressed TCP/IP and UDP/IP data packets and furthermore to establish a PDCP entity which applies IP header compression protocol RFC 2507.

7.3.2.1.2.2 Conformance requirement

1. The Packet Data Convergence Protocol shall perform the following functions:

   - transfer of user data. This function is used for conveyance of data between users of PDCP services.

2. Depending on the configuration by upper layers (i.e. PDCP PDU type to be used and header compressor protocol), the PDCP sublayer shall be able to:

   - identify the correct header compression protocol; and

   - distinguish different types of header compression packets within a header compression protocol.

Reference(s)

TS 25.323 clause 5.

TS 25.323 clause 5.1.1.

7.3.2.1.2.3 Test purpose

1. To verify, that the UE transmits and receives in acknowledged mode (RLC AM) TCP/IP and UDP/IP data packets by using IP header compression protocol as described in RFC2507 as configured by higher layers.
2. To verify, that the PID assignment rules are correctly applied by the UE. The UE as shall use the correct PID value for the applied optimisation method for transmitting and receiving TCP/IP and UDP/IP data packets.

7.3.2.1.2.4 Method of test

Initial conditions

UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108. Usage of "PDCP Data" PDU and IP header compression is configured.

Related ICS/IXIT Statement(s)

Support of IP header compression protocol RFC 2507 - YES/NO.

Support of PS – Yes/No

PIXIT: Test_PDCP_TCP/IP_Packet1

PIXIT: Test_PDCP_TCP/IP_Packet2

PIXIT: Test_PDCP_UDP/IP_Packet1

PIXIT: Test_PDCP_UDP/IP_Packet2

Test procedure

a) The SS setups a packet switched session including radio bearer and UE test loop mode 1 in RLC AM using Common test procedures for mobile terminated PS switched sessions. Usage of "PDCP Data" PDU has been configured by higher layers.

b) The SS sends a "normal" TCP/IP data packet (no compression packet type), PID=0.

c) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet with the correct decompression protocol. Then, it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration.

d) The SS receives and decodes the TCP/IP data packet according to the inserted PID. The decoded data packet shall be identical with the data as sent before.

e) The SS sends a TCP/IP data packet with packet type: Full_Header, PID=1.

NOTE: According to the compression protocol RFC 2507, this is necessary to transmit the created CONTEXT and the assigned CID.

f) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet with the correct decompression protocol. Then, it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration.

g) The SS receives and decodes the TCP/IP data packet according to the inserted PID. The decoded data packet shall be identical with the data as sent before.

h) The SS sends a TCP/IP data packet with packet type: Compressed_TCP, PID=2.

i) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet with the correct decompression protocol. Then, it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration.

j) The SS receives and decodes the TCP/IP data packet according to the inserted PID. The decoded data packet shall be identical with the data as sent before.

k) Step b) to d) is repeated for a "normal" UDP/IP data packet, PID=0.

l) Step e) to g) is repeated for a UDP/IP data packet with packet type: Full_Header, PID=1.

m) The SS sends a UDP/IP data packet with packet type: Compressed_non_TCP, PID=4.

n) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet with the correct decompression protocol. Then, it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration.

o) The SS receives and decodes the UDP/IP data packet according to the inserted PID. The decoded data packet shall be identical with the data as sent before.

p) The SS deactivates the UE tests loop mode 1 and terminates the connection.

Expected sequence

Step	Direction UE	Direction SS	Message	Comments
Setup a UE terminated PS session using IP Header compression in AM RLC (using UE test loop mode 1)				
				The SS creates a TCP/IP packet without IP header compression.
1	←		PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 to 3 data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
3	←		PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 1 (Full_Header packet type [TCP/IP]) data: below described TCP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU, recognizes PID value = 1 applied for this TCP/IP data packet and decompresses it with the appropriate method. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.

Step	Direction UE | SS	Message	Comments
4	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 to 3 data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
5	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 2 (Compressed_TCP packet type) data: below described TCP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU, recognizes PID value = 2 applied for this TCP/IP data packet and decompress it with the appropriate method. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
6	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 to 3 data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
7	←	PDCP Data	The SS creates a UDP/IP packet without compressed IP header compression. The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described UDP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU and recognizes with PID value = 0, there was no IP header compression applied for the UDP/IP packet. Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to the Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.

Step	Direction		Message	Comments
	UE	SS		
8	→		PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (Data PDU with Header) PID value = 0,1 or 4 (depending on which UDP/IP header format is used by the UE) data: previously received UDP/IP packet After reception of this UDP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.

Step	Direction UE | SS	Message	Comments
9	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 1 (Full_Header packet type) data: below described UDP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 1 applied for this UDP/IP data packet and decompress it with the appropriate method. The data packet is forwarded via PDCP-SAP to the Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
10	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (Data PDU with Header) PID value = 0,1 or 4 (depending on which UDP/IP header format is used by the UE) data: previously received UDP/IP packet After reception of this UDP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
11	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 4 (Compressed _non-TCP packet type) data: below described UDP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 4 applied for this UDP/IP data packet and decompress it with the appropriate method. The data packet is forwarded via PDCP-SAP to the Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
12	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (Data PDU with Header) PID value = 0,1 or 4 (depending on which UDP/IP header format is used by the UE) data: previously received UDP/IP packet After reception of this UDP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)			

Specific Message Contents

RRC CONNECTION SETUP message

The contents of the RRC CONNECTION SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in AM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for AM) with the following exceptions:

Information Element	Value/remark
Capability update requirement - UE radio access capability update requirement	 TRUE NOTE: Value will be checked. Stated capability must be compatible with 34.123-2 (c.f. PICS/PIXIT statements in GSM) and the user settings

RADIO BEARER SETUP message

The contents of the RADIO BEARER SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in AM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for AM) which fit to the here described parameters with the following exceptions:

Information Element	Value/remark
RAB information for setup	
- RAB info	
- RAB identity	No. # 23 as described in TS 34.108, Table 6.10.2.1.1 Prioritised RABs. QoS parameter: Traffic Class: Interactive or Background, max. UL: 64 kbps and max. DL: 64 kbps as described in TS 34.108, including described physical channel parameters, configuration for AM RLC Residual BER as described in TS 34.108, clause: 6.10 Related Signalling RB UL: 3.4 kbps, DL: 3.4 kbps DCCH, No. #2 (as described in TS 34.108)
- CN domain identity	PS domain
- RB information to setup	
- RB identity	20
- PDCP info	
- Support of lossless SRNS relocation	False (IE "Support of lossless SRNS relocation" only present, if RLC "In-sequence delivery" is TRUE and in AM)
- PDCP PDU header	present
- Header compression information	1
CHOICE *algorithm type*	
- RFC2507	
- F_MAX_PERIOD	256 (Default)
- F_MAX_TIME	5 (Default)
- MAX_HEADER	168 (Default)
- TCP_SPACE	15 (Default)
- NON_TCP_SPACE	15 (Default)
- EXPECT_REORDERING	reordering not expected (Default)
- RLC info	
- Downlink RLC mode	(AM RLC)
- Uplink RLC mode	(AM RLC)

Content of PDCP Data PDU (Step 1)

Information Element	Value/remark
PDU type PID Data	000 00000 (No header compression, PID = 0) PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

Content of PDCP Data PDU (Step 3)

Information Element	Value/remark
PDU type PID Data	000 00001 (Full_Header, PID = 1) PDCP test data type #1: TCP/IP data packet with full TCP/IP header with any data content. The data shall be limited to 1500 bytes.

Content of PDCP Data PDU (Step 5)

Information Element	Value/remark
PDU type PID Data	000 00010 (Compressed_TCP, PID = 2) PDCP test data type #1: TCP/IP data packet with a compressed header with any data content. The data shall be limited to 1500 bytes.

Content of PDCP Data PDU (Step 7)

Information Element	Value/remark
PDU type PID Data	000 00000 (No header compression, PID = 0) PDCP test data type #2: UDP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

Content of PDCP Data PDU (Step 9)

Information Element	Value/remark
PDU type PID Data	000 00001 (Full_Header, PID = 1) PDCP test data type #2: UDP/IP data packet with full UDP/IP header with any data content. The data shall be limited to 1500 bytes.

Content of PDCP Data PDU (Step 11)

Information Element	Value/remark
PDU type PID Data	000 00100 (Compressed_non-TCP, PID = 4) PDCP test data type #2: UDP/IP data packet with a compressed header with any data content. The data shall be limited to 1500 bytes.

7.3.2.1.2.5 Test requirements

The UE shall return the TCP/IP and UDP/IP data packets as indication, that the previous packets have been received and handled with the correct compression protocol. This verifies, that the PDCP configuration on UE side works as negotiated by the RRC. An invalid PDU type as well as unconfigured PID values shall not be received by SS.

7.3.2.2 UE in RLC UM

7.3.2.2.1 Transmission of uncompressed Header

7.3.2.2.1.1 Definition and applicability

Applicable for all UEs supporting RLC UM and a Radio Bearer as described in the Common Test Sequences.

The UE shall be capable to deal with TCP/IP and UDP/IP data packets with uncompressed IP header.

7.3.2.2.1.2 Conformance requirement

1. The Packet Data Convergence Protocol shall perform the following functions:
   - transfer of user data. This function is used for conveyance of data between users of PDCP services
2. Depending on the configuration by upper layers (i.e. PDCP PDU type to be used and header compressor protocol), the PDCP sublayer shall be able to:
   - identify the correct header compression protocol; and
   - distinguish different types of header compression packets within a header compression protocol.

The mapping of the PID values shall follow the general rules listed below:

- PID value "0" shall indicate "no compression". PID value "0" shall be used in a PDCP PDU containing in its Data field a PDCP SDU that is unchanged by the Sender and that shall not be decompressed by the Receiver;

Reference(s)

TS 25.323 clause 5.

TS 25.323 clause 5.1.1.

7.3.2.2.1.3 Test purpose

The test case consists of two test procedures:

The first test procedure verifies, that the "PDCP Data" PDU is used for uncompressed IP header packets, if no IP header compression is configured by higher layers. The second test procedure verifies, that the "PDCP No header" PDU is used for uncompressed IP header packets, if no IP header compression is configured by higher layers.

1. To verify, that the UE transmits and receives in unacknowledged mode (RLC UM) TCP/IP and UDP/IP data packets without IP header compression as configured by higher layers.
2. To verify, that PID assignment rules are correctly applied, if usage of "PDCP Data" PDU are negotiated, i.e. the UE shall recognize PID value = 0 for a received TCP/IP and UDP/IP data packet and it shall use PID=0 to transmit IP data packets, if no IP header compression is negotiated. If usage of "PDCP No Header" PDU is negotiated, no PID assignment is used for transmitting and receiving TCP/IP and UDP/IP data packets.

7.3.2.2.1.4 Method of test

Initial conditions

UE is in Idle mode.

Test procedure 1: Usage of "PDCP Data" PDU and no IP header compression is configured.

Test procedure 2: no IP header compression is configured.

Related ICS/IXIT Statement(s)

Support of PS – Yes/No

PIXIT: Test_PDCP_TCP/IP_Packet1

PIXIT: Test_PDCP_UDP/IP_Packet1

Proc 1: Test procedure 1: Transmission of uncompressed IP header packets using PDCP Data PDU

a) The SS setups a packet switched session including radio bearer and UE test loop mode 1 in RLC UM using Common test procedures for mobile terminated PS switched sessions. Usage of "PDCP Data" PDU has been configured by higher layers.

b) The SS sends a TCP/IP data packet with uncompressed IP Header.

c) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PDCP PDU type and shall handle the received data packet with the appropriate decoding method. Then it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration using PDCP Data PDU.

d) The SS receives and decodes the TCP/IP data packet. The decoded data packet shall be identical with the data as sent before.

e) Step b) to d) shall be repeated by using a UDP/IP data packet with uncompressed IP Header.

The SS deactivates the UE test loop mode and terminates the connection.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
Setup a UE terminated PS session using IP Header compression in UM RLC (using UE test loop mode 1)				
				The SS creates a TCP/IP packet without IP header compression (PDCP Data PDU).
1	←		PDCP Data	The SS sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet
				After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP Data	The UE sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
				The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU).

Step	Direction UE | SS	Message	Comments
3	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described UDP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU and recognizes with PID value = 0, there was no IP header compression applied for the UDP/IP packet. Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to the Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
4	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: data: previously received UDP/IP packet After reception of this UDP/IP data packet, the SS decodes the received data
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)			

Specific Message Contents

RRC CONNECTION SETUP message

The contents of the RRC CONNECTION SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in UM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for UM) with the following exceptions:

Information Element	Value/remark
Capability update requirement - UE radio access capability update requirement	 TRUE NOTE: Value will be checked. Stated capability must be compatible with 34.123-2 (c.f. PICS/PIXIT statements in GSM) and the user settings

RADIO BEARER SETUP message

The contents of the RADIO BEARER SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in UM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for UM) which fits to the below described parameters with the following exceptions:

Information Element	Value/remark
RAB information for setup - RAB info - RAB identity	 No. # 23 as described in TS 34.108, Table 6.10.2.1.1 Prioritised RABs. QoS parameter: Traffic Class: Interactive or Background, max. UL: 64 kbps and max. DL: 64 kbps as described in TS 34.108, including described physical channel parameters, configuration for UM RLC Residual BER as described in TS 34.108, clause: 6.10 Related Signalling RB UL: 3.4 kbps, DL: 3.4 kbps DCCH, No. #2 (as described in TS 34.108)
- CN domain identity	PS domain
- RB information to setup	
- RB identity	21
- PDCP info	
- PDCP PDU header	present
- RLC info	
- Downlink RLC mode	(UM RLC)

Content of PDCP Data PDU (Step 1)

Information Element	Value/remark
PDU type	000
PID	00000 (No header compression, PID = 0)
Data	PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

Content of PDCP Data PDU (Step 3)

Information Element	Value/remark
PDU type	000
PID	00000 (No header compression, PID = 0)
Data	PDCP test data type #2: UDP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

Proc 2: Test procedure 2: Transmission of uncompressed IP header packets using No Header PDU

a) The SS setups a packet switched session including radio bearer and UE test loop mode 1 in RLC UM using Common test procedures for mobile terminated PS switched sessions. Usage of "PDCP No Header" PDU has been configured by higher layers.

b) The SS sends a TCP/IP data packet with uncompressed IP Header.

c) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PDCP PDU type and shall handle the received data packet with the appropriate decoding method. Then it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration using PDCP No Header PDU.

d) The SS receives and decodes the TCP/IP data packet. The decoded data packet shall be identical with the data as sent before.

e) Step b) to d) shall be repeated by using a UDP/IP data packet with uncompressed IP Header.

f) The SS deactivates the Loop back test mode and terminates the connection.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
Setup a UE terminated PS session using IP Header compression in UM RLC (using UE test loop mode 1)				
				The SS creates a TCP/IP packet without IP header compression (PDCP No Header PDU).
1	←		PDCP No Header	The SS sends a PDCP No Header PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: data: below described TCP/IP packet
				After having received the PDCP No Header PDU, the UE decodes the PDU and recognizes, there was no PID applied for the TCP/IP packet. Therefore, no IP header decompression shall be applied for this packet. Then, the data packet is forwarded via PDCP-SAP to the Radio Bearer Loop Back (RB LB) entity.
				The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP No Header	The UE sends a PDCP No Header PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet
				After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
				The SS creates a UDP/IP packet without IP header compression (PDCP No Header PDU).

Step	Direction		Message	Comments
	UE	SS		
3	←		PDCP No Header	The SS sends a PDCP No Header PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: data: below described UDP/IP packet
				After having received the PDCP No Header PDU, the UE decodes the PDU and recognizes, there was no PID applied for the UDP/IP packet. Therefore, no IP header decompression shall be applied for this packet. Then, the data packet is forwarded via PDCP-SAP to the Radio Bearer Loop Back (RB LB) entity.
				The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
4	→		PDCP No Header	The UE sends a PDCP No Header PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: data: previously received UDP/IP packet
				After reception of this UDP/IP data packet, the SS decodes the received data
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)				

Specific Message Contents

RRC CONNECTION SETUP message

The contents of the RRC CONNECTION SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in UM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for UM) with the following exceptions:

Information Element	Value/remark
Capability update requirement - UE radio access capability update requirement	 TRUE NOTE: Value will be checked. Stated capability must be compatible with 34.123-2 (c.f. PICS/PIXIT statements in GSM) and the user settings

RADIO BEARER SETUP message

The contents of the RADIO BEARER SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in UM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for UM) which fits to the below described parameters with the following exceptions:

Information Element	Value/remark
RAB information for setup - RAB info - RAB identity	 No. # 23 as described in TS 34.108, Table 6.10.2.1.1 Prioritised RABs. QoS parameter: Traffic Class: Interactive or Background, max. UL: 64 kbps and max. DL: 64 kbps as described in TS 34.108, including described physical channel parameters, configuration for UM RLC Residual BER as described in TS 34.108, clause: 6.10 Related Signalling RB UL: 3.4 kbps, DL: 3.4 kbps DCCH, No. #2 (as described in TS 34.108)
- CN domain identity	PS domain
- RB information to setup	
- RB identity	21
- PDCP info	False
- PDCP PDU header	absent
- RLC info	
- Downlink RLC mode	(UM RLC)
- Uplink RLC mode	(UM RLC)

Content of PDCP No Header PDU (Step 1)

Information Element	Value/remark
Data	PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

Content of PDCP No Header PDU (Step 3)

Information Element	Value/remark
Data	PDCP test data type #2: UDP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

7.3.2.2.1.5 Test requirements

Test requirements 1 (Proc 1): Transmission of uncompressed IP header packets using PDCP Data PDU

The UE shall return the TCP/IP and UDP/IP data packets as indication, that the previous packets have been received and handled correctly (PDCP Data PDU). This verifies, that the PDCP configuration on UE side works as negotiated by the RRC. An invalid PDU type as well as unconfigured PID values shall not be received by SS.

Test requirements 2 (Proc 2): Transmission of uncompressed IP header packets using PDCP No Header PDU

The UE shall return the TCP/IP and UDP/IP data packets as indication, that the previous packets have been received and handled correctly (PDCP No Header PDU). This verifies, that the PDCP configuration on UE side works as negotiated by the RRC. An invalid PDU type as well as unconfigured PID values shall not be received by SS.

7.3.2.2.2 Transmission of compressed Header

7.3.2.2.2.1 Definition and applicability

Applicable for all UEs supporting RLC UM and a Radio Bearer as described in the Common Test Sequences.

The UE shall be capable to deal with compressed TCP/IP and UDP/IP data packets and furthermore to establish a PDCP entity which applies IP header compression protocol RFC 2507.

7.3.2.2.2.2 Conformance requirement

1. The Packet Data Convergence Protocol shall perform the following functions:
   - transfer of user data. This function is used for conveyance of data between users of PDCP services.
2. Depending on the configuration by upper layers (i.e. PDCP PDU type to be used and header compressor protocol), the PDCP sublayer shall be able to:
   - identify the correct header compression protocol; and
   - distinguish different types of header compression packets within a header compression protocol.

Reference(s)

TS 25.323 clause 5.

TS 25.323 clause 5.1.1.

7.3.2.2.2.3 Test purpose

1. To verify, that the UE transmits and receives in unacknowledged mode (RLC UM) TCP/IP and UDP/IP data packets by using IP header compression protocol as described in RFC2507 as configured by higher layers.
2. To verify, that the PID assignment rules are correctly applied by the UE. The UE as shall use the correct PID value for the applied optimisation method for transmitting and receiving TCP/IP and UDP/IP data packets.

7.3.2.2.2.4 Method of test

Initial conditions

UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108. Usage of "PDCP Data" PDU and no IP header compression is configured.

Related ICS/IXIT Statement(s)

Support of IP header compression protocol RFC 2507 - YES/NO

Support of PS – Yes/No

PIXIT: Test_PDCP_TCP/IP_Packet1

PIXIT: Test_PDCP_TCP/IP_Packet2

PIXIT: Test_PDCP_UDP/IP_Packet1

PIXIT: Test_PDCP_UDP/IP_Packet2

Test procedure

a) The SS setups a packet switched session including radio bearer and UE test loop mode 1 in RLC UM using Common test procedures for mobile terminated PS switched sessions. Usage of "PDCP Data" PDU has been configured by higher layers.

b) The SS sends a "normal" TCP/IP data packet (no compression packet type), PID=0.

c) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet with the correct decompression protocol. Then, it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration.

d) The SS receives and decodes the TCP/IP data packet according to the inserted PID. The decoded data packet shall be identical with the data as sent before.

e) The SS sends a TCP/IP data packet with packet type: Full_Header, PID=1.

NOTE: According to the compression protocol RFC 2507, this is necessary to transmit the created CONTEXT and the assigned CID.

f) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet with the correct decompression protocol. Then, it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration.

g) The SS receives and decodes the TCP/IP data packet according to the inserted PID. The decoded data packet shall be identical with the data as sent before.

h) The SS sends a TCP/IP data packet with packet type: Compressed_TCP, PID=2.

i) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet with the correct decompression protocol. Then, it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration.

j) The SS receives and decodes the TCP/IP data packet according to the inserted PID. The decoded data packet shall be identical with the data as sent before.

k) Step b) to d) is repeated for a "normal" UDP/IP data packet, PID=0.

l) Step e) to g) is repeated for a UDP/IP data packet with packet type: Full_Header, PID=1.

m) The SS sends a UDP/IP data packet with packet type: Compressed_non_TCP, PID=4.

n) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet with the correct decompression protocol. Then, it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration.

o) The SS receives and decodes the UDP/IP data packet according to the inserted PID. The decoded data packet shall be identical with the data as sent before.

p) The SS deactivates the UE test loop test mode and terminates the connection.

Expected sequence

Step	Direction UE	Direction SS	Message	Comments
Setup a UE terminated PS session using IP Header compression in UM RLC (using UE test loop mode 1)				
				The SS creates a TCP/IP packet without IP header compression.
1	←		PDCP Data	The SS sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP Data	The UE sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 to 3 data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
3	←		PDCP Data	The SS sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 1 (Full_Header packet type [TCP/IP]) data: below described TCP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU, recognizes PID value = 1 applied for this TCP/IP data packet and decompresses it with the appropriate method. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity.

Step	Direction UE / SS	Message	Comments
			The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
4	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 to 3 data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
5	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 2 (Compressed_TCP packet type) data: below described TCP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU, recognizes PID value = 2 applied for this TCP/IP data packet and decompress it with the appropriate method. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
6	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 to 3 data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
			The SS creates a UDP/IP packet without compressed IP header compression.
7	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described UDP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU and recognizes with PID value = 0, there was no IP header compression applied for the UDP/IP packet. Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to the Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.

Step	Direction UE | SS	Message	Comments
8	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (Data PDU with Header) PID value = 0,1 or 4 (depending on which UDP/IP header format is used by the UE) data: previously received UDP/IP packet After reception of this UDP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
9	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 1 (Full_Header packet type) data: below described UDP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 1 applied for this UDP/IP data packet and decompress it with the appropriate method. The data packet is forwarded via PDCP-SAP to the Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
10	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (Data PDU with Header) PID value = 0,1 or 4 (depending on which UDP/IP header format is used by the UE) data: below described UDP/IP packet After reception of this UDP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
11	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 4 (Compressed _non-TCP packet type) data: below described UDP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 1 applied for this UDP/IP data packet and decompress it with the appropriate method. The data packet is forwarded via PDCP-SAP to the Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.

Step	Direction UE / SS	Message	Comments
12	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (Data PDU with Header) PID value = 0,1 or 4 (depending on which UDP/IP header format is used by the UE) data: previously received UDP/IP packet After reception of this UDP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)			

Specific Message Contents

RRC CONNECTION SETUP message

The contents of the RRC CONNECTION SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in UM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for UM) with the following exceptions:

Information Element	Value/remark
Capability update requirement - UE radio access capability update requirement	 TRUE NOTE: Value will be checked. Stated capability must be compatible with 34.123-2 (c.f. PICS/PIXIT statements in GSM) and the user settings

RADIO BEARER SETUP message

The contents of the RADIO BEARER SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in UM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for UM) which fit to the here described parameters with the following exceptions:

Information Element	Value/remark
RAB information for setup	
- RAB info	
- RAB identity	No. # 23 as described in TS 34.108, Table 6.10.2.1.1 Prioritised RABs. QoS parameter: Traffic Class: Interactive or Background, max. UL: 64 kbps and max. DL: 64 kbps as described in TS 34.108, including described physical channel parameters, configuration for UM RLC Residual BER as described in TS 34.108, clause: 6.10 Related Signalling RB UL: 3.4 kbps, DL: 3.4 kbps DCCH, No. #2 (as described in TS 34.108)
- CN domain identity	PS domain
- RB information to setup	
- RB identity	21
- PDCP info	
	False
- PDCP PDU header	present
- Header compression information	1
CHOICE *algorithm type*	
- RFC2507	
- F_MAX_PERIOD	256 (Default)
- F_MAX_TIME	5 (Default)
- MAX_HEADER	168 (Default)
- TCP_SPACE	15 (Default)
- NON_TCP_SPACE	15 (Default)
- EXPECT_REORDERING	reordering not expected (Default)
- RLC info	
- Downlink RLC mode	(UM RLC)
- Uplink RLC mode	(UM RLC)

Content of PDCP Data PDU (Step 1)

Information Element	Value/remark
PDU type	000
PID	00000 (No header compression, PID = 0)
Data	PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

Content of PDCP Data PDU (Step 3)

Information Element	Value/remark
PDU type	000
PID	00001 (Full_Header, PID = 1)
Data	PDCP test data type #1: TCP/IP data packet with full TCP/IP header with any data content. The data shall be limited to 1500 bytes.

Content of PDCP Data PDU (Step 5)

Information Element	Value/remark
PDU type	000
PID	00010 (Compressed_TCP, PID = 2)
Data	PDCP test data type #1: TCP/IP data packet with a compressed header with any data content. The data shall be limited to 1500 bytes.

Content of PDCP Data PDU (Step 7)

Information Element	Value/remark
PDU type	000
PID	00000 (No header compression, PID = 0)
Data	PDCP test data type #2: UDP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

Content of PDCP Data PDU (Step 9)

Information Element	Value/remark
PDU type	000
PID	00001 (Full_Header, PID = 1)
Data	PDCP test data type #2: UDP/IP data packet with full UDP/IP header with any data content. The data shall be limited to 1500 bytes.

Content of PDCP Data PDU (Step 11)

Information Element	Value/remark
PDU type	000
PID	00100 (Compressed_non-TCP, PID = 4)
Data	PDCP test data type #2: UDP/IP data packet with a compressed header with any data content. The data shall be limited to 1500 bytes.

7.3.2.2.2.5 Test requirements

The UE shall return the TCP/IP and UDP/IP data packets as indication, that the previous packets have been received and handled with the correct compression method. This verifies, that the PDCP configuration on UE side works as negotiated by the RRC. An invalid PDU type as well as unconfigured PID values shall not be received by SS.

7.3.2.2.3 Extension of used compression methods

7.3.2.2.3.1 Definition and applicability

Applicable for all UEs supporting RLC UM and a Radio Bearer as described in the Common Test Sequences.

The UE shall be capable to deal with compressed TCP/IP data packets and furthermore to establish a PDCP entity which applies IP header compression protocol: RFC 2507.

7.3.2.2.3.2 Conformance requirement

1. The Packet Data Convergence Protocol shall perform the following functions:

   - transfer of user data. Transmission of user data means that PDCP receives PDCP SDU from the NAS and forwards it to the RLC layer and vice versa;

2. Depending on the configuration by upper layers (i.e. PDCP PDU type to be used and header compressor protocol), the PDCP sublayer shall be able to:

   - identify the correct header compression protocol; and

- distinguish different types of header compression packets within a header compression protocol.

3. The mapping of the PID values shall follow the general rules listed below:

   - PID values are re-mapped for the PDCP entity after any reconfiguration of the header compression protocols for that entity.

Reference(s)

TS 25.323 clause 5.

TS 25.323 clause 5.1

TS 25.323 clause 5.1.1.

7.3.2.2.3.3 Test purpose

1. To verify, that the UE is able to handle an extended PID value allocation table by header compression protocol IETF RFC 2507 after PDCP reconfiguration as configured by RRC.

7.3.2.2.3.4 Method of test

Initial conditions

UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108. Usage of "PDCP Data" PDU and no IP header compression is configured.

Related ICS/IXIT Statement(s)

Support of IP header compression protocol RFC 2507 - YES/NO

Support of PS – Yes/No

PIXIT: Test_PDCP_TCP/IP_Packet1

PIXIT: Test_PDCP_TCP/IP_Packet2

Test procedure

a) The SS setups a packet switched session including radio bearer and UE test loop mode 1 in RLC UM using Common test procedures for mobile terminated PS switched sessions (with the UE test loop mode 1). Usage of "PDCP Data PDU" and no optimisation method has been configured by higher layers.

b) The SS sends a TCP/IP data packet (no compression packet type), PID=0.

c) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet correctly. Afterwards it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration.

d) The SS receives and decodes the TCP/IP data packet according to the inserted PID. The decoded data packet shall be identical with the data as sent before.

e) The SS reconfigures (using RRC Radio Bearer Reconfiguration message) the PDCP entity by extending the PID value allocation table and therefore the applied optimisation method with the IP header compression protocol RFC 2507. The UE test loop mode 1 in RLC UM is still active.

f) The SS sends a TCP/IP data packet (no compression packet type), PID=0.

g) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet correctly. Afterwards it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration.

h) The SS receives and decodes the TCP/IP data packet according to the inserted PID. The decoded data packet shall be identical with the data as sent before.

i) The SS sends a TCP/IP data packet with packet type: Full_Header, PID=1.

j) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet correctly. Afterwards it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration.

k) The SS receives and decodes the TCP/IP data packet according to the inserted PID. The decoded data packet shall be identical with the data as sent before.

l) The SS deactivates the UE test loop mode and terminates the connection.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
Setup a UE terminated PS session using IP Header compression in UM RLC (using UE test loop mode 1)				
1	←		PDCP Data	The SS creates a TCP/IP packet without IP header compression. The SS sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression shall be applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP Data	The UE sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
3	←		RRC RADIO BEARER RECONFIGURATION	SS extends the "PID value allocation table" with IP header compression PID (RFC 2507) in the UE.
4	→		RRC RADIO BEARER RECONFIGURATION COMPLETE	UE acknowledges its new settings
5	←		PDCP Data	The SS sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (normal packet type [TCP/IP]) data: below described TCP/IP packet. After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression shall be applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.

Step	Direction UE / SS	Message	Comments
6	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 to 3 data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
7	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 1 (Full_Header packet type [TCP/IP]) data: below described TCP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 1 applied for this TCP/IP data packet and shall decompress it with the appropriate method. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
8	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 to 3 data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)			

Specific Message Contents

RRC RADIO BEARER RECONFIGURATION message

The contents of the RRC RADIO BEARER RECONFIGURATION message applied in the preamble "Setup a UE terminated PS session using IP Header compression in UM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for UM) with the following exceptions:

Information Element	Value/remark
RB information to reconfigure list	1
RB information to reconfigure	
- PDCP info	
- PDCP PDU header	present
- Header compression information	1
CHOICE *algorithm type*	
- RFC2507	
- F_MAX_PERIOD	256 (Default)
- F_MAX_TIME	5 (Default)
- MAX_HEADER	168 (Default)
- TCP_SPACE	15 (Default)
- NON_TCP_SPACE	15 (Default)
- EXPECT_REORDERING	reordering not expected (Default)

RRC CONNECTION SETUP message

The contents of the RRC CONNECTION SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in UM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for UM) with the following exceptions:

Information Element	Value/remark
Capability update requirement - UE radio access capability update requirement	 TRUE NOTE: Value will be checked. Stated capability must be compatible with 34.123-2 (c.f. PICS/PIXIT statements in GSM) and the user settings

RADIO BEARER SETUP message

The contents of the RADIO BEARER SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in UM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for UM) which fit to the here described parameters with the following exceptions:

Information Element	Value/remark
RAB information for setup	
- RAB info	
- RAB identity	No. # 23 as described in TS 34.108, Table 6.10.2.1.1 Prioritised RABs. QoS parameter: Traffic Class: Interactive or Background, max. UL: 64 kbps and max. DL: 64 kbps as described in TS 34.108, including described physical channel parameters, configuration for UM RLC Residual BER as described in TS 34.108, clause: 6.10 Related Signalling RB UL: 3.4 kbps, DL: 3.4 kbps DCCH, No. #2 (as described in TS 34.108)
- CN domain identity	PS domain
- RB information to setup	
- RB identity	21
- PDCP info	
- PDCP PDU header	present
- RLC info	
- Downlink RLC mode	(UM RLC)
- Uplink RLC mode	(UM RLC)

Content of PDCP Data PDU (Step 1 and 5)

Information Element	Value/remark
PDU type	000
PID	00000 (No header compression, PID = 0)
Data	PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

Content of PDCP Data PDU (Step 7)

Information Element	Value/remark
PDU type	000
PID	00001 (Full_Header, PID = 1)
Data	PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

7.3.2.2.3.5 Test requirements

After PDCP reconfiguration, the UE shall return the TCP/IP data packets as indication, that the extension of used optimisation method are applied by UE. This verifies, that the PDCP configuration on UE side works as negotiated by the RRC. An invalid PDU type as well as unconfigured PID values shall not be received by SS.

7.3.2.2.4 Compression type used for different entities

7.3.2.2.4.1 Definition and applicability

Applicable only for an UE supporting the establishment of more than one PDCP entity in parallel, i.e. it shall be possible to configure more than one Radio Bearer Loop Back entities (each PDCP entity are assigned via PDCP-SAP to its own Radio Bearer Loop Back entity).

Applicable for all UEs supporting two Radio Bearers in RLC UM and RLC AM as described in this test case, clause 7.3.2.2.4.6 Combined PDCP Acknowledged and Unacknowledged mode configuration.

The UE shall be capable to deal with compressed TCP/IP data packets and furthermore it shall apply IP header compression protocol RFC 2507.

7.3.2.2.4.2 Conformance requirement

1. The Packet Data Convergence Protocol shall perform the following functions:

- transfer of user data. This function is used for conveyance of data between users of PDCP services.

2. Depending on the configuration by upper layers (i.e. PDCP PDU type to be used and header compressor protocol), the PDCP sublayer shall be able to:

   - identify the correct header compression protocol; and

   - distinguish different types of header compression packets within a header compression protocol.

3. The mapping of the PID values shall follow the general rules listed below:

   - PID values shall be mapped to the different packet types independently at each PDCP entity;

Several PDCP entities may be defined for a UE with each using the same or different protocol type. In this version of the specification, only one header compression protocol type, RFC 2507 [6], is supported.

Reference(s)

TS 25.323 clause 5.

TS 25.323 clause 5.1.1.

TS 25.323 clause 4.2.

7.3.2.2.4.3 Test purpose

1. To verify, that a configured IP header compression protocol are applied to compress and decompress TCP/IP data packets by several PDCP entities in parallel, if more than one entities are established, i.e. the UE uses the same PID to transmit two TCP/IP data packets with the same content in parallel using two Radio Bearer configurations.

7.3.2.2.4.4 Method of test

NOTE: For this test case, the SS shall be configured to handle more than one received PDCP messages.

Initial conditions

UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108. Usage of "PDCP Data" PDU and IP header compression is configured for both PDCP entities.

Related ICS/IXIT Statement(s)

Establishment of more than one PDCP entities - YES/NO.

Support of IP header compression protocol RFC 2507 - YES/NO

Support of UM RB and AM RB

Support of PS – Yes/No

IXIT: Test_PDCP_TCP/IP_Packet1

IXIT: Test_PDCP_TCP/IP_Packet2

Test procedure

a) The SS setups a packet switched session including two radio bearer configurations in parallel in UE test loop mode 1 and in RLC UM and RLC UM using Common test procedures for mobile terminated PS switched sessions. Usage of IP header compression protocol RFC 2507 has been configured by higher layers.

b) The SS sends two successive "normal" TCP/IP data packet, PID=0 via both PDCP configurations to their peer entities.

c) After having received the TCP/IP data packets, the PDCP entities of the UE shall recognize the PID value and shall handle the received data packet independent of the used PID with the correct decompression method. Then they forward the data to their Radio Bearer Loop Back entity. Both received data shall be returned by each Radio Bearer Loop Back entity.

d) The SS receives and decodes TCP/IP data packets according to the inserted PID. The decoded data packets shall be identical with the data as sent before.

e) The SS sends two successive TCP/IP data packets with full header (PID=1) via both PDCP configurations to their peer entities.

f) After having received the TCP/IP data packets, the PDCP entities of the UE shall recognize the PID value and shall handle the received data packets independent of the used PID with the correct decompression method. Then they forward the data to their Radio Bearer Loop Back entity. Both received data shall be returned by each Radio Bearer Loop Back entity.

g) The SS receives and decodes TCP/IP data packets according to the inserted PID. The decoded data packets shall be identical with the data as sent before.

h) The SS deactivates the UE test loop mode and terminates the connection.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
Setup a UE terminated PS session using IP Header compression in UM RLC (using UE test loop mode 1)				
1	←		PDCP Data	The SS sends two successive PDCP Data PDUs using the RLC-UM-Data-Request Primitive via both PDCP entities with the following contents to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet After having received both PDCP Data PDUs, the UE decodes each PDU and recognizes PID value = 0 (no IP header compression applied for both TCP/IP data packets). Although the same PID is used for both PDUs, the UE shall handle they with the correct method and it forwards both data packets via PDCP-SAPs to their Radio Bearer Loop Back (RB LB) entities. The RB LB entities in UE test loop mode 1 return the received data packets and send they back to their PDCP entities.

Step	Direction UE / SS	Message	Comments
2	→	PDCP Data	The UE sends back for each PDCP configuration a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 to 3 data: previously received TCP/IP packet After reception of TCP/IP data packets, the SS applies the appropriate decoding function for both received messages depending on which PID was assigned to the received data
3	←	PDCP Data	The SS sends two successive PDCP Data PDUs using the RLC-UM-Data-Request Primitive via both PDCP entities with the following contents to the UE: PDU type = 000 (PDCP Data PDU) PID = 1 (Full_Header packet type [TCP/IP]) data: below described TCP/IP packet After having received both PDCP Data PDUs, the UE decodes each PDU and recognizes PID value = 1 (Full_Header packet type applied for both TCP/IP data packets). Although the same PID is used for both PDUs, the UE shall handle they with the correct method and it forwards both data packets via PDCP-SAPs to their Radio Bearer Loop Back (RB LB) entities. The RB LB entities in UE test loop mode 1 return the received data packets and send they back to their PDCP entities.
4	→	PDCP Data	The UE sends back for each PDCP configuration a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 to 3 data: previously received TCP/IP packet After reception of TCP/IP data packets, the SS applies the appropriate decoding function for both received messages depending on which PID was assigned to the received data
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)			

Specific Message Contents

RRC CONNECTION SETUP message

The contents of the RRC CONNECTION SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in UM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for UM) with the following exceptions:

Information Element	Value/remark
Capability update requirement - UE radio access capability update requirement	 TRUE NOTE: Value will be checked. Stated capability must be compatible with 34.123-2 (c.f. PICS/PIXIT statements in GSM) and the user settings

RADIO BEARER SETUP message

The contents of the RADIO BEARER SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in UM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for UM) which fit to the here described parameters with the following exceptions:

Information Element	Value/remark
RAB information for setup	
- RAB info	
- RAB identity	No. # 23 as described in TS 34.108, Table 6.10.2.1.1 Prioritised RABs. QoS parameter: Traffic Class: Interactive or Background, max. UL: 64 kbps and max. DL: 64 kbps as described in TS 34.108, including described physical channel parameters, configuration for UM RLC configuration for UM RLC Residual BER as described in TS 34.108, clause: 6.10 Related Signalling RB UL: 3.4 kbps, DL: 3.4 kbps DCCH, No. #2 (as described in TS 34.108)
- CN domain identity	PS domain
- RB information to setup	
- RB identity	20
- PDCP info	
- PDCP PDU header	present
- Header compression information	1
CHOICE *algorithm type*	
- RFC2507	
- F_MAX_PERIOD	256 (Default)
- F_MAX_TIME	5 (Default)
- MAX_HEADER	168 (Default)
- TCP_SPACE	15 (Default)
- NON_TCP_SPACE	15 (Default)
- EXPECT_REORDERING	reordering not expected (Default)
- RLC info	
- Downlink RLC mode	(AM RLC)
- Uplink RLC mode	(AM RLC)
- RB information to setup	(NOTE: for RB ID 21, the same RAB configurations are used (No. # 23 as described in TS 34.108) as described for RB ID 20)
- RB identity	21
- PDCP info	
- PDCP PDU header	present
- Header compression information	1
CHOICE *algorithm type*	
- RFC2507	
- F_MAX_PERIOD	256 (Default)
- F_MAX_TIME	5 (Default)
- MAX_HEADER	168 (Default)
- TCP_SPACE	15 (Default)
- NON_TCP_SPACE	15 (Default)
- EXPECT_REORDERING	reordering not expected (Default)
- RLC info	
- Downlink RLC mode	(UM RLC)
- Uplink RLC mode	(UM RLC)

Content of both PDCP Data PDU (Step 1)

Information Element	Value/remark
PDU type PID Data	000 00000 (No header compression, PID = 0) PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

Content of both PDCP Data PDU (Step 3)

Information Element	Value/remark
PDU type PID Data	000 00001 (Full_Header, PID = 1) PDCP test data type #1: TCP/IP data packet with full TCP/IP header compression with any data content. The data shall be limited to 1500 bytes.

7.3.2.2.4.5 Test requirements

The UE shall return both TCP/IP data packets as indication that the previous received data packets associated with the same PID value are handled in parallel with the same decompression protocol. This verifies, that more than one PDCP configuration on UE side using the same compression protocol is able to apply it in parallel. An invalid PDU type as well as unconfigured PID values shall not be received by SS.

7.3.2.2.4.6 Combined PDCP Acknowledged and Unacknowledged mode configuration

This configuration is based on the interactive or background / UL:64 DL 64 kbps / PS RAB. The SRB configurations are UL:3.4 DL:3.4 kbps for DCCH aligned to this combined RABs are described for SRB DL 3.4 kbps in TS 34.108, clause 6.10.2.4.1.2.2 and for SRB DL 3.4 kbps in TS 34.108, clause 6.10.2.4.1.2.1. The TFCS refer to TS34.108, clause 6.10.2.4.1.24.1.1.3 for UL and clause 6.10.2.4.1.25.2.1.3 for DL, the Physical channel parameters refer to TS 34.108, clause 6.10.2.4.1.24.1.2 for UL clause 6.10.2.4.1.25.2.2 and for DL accordingly. The configuration is applied to PDCP test cases using both the acknowledged and unacknowledged mode.

Table 7.3.2.2.4/1: Uplink Transport channel parameter for combined RABs PS AM_UM

Higher layer	RAB/Signalling RB		RAB #20	RAB #21
RLC	Logical channel type		DTCH	DTCH
	RLC mode		AM	UM
	Payload sizes, bit		316	324
	Max data rate, bps		63200	64800
	TrD PDU header, bit		16	8
MAC	MAC header, bit		4	
	MAC multiplexing		2 logical channel multiplexing	
Layer 1	TrCH type		DCH	
	TB sizes, bit		336	
	TFS	TF0, bits	0x336	
		TF1, bits	1x336	
		TF2, bits	2x336	
		TF3, bits	3x336	
		TF4, bits	4x336	
	TTI, ms		20	
	Coding type		TC	
	CRC, bit		16	
	Max number of bits/TTI after channel coding		4236	
	Uplink: Max number of bits/radio frame before rate matching		2118	
	RM attribute		130-170	

Table 7.3.2.2.4/2: Downlink Transport channel parameter for combined RABs PS AM_UM

Higher layer	RAB/Signalling RB		RAB #20	RAB #21
RLC	Logical channel type		DTCH	DTCH
	RLC mode		AM	UM
	Payload sizes, bit		316	324
	Max data rate, bps		63200	64800
	TrD PDU header, bit		16	8
MAC	MAC header, bit		4	
	MAC multiplexing		2 logical channel multiplexing	
Layer 1	TrCH type		DCH	
	TB sizes, bit		336	
	TFS	TF0, bits	0x336	
		TF1, bits	1x336	
		TF2, bits	2x336	
		TF3, bits	3x336	
		TF4, bits	4x336	
	TTI, ms		20	
	Coding type		TC	
	CRC, bit		16	
	Max number of bits/TTI after channel coding		4236	
	RM attribute		130-170	

7.3.2.2.5 Reception of not defined PID values

7.3.2.2.5.1 Definition and applicability

Applicable for all UEs supporting RLC UM and a Radio Bearer as described in the Common Test Sequences.

The UE shall be capable to deal with compressed TCP/IP data packets and furthermore to establish a PDCP entity, which applies PDCP Data PDU if no IP header compression protocol, is negotiated.

The UE shall not forward invalid PDCP PDU data contents to its Radio Bearer.

7.3.2.2.5.2 Conformance requirement

1. Depending on the configuration by upper layers (i.e. PDCP PDU type to be used and header compressor protocol), the PDCP sublayer shall be able to:

   - identify the correct header compression protocol; and

   - distinguish different types of header compression packets within a header compression protocol.

2. If a PDCP entity receives a PDCP PDU with a PID value that is not mapped with a valid packet type (see TS 25.323 subclause 5.1.1), it shall:

   - discard the PDCP PDU.

Reference(s)

TS 25.323 clause 5.1.1.

TS 25.323 clause 9.2.

7.3.2.2.5.3 Test purpose

1. To verify, that a UE considers a received PDCP PDU message with not defined PID value as invalid, i.e. such an invalid PDCP PDU is not forwarded to the Radio Bearer entity on UE side. Therefore the UE using test loop mode 1 does not return such data packet to the SS.

7.3.2.2.5.4 Method of test

Initial conditions

UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108. Usage of "PDCP Data" PDU and no IP header compression is configured.

Related ICS/IXIT Statement(s)

Support of IP header compression protocol RFC 2507 - YES/NO

Support of PS – Yes/No

IXIT: Test_PDCP_TCP/IP_Packet1

IXIT: Test_PDCP_TCP/IP_Packet2

Test procedure

a) The SS setups a packet switched session including radio bearer and UE test loop mode 1 in RLC UM using Common test procedures for mobile terminated PS switched sessions. Usage of "PDCP Data PDU" and no PDCP IP header compression protocol has been configured by higher layers.

b) The SS sends a "normal" TCP/IP data packet (no compression packet type), PID=0.

c) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet with the correct decoding method. Afterwards it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration.

d) The SS receives and decodes TCP/IP data packets according to the inserted PID. The decoded data packets shall be identical with the data as sent before.

e) The SS sends a TCP/IP data packet with PID=1. See note 1.

f) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet with the correct decoding method.

g) The SS waits an amount of time to make sure, that no returned data packet was sent by UE.

h) The SS deactivates the UE test loop mode and terminates the connection.

NOTE 1 As no PDCP IP header compression protocol has been configured only PID=0 shall be recognised by the UE and PID=1 shall be considered as invalid PID value by the UE).

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
Setup a UE terminated PS session using IP Header compression in UM RLC (using UE test loop mode 1)				
1	←		PDCP Data	The SS sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression shall be applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP Data	The UE sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
3	←		PDCP Data	The SS sends a PDCP Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 1 (Full_Header packet type [TCP/IP]) data: below described TCP/IP packet. After having received the PDCP Data PDU, the UE shall recognize, that a not defined PID value (as configured by higher layers) is inserted in the PDCP PDU. The UE shall consider this PDU as invalid, i.e. the data packet is not forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. Therefore this data packet is not returned to the SS.
4				The SS waits a amount of time to make sure, that the previously sent data packet is not returned to the SS.
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)				

Specific Message Contents

RRC CONNECTION SETUP message

The contents of the RRC CONNECTION SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in UM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for UM) with the following exceptions:

Information Element	Value/remark
Capability update requirement - UE radio access capability update requirement	 TRUE NOTE: Value will be checked. Stated capability must be compatible with 34.123-2 (c.f. PICS/PIXIT statements in GSM) and the user settings

RADIO BEARER SETUP message

The contents of the RADIO BEARER SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in UM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for UM) which fit to the here described parameters with the following exceptions:

Information Element	Value/remark
RAB information for setup	
- RAB info	
- RAB identity	No. # 23 as described in TS 34.108, Table 6.10.2.1.1 Prioritised RABs. QoS parameter: Traffic Class: Interactive or Background, max. UL: 64 kbps and max. DL: 64 kbps as described in TS 34.108, including described physical channel parameters, configuration for UM RLC Residual BER as described in TS 34.108, clause: 6.10 Related Signalling RB UL: 3.4 kbps, DL: 3.4 kbps DCCH, No. #2 (as described in TS 34.108)
- CN domain identity	PS domain
- RB information to setup	
- RB identity	21
- PDCP info	
- PDCP PDU header	present
- RLC info	
- Downlink RLC mode	(UM RLC)
- Uplink RLC mode	(UM RLC)

Content of PDCP Data PDU (Step 1)

Information Element	Value/remark
PDU type	000
PID	00000 (No header compression, PID = 0)
Data	PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes

Content of PDCP Data PDU (Step 3)

Information Element	Value/remark
PDU type	000
PID	00001 (Invalid PID value, PID = 1)
Data	PDCP test data type #1: TCP/IP data packet with full TCP/IP header compression with any data content. The data shall be limited to 1500 bytes.

7.3.2.2.5.5 Test requirements

The UE shall return the received TCP/IP data packet using the PDCP Data PDU with PID = 0.

The UE shall not return the TCP/IP data packet using the PDCP Data PDU with PID = 1.

7.3.3 PDCP sequence numbering when lossless SRNS Relocation

7.3.3.1 Data transmission if lossless SRNS Relocation is supported

7.3.3.1.1 Definition and applicability

Applicable for all UEs supporting RLC AM, RLC in-sequence delivery, a Radio Bearer as described in the Common Test Sequences and lossless SRNS relocation.

The UE shall be capable to deal with uncompressed TCP/IP data packets and furthermore to establish a PDCP entity which applies PDCP Sequence Numbering

7.3.3.1.2 Conformance requirement

1. PDCP sequence numbering shall be applied when lossless SRNS Relocation is supported. PDCP Sequence Numbers serve to acknowledge previously transmitted PDCP SDUs prior to relocation.

2. In case of a lossless SRNS Relocation procedure:

   - the UTRAN should send to the UE the next expected UL_Receive PDCP SN; and

   - the UE shall send to the UTRAN the next expected DL_Receive PDCP SN.

This information exchange synchronises the Sequence Numbers at the UE and UTRAN PDCP entities.

Reference(s)

TS 25.323 clause 5.4.1.1

TS 25.323 clause 5.4.1.3.

7.3.3.1.3 Test purpose

1. To verify, that a UE supporting lossless SRNS relocation is able to receive and to send IP data packets by using PDCP Sequence Numbering as configured by higher layers.

7.3.3.1.4 Method of test

Initial conditions

SS: 2 cells - Cell A belonging to the valid SRNS (Source SRNS), Cell B belonging to the DRNS (Target SRNS). Both cells are neighbour cells. Cell A has a higher RF power level than Cell B such that an UE shall find Cell A more suitable for service.

UE: It is in Idle mode and has selected cell A with valid SRNS (Source SRNS). Usage of "PDCP Data" PDU, PDCP SeqNum PDU and no IP header compression is configured.

Related ICS/IXIT Statement(s)

Support of lossless SRNS Relocation - YES/NO

Support of PS – Yes/No

IXIT: Test_PDCP_TCP/IP_Packet1

IXIT: Test_PDCP_TCP/IP_Packet2

Test procedure

a) The SS setups a packet switched session including Radio Bearer and UE test loop mode 1 in RLC AM and in-sequence delivery using Common test procedures for mobile terminated PS switched sessions in Cell A. The RLC buffer discharge mode shall be set to "no discard". Usage of "PDCP Data" PDU, support of lossless SRNS relocation and no IP header compression has been configured by higher layers. The PDCP SN window size has been negotiated by RRC.

b) The SS sends a TCP/IP data packet (no compression packet type), PID=0.

c) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet correctly. Afterwards it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration.

d) The SS receives and decodes the TCP/IP data packet according to the inserted PID. The decoded data packet shall be identical with the data as sent before.

e) The SS starts to broadcast BCCH messages on the primary CPICH in cell B with a power level higher than in cell A. The UE shall chose cell B to be more suitable for service and hence perform a cell reselection.

f) After completion of cell reselection, the UE transmits a CELL UPDATE message to the SS on the uplink CCCH of cell B with the Cell update cause "Cell Reselection".

g) The SS sends a TCP/IP data packet (no compression packet type), PID=0. The PDCP Data PDU is used during lossless SRNS relocation procedure.

h) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet correctly. Afterwards it forwards the data to its Radio Bearer Loop Back entity. The UE shall increase its internal Sequence Number counter by 1.The received data shall be returned by the UE via its PDCP configuration using PDCP SeqNum PDU.

i) The SS receives and decodes the TCP/IP data packet according to the inserted PID. The decoded data packet shall be identical with the data as sent before.

j) After having performed SRNS relocation (target RNC allocated with new S-RNTI for the UE), the Target SRNS is the valid SRNS and the SS sends a "CELL UPDATE CONFIRM" message with new RNC_ID to indicate the completion of the cell update.

k) The UE shall confirm the reallocation.

l) The SS sends the next TCP/IP data packet (no compression packet type), PID=0 using the PDCP SeqNum PDU to the UE.

m) After having received the TCP/IP data packet, the UE shall recognize the PID value and shall handle the received data packet correctly. Afterwards it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration.

n) The SS receives and decodes TCP/IP data packets according to the inserted PID. The decoded data packets shall be identical with the data as sent before.

o) The SS deactivates the UE test loop mode and terminates the connection.

Expected sequence

Step	Direction UE	Direction SS	Message	Comments
Setup a UE terminated PS session using IP Header compression in AM RLC (using UE test loop mode 1) in Cell A				
1	←		PDCP Data	The SS creates a TCP/IP packet without IP header compression. The DL_Send PDCP SN is set to "0". The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet Afterwards the SS increments its counter value DL_Send PDCP SN by "1". After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression shall be applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
3				The SS increases the RF power level of cell B and decreases the power level of Cell A such that the UE finds cell B more suitable for service.
4				The UE cell reselection is performed and Cell B are selected for service.
5	→		RRC CELL UPDATE	Then, the UE shall inform the SS about the new cell selection by sending cell update with new parameters (parameter values as used in RRC testing).

Step	Direction UE / SS	Message	Comments
6	←	PDCP Data	The SS sends a PDCP Data PDU with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet Afterwards the SS increments its counter value DL_Send PDCP SN by "1". The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
7	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
8	←	RRC CELL UPDATE CONFIRM	After having performed SRNS relocation, the Target SRNS is the valid SRNS and the SS sends a "CELL UPDATE CONFIRM" message See message content.
9	→	UTRAN MOBILITY INFORMATION CONFIRM	The UE confirms the newly received information.
10	←	PDCP SeqNum	The SS sends the next PDCP SeqNum PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) SeqNum = current PDCP Sequence Number data: below described TCP/IP packet Afterwards the SS increments its counter value DL_Send PDCP SN by "1". After having received the PDCP SeqNum PDU, the UE shall set the received PDCP Sequence Number as its own valid value. It decodes the PDU, recognizes PID value = 0 applied for this TCP/IP data packet and shall decompress it with the appropriate method. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The SN synchronisation shall be considered as successfully performed after acknowledgement of SeqNum PDU transmission by lower layer in the SS. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
11	→	PDCP SeqNum	The UE sends a PDCP SeqNum PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 SeqNum = current PDCP Sequence Number data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)			

Specific Message Contents

RRC CONNECTION SETUP message

The contents of the RRC CONNECTION SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in AM RLC" of this test case are identical to those of the Default Message Contents for Signalling in TS 34.108 clause 9.1 (”UM (Transition to CELL_FACH)”) with the following exceptions:

Information Element	Value/remark
Capability update requirement - UE radio access capability update requirement	 TRUE NOTE: Value will be checked. Stated capability must be compatible with 34.123-2 (c.f. PICS/PIXIT statements in GSM) and the user settings

RADIO BEARER SETUP message

The contents of the RADIO BEARER SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in AM RLC" of this test case are identical to those of the Default Message Contents for Signalling in TS 34.108 clause 9.1 ”AM (Packet to CELL_FACH from CELL_FACH in PS”) with the following exceptions:

Information Element	Value/remark
RAB information for setup - RAB info - RB information to setup - RB identity - PDCP info - Support of lossless SRNS relocation - Max PDCP SN window size - PDCP PDU header - CHOICE RLC info type - CHOICE Uplink RLC mode - Transmission RLC Discard - CHOICE SDU Discard Mode - CHOICE Downlink RLC mode - In-sequence delivery Downlink counter synchronisation info - RB with PDCP information - RB identity - PDCP SN info	 20 True 65535 Present RLC info AM RLC No discard Note: Default value as defined in TS 34.108, Clause 9.1 AM RLC True Note: Default value as defined in TS 34.108, Clause 9.1 20 1 (Note: next expected Sequence Number)

Content of PDCP Data PDU (Step 1)

Information Element	Value/remark
PDU type PID Data	000 00000 (No header compression, PID = 0) PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

Content of PDCP SeqNum PDU (Step 6)

Information Element	Value/remark
PDU type PID Sequence number Data	001 00000 (No header compression, PID = 0) (16 Bit value) valid Sequence Number of the SS PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

CELL UPDATE CONFIRM (Step 8)

Use the message sub-type in default message content defined in Annex A, with the following exceptions.

Information Element	Value/Remarks
New U-RNTI	New value of U-RNTI different from the previous U-RNTI
Receive PDCP sequence number	IE is set to the value to be counted inside SS as next expected reception Sequence Number

UTRAN MOBILITY INFORMATION CONFIRM (Step 9)

Only the message type is checked.

Content of PDCP Data PDU (Step 10)

Information Element	Value/remark
PDU type PID Data	000 00000 (No header compression, PID = 0) PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

7.3.3.1.5 Test requirements

After having completed lossless SRNS relocation, the UE shall return the received TCP/IP data packet by using PDCP SeqNum PDUs as indication, that it supports lossless SRNS relocation. This verifies, that Sequence Numbering is used for lossless SRNS relocation. An invalid PDU type as well as unconfigured PID values shall not be received by SS.

7.3.3.2 Synchronisation of PDCP sequence numbers

7.3.3.2.1 Definition and applicability

Applicable for all UEs supporting RLC AM, RLC in-sequence delivery, a Radio Bearer as described in the Common Test Sequences.

The UE shall be capable to deal with compressed TCP/IP and UDP/IP data packets and furthermore it shall be capable to use IP Header compression protocol RFC 2507.

7.3.3.2.2 Conformance requirement

The PDCP SeqNum PDU shall be sent by the peer PDCP entities when synchronisation of the PDCP SN is required. (...) Synchronisation of PDCP SN is required after (...) RB reconfiguration.

1. In case of a lossless SRNS Relocation procedure:

   - the UTRAN should send to the UE the next expected UL_Receive PDCP SN; and

   - the UE shall send to the UTRAN the next expected DL_Receive PDCP SN.

This information exchange synchronises the Sequence Numbers at the UE and UTRAN PDCP entities.

2. For radio bearers that are configured to support lossless SRNS Relocation, the PDCP entity shall:

- if upper layer indicates to a PDCP entity that it should synchronise the PDCP SN following a RLC reset or RB reconfiguration; or
- if the UE/UTRAN PDCP entity receives an invalid "next expected UL/DL_Receive PDCP SN" from upper layer after Relocation:
  - trigger the PDCP SN synchronisation procedure by submitting one PDCP SeqNum PDU to lower layer;
- consider that the synchronisation procedure is complete on confirmation by lower layer of the successful transmission of the PDCP SeqNum PDU.

Reference(s)

TS 25.323 clause 5.4.1.3

TS 25.323 clause 5.4.1.2

7.3.3.2.3 Test purpose

1. To verify, that the UE supporting lossless SRNS relocation as configured by higher layers is able to handle the "PDCP SeqNum" PDU to synchronize the used PDCP Sequence Number after reconfiguration of the Radio Bearer.

7.3.3.2.4 Method of test

Initial conditions

SS: 2 cells - Cell A belonging to the valid SRNS (Source SRNS), Cell B belonging to the DRNS (Target SRNS). Both cells are neighbour cells. Cell A has a higher RF power level than Cell B such that an UE shall find Cell A more suitable for service.

UE: It is in Idle mode and has selected cell A with valid SRNS (Source SRNS). Usage of "PDCP Data" PDU, "PDCP SeqNum" PDU and no IP header compression is configured.

Related ICS/IXIT Statement(s)

Support of lossless SRNS relocation - YES/NO

Support of RLC in-sequence delivery - YES/NO

Test procedure

a) The SS setups a packet switched session including Radio Bearer and UE test loop mode 1 in RLC AM and in-sequence delivery using Common test procedures for mobile terminated PS switched sessions in Cell A. The RLC buffer discharge mode shall be set to "no discard". Usage of "PDCP Data" PDU and "PDCP SeqNum" PDU, support of lossless SRNS relocation and no IP header compression has been configured by higher layers. The PDCP SN window size has been negotiated by RRC.
b) The SS sends a TCP/IP data packet (no compression packet type), PID=0.
c) After having received the TCP/IP data packet, the PDCP entity of the UE shall recognize the PID value and shall handle the received data packet correctly. Afterwards it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration.
d) The SS receives and decodes the TCP/IP data packet according to the inserted PID. The decoded data packet shall be identical with the data as sent before.
e) The SS reconfigures (using RRC Radio Bearer Reconfiguration message) the PDCP entity by extending the PID value allocation table and therefore the applied optimisation method with the IP header compression protocol RFC 2507. The UE test loop mode 1 in RLC AM is still active.
f) The SS sends the next TCP/IP data packet (no compression packet type), PID=0 using the "PDCP SeqNum" PDU including the current PDCP Sequence Number value to the UE.
g) After having received the TCP/IP data packet, the UE shall recognize the PID value and shall handle the received data packet correctly. Afterwards it forwards the data to its Radio Bearer Loop Back entity. The

received data shall be returned by the UE by using PDCP "SeqNum" PDU including its DL_Receive PDCP SN via its PDCP configuration.

h) The SS receives and decodes TCP/IP data packets according to the inserted PID. The decoded data packets shall be identical with the data as sent before.

i) The SS deactivates the UE test loop mode and terminates the connection.

Expected sequence

Step	Direction UE	Direction SS	Message	Comments
Setup a UE terminated PS session using IP Header compression in AM RLC (using UE test loop mode 1) in Cell A				
1	←		PDCP Data	The SS creates a TCP/IP packet without IP header compression. The DL_Send PDCP SN is set to "0". The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet Afterwards the SS increments its counter value DL_Send PDCP SN by "1". After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression shall be applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: PDU type = 000 (PDCP Data PDU) PID value = 0 data: previously received TCP/IP packet After reception of this TCP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
3	←		RRC RADIO BEARER RECONFIGURATION	SS extends the "PID value allocation table" with IP header compression PID (RFC 2507) in the UE.
4	→		RRC RADIO BEARER RECONFIGURATION COMPLETE	UE acknowledges its new settings

Step	Direction UE | SS	Message	Comments
5	←	PDCP SeqNum	The SS sends a PDCP SeqNum PDU including its current Sequence Number with the following content to the UE: PDU type = 001 (PDCP SeqNum PDU) PID = 0 (normal packet type [TCP/IP]) SeqNum = current PDCP Sequence Number data: below described TCP/IP packet Afterwards the SS increments its counter value DL_Send PDCP SN by "1". After having received the PDCP SeqNum PDU, the UE shall set the received PDCP Sequence Number as its own valid value. It decodes the PDU, recognizes PID value = 0 applied for this TCP/IP data packet and shall decompress it with the appropriate method. The UE shall set the value of DL_Receive PDCP SN to the value as received from SS. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The SN synchronisation shall be considered as successfully performed after acknowledgement of SeqNum PDU transmission by lower layer in the SS. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
6	→	PDCP PDU	The UE sends a PDCP PDU with PDCP Header back to the SS. The content is as follows: PDU type = 000 (PDCP Data PDU) PID value = 0 to 3 SeqNum: current UE value, (optional parameter, depending on PDU used) data: previously received TCP/IP packet. After reception of this TCP/IP data packet, the SS applies the appropriate decoding function depending on the assigned PID.
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)			

Specific Message Contents

RRC RADIO BEARER RECONFIGURATION message

The contents of the RRC RADIO BEARER RECONFIGURATION message applied in the preamble "Setup a UE terminated PS session using IP Header compression in AM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for AM) with the following exceptions:

Information Element	Value/remark
RB information to reconfigure list RB information to reconfigure - PDCP info - Max PDCP SN window size - Support of lossless SRNS relocation - PDCP PDU header - Header compression information CHOICE *algorithm type* - RFC2507 - F_MAX_PERIOD - F_MAX_TIME - MAX_HEADER - TCP_SPACE - NON_TCP_SPACE - EXPECT_REORDERING	1 65535 TRUE present 1 256 (Default) 5 (Default) 168 (Default) 15 (Default) 15 (Default) reordering not expected (Default)
Receive PDCP sequence number	IE is set to the value to be counted inside SS as next expected reception Sequence Number
U-RNTI	New value of U-RNTI different from the previous U-RNTI

RRC CONNECTION SETUP message

The contents of the RRC CONNECTION SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in AM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for AM) with the following exceptions:

Information Element	Value/remark
Capability update requirement - UE radio access capability update requirement	 TRUE NOTE: Value will be checked. Stated capability must be compatible with 34.123-2 (c.f. PICS/PIXIT statements in GSM) and the user settings

RADIO BEARER SETUP message

The contents of the RADIO BEARER SETUP message applied in the preamble "Setup a UE terminated PS session using IP Header compression in AM RLC" of this test case is identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (PS connection for AM) which fit to the here described parameters with the following exceptions:

Information Element	Value/remark
- Downlink counter synchronisation info	
- RB with PDCP information list	
- RB identity	20
- PDCP SN info	1 (Note: next expected Sequence Number)
- RAB information for setup	
- RAB info	
- RAB identity	No. # 23 as described in TS 34.108, Table 6.10.2.1.1 Prioritised RABs. QoS parameter: Traffic Class: Interactive or Background, max. UL: 64 kbps and max. DL: 64 kbps as described in TS 34.108, including described physical channel parameters, configuration for AM RLC Residual BER as described in TS 24.108, clause: 6.10 Related Signalling RB UL: 3.4 kbps, DL: 3.4 kbps DCCH, No. #2 (as described in TS 34.108)
- CN domain identity	PS domain
- RB information to setup	
- RB identity	20
- PDCP info	
- Max PDCP SN window size	65535
- Support of lossless SRNS relocation	TRUE
- PDCP PDU header	present
- RLC info	
- Downlink RLC mode	(AM RLC)
- In-sequence delivery	True
- Uplink RLC mode	(AM RLC)
- Transmission RLC Discard	No Discard Note: Default value defined in TS 34.108, Annex B

Content of PDCP Data PDU (Step 1)

Information Element	Value/remark
PDU type	000
PID	00000 (No header compression, PID = 0)
Data	PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

Content of PDCP SeqNum PDU (Step 5)

Information Element	Value/remark
PDU type	001
PID	00000 (No header compression, PID = 0)
Sequence number	(16 Bit value) valid Sequence Number of the SS
Data	PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

7.3.3.2.5 Test requirements

After having received the TCP/IP data packet conveyed with the "PDCP SeqNum" PDU, the UE shall return the TCP/IP data packets as indication, that the UE is able to handle a Sequence Number synchronisation. An invalid PDU type as well as unconfigured PID values shall not be received by SS.

7.3.3.3 PDCP Sequence Numbering and Data Forwarding - Reception of reserved PDU type

FFS

7.3.3.4 PDCP Sequence Number synchronization – Reception of invalid next expected receive Sequence Number

FFS

7.3.3.5 UTRAN MOBILITY INFORMATION: Lossless SRNS relocation in CELL_FACH (without pending of ciphering)

7.3.3.5.1 Definition

7.3.3.5.2 Conformance requirement

To initiate the procedure UTRAN transmits a UTRAN MOBILITY INFORMATION message to the UE on the downlink DCCH using AM or UM RLC. In case of SRNS relocation, the message is sent using UM RLC only.

When the UE receives a UTRAN MOBILITY INFORMATION message, it shall:

1> if the variable PDCP_SN_INFO is non-empty:

2> include the IE "RB with PDCP information list" in the UTRAN MOBILITY INFORMATION CONFIRM message and set it to the value of the variable PDCP_SN_INFO.

1> if the received UTRAN MOBILITY INFORMATION message included the IE "Downlink counter synchronisation info":

2> re-establish RB2;

2> set the new uplink and downlink HFN component of COUNT-C of RB2 to MAX(uplink HFN component of COUNT-C of RB2, downlink HFN component of COUNT-C of RB2);

2> increment by one the downlink and uplink values of the HFN component of COUNT-C for RB2;

2> calculate the START value according to TS 25.331 subclause 8.5.9;

2> include the calculated START values for each CN domain in the IE "START list" in the IE "Uplink counter synchronisation info" in the UTRAN MOBILITY INFORMATION CONFIRM message.

1> transmit a UTRAN MOBILITY INFORMATION CONFIRM message on the uplink DCCH using AM RLC;

1> if the IE "Downlink counter synchronisation info" was included in the received UTRAN MOBILITY INFORMATION message:

2> when RLC has confirmed the successful transmission of the response message:

3> re-establish all AM and UM RLC entities with RB identities larger than 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the corresponding CN domain;

3> re-establish the RLC entities with RB identities 1, 3 and 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the CN domain stored in the variable LATEST_CONFIGURED_CN_DOMAIN;

3> set the remaining bits of the HFN component of the COUNT-C values of all UM RLC entities to zero;

3> re-initialise the PDCP header compression entities of each radio bearer in the variable ESTABLISHED_RABS.

1> if the variable PDCP_SN_INFO is non-empty:

2> when RLC has confirmed the successful transmission of the UTRAN MOBILITY INFORMATION CONFIRM message:

3> for each radio bearer in the variable PDCP_SN_INFO:

4> if the IE "RB started" in the variable ESTABLISHED_RABS is set to "started":

5> configure the RLC entity for that radio bearer to "continue".

3> clear the variable PDCP_SN_INFO.

Reference

3GPP TS 25.331 clause 8.3.3

7.3.3.5.3 Test purpose

1. To confirm that the UE that support lossless SRNS relocation, sends the correct expected downlink PDCP sequence number to SS after a successful SRNS relocation.
2. To confirm that the UE sends calculated START values for each CN domain to SS after a successful SRNS relocation.
3. In the case that ciphering is applied by the network, to confirm that the UE applies the new ciphering algorithm following a successful SRNS relocation.

7.3.3.5.4 Method of test

Initial Condition

System Simulator: 1 cell.

UE: PS-DCCH _FACH (state 6-8) as specified in clause 7.4 of TS 34.108.

Initial conditions message sequence

Step	Direction		Message	Comment
	UE	SS		
SS executes procedure Activate closed loop mode 1 in CELL_FACH case as specified-in clause 7.3.1.2.1.4				

Related ICS/IXIT statements

- Lossless SRNS relocation supported yes/no
- Support of RLC in-sequence delivery Yes/No

Specific Message Contents

If network applies ciphering, the contents of SECURITY MODE COMMAND message in the initial condition set-up are identical to the same message sub-type found in [9] TS 34.108 clause 9, with the following exceptions:

Information Element	Value/remark
Ciphering mode info	
- Ciphering mode command	Start/restart
- Ciphering algorithm	UEA0
- Ciphering activation time for DPCH	Not Present
- Radio bearer downlink ciphering activation time info	
- Radio bearer activation time	
- RB identity	1
- RLC sequence number	Current RLC SN+2
- RB identity	2
- RLC sequence number	Current RLC SN+2
- RB identity	3
- RLC sequence number	Current RLC SN + 2
- RB identity	4
- RLC sequence number	Current RLC SN + 2

The contents of RADIO BEARER SETUP message to be transmitted during P14 as specified in TS 34.108 clause 7.4, use the message titled "Packet to CELL_FACH from CELL_FACH in PS" as found in TS 34.108 clause 9, with the following exception.

Information Element	Value/remark
- PDCP info	
- Support for lossless SRNS relocation	TRUE
- Max PDCP SN window size	sn65535
- PDCP PDU header	present

Test Procedure

The UE is in the CELL_FACH state. If PS RAB has been established in the initial condition, SS initiates UE to enter loopback mode 1 and sends a PDCP PDU on the RAB. If ciphering is supported, a PDCP PDUs has to be decided so that the ciphering activation time is elapsed. SS shall suspend the sending of PDCP PDUs and wait for the last PDCP PDU to be send back by the UE and then note the next PDCP SN for the next PDCP PDU. SS then transmits a UTRAN MOBILITY INFORMATION message, which includes a valid IE "New C-RNTI" and "New U-RNTI", IE "Downlink counter synchronisation info" and IE "Integrity protection mode info", to the UE on the downlink DCCH using UM RLC. SS verifies that the UE sends UTRAN MOBILITY INFORMATION CONFIRM message. This message also includes a calculated new START value according to the formula "$START_X' = MSB_{20}$ (MAX {COUNT-C, COUNT-I | radio bearers and signalling radio bearers using the most recently configured CK_X and IK_X}) + 2", calculated IE "Integrity Check Info" using a new FRESH value as included in IE "Integrity protection initialisation number" in IE "Integrity protection mode info" in UTRAN MOBILITY INFORMATION message and COUNT-I that includes subsequent HFN as used in the old integrity protection configuration, and "Receive PDCP sequence number".

SS transmits UE CAPABILITY ENQUIRY message on the downlink DCCH using RLC-AM. The UE shall respond to downlink message with a UE CAPABILITY INFORMATION message on the uplink DCCH using RLC-AM. SS responds with UE CAPABILITY INFORMATION CONFIRM message. SS resumes the transmission of PDCP PDUs and checks that all transmitted PDCP PDUs are sent back by the UE.

Expected sequence

Step	Direction UE	SS	Message	Comment
				The SS creates a TCP/IP packet without IP header compression (PDCP Data PDU).
1	←		PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet
1a				After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity.
1b				The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet
2a				After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
2b				The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU).
2c				SS shall suspend the sending of PDCP PDUs and wait for the last PDCP PDU to be sent back by the UE and then note the next PDCP SN for the next PDCP PDU.

3	←	UTRAN MOBILITY INFORMATION	If IE "Ciphering mode info" is present in the SECURITY MODE COMMAND during initial condition set-up, this message is sent after last ciphering activation time has elapsed and there is no pending ciphering activation time. New U-RNTI identities are assigned to the UE. IE "Downlink counter synchronisation info" includes the next PCDP sequence number that SS is expected to receive from the UE, otherwise only IE "Downlink counter synchronisation info" is included. New integrity protection configuration is applied on DL SRB1.
4	→	UTRAN MOBILITY INFORMATION CONFIRM	New calculated START value is included, IE "Receive PDCP sequence number" shall be included. New integrity protection configuration is applied on UL SRB2. If IE "Ciphering mode info" is present in step 3, new ciphering configuration is applied on UL SRB2 with the downlink and uplink values of the HFN component of COUNT-C for SRB2 incremented by one.
5	←	UE CAPABILITY ENQUIRY	New integrity protection configuration is applied on DL SRB2. If IE "Ciphering mode info" is present in step 3, new ciphering configuration is applied on DL SRB2 with the same START value as used in step 4.
6	→	UE CAPABILITY INFORMATION	SS confirms that new integrity protection configuration is applied on SRB2 by UE.
7	←	UE CAPABILITY INFORMATION CONFIRM	
8		Void	
9		Void	
			The SS creates a TCP/IP packet without IP header compression (PDCP Data PDU).
10	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet
11			After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity.

12			The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
13	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet
14			After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
15			The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU).
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)			

Specific Message Contents

UTRAN MOBILITY INFORMATION (Step 3)

Use the same message sub-type found in TS 34.108, clause 9, with the following exceptions:

Information Element	Value/remark
Ciphering mode info	If network does not apply ciphering, set this IE to “Not present”. If network applies ciphering, this IE present with the values of the sub IEs as stated below.
- Ciphering mode command	Start/restart
- Ciphering algorithm	UEA1
- Ciphering activation time for DPCH	Not Present
- Radio bearer downlink ciphering activation time info	
- Radio bearer activation time	
- RB identity	1
- RLC sequence number	Current RLC SN+2
- RB identity	2
- RLC sequence number	Current RLC SN+2
- RB identity	3
- RLC sequence number	Current RLC SN+2
- RB identity	4
- RLC sequence number	Current RLC SN+2
- RB identity	20
- RLC sequence number	Current RLC SN+2
Integrity protection mode info - Integrity protection mode command - Downlink integrity protection activation info - Integrity protection algorithm - Integrity protection initialisation number	 Start Not Present UIA1 SS selects an arbitrary 32 bits number for FRESH
New U-RNTI - SRNC Identity - S-RNTI New C-RNTI CN Information info - PLMN identity - CN common GSM-MAP NAS system information - GSM-MAP NAS system information - CN domain related information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information - CN domain specific DRX cycle length coefficient - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information - CN domain specific DRX cycle length coefficient Downlink counter synchronisation info - RB with PDCP information list - RB with PDCP information - RB identity - PDCP SN info	 An arbitrary 12-bits string which is different from original SRNC An arbitrary 20-bits string which is different from original S-RNTI Not Present Not present 00 01H PS 05 00H 7 CS 1E 01H 7 This IE is included 20 The next PCDP sequence number that SS is expected to receive from the UE

UTRAN MOBILITY INFORMATION CONFIRM for PS only UE (Step 4)

The same message sub-type found in TS 34.108, clause 9 shall be transmitted by the UE on the uplink DCCH with the following exceptions:

Information Element	Value/remark
Uplink counter synchronisation info	
- RB with PDCP information list	This IE is checked
- RB with PDCP information	
- RB identity	20
- PDCP SN info	Check that the PCDP sequence number is the next sequence number that SS would transmit to the UE. (X)
- START list	Check that this IE is correct value

Content of PDCP Data PDUs used for entire test case

Information Element	Value/remark
PDU type	000
PID	00000 (No header compression, PID = 0)
Data	PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

UE CAPABILITY ENQUIRY (Step 5)

Use the same message sub-type found in [9] TS 34.108 clause 9.

UE CAPABILITY INFORMATION (Step 6)

Check that the UE uses the same message sub-type found in TS 34.108 clause 9.

UE CAPABILITY INFORMATION CONFIRM (Step 7)

Use the same message sub-type found in [9] TS 34.108 clause 9.

7.3.3.5.5 Test requirement

After step 1, UE shall transmit back all the PDCP PDUs sent by the SS to the UE.

After step 3, the UE shall transmit a UTRAN MOBILITY INFORMATION CONFIRM message on the uplink DCCH using AM RLC which includes which includes a calculated new START value according to the formula "$START_X$' = MSB_{20} (MAX {COUNT-C, COUNT-I | radio bearers and signalling radio bearers using the most recently configured CK_X and IK_X}) + 2", calculated IE "Integrity Check Info" using the new FRESH value as included in IE "Integrity protection initialisation number" in IE "Integrity protection mode info" in UTRAN MOBILITY INFORMATION message and COUNT-I that includes subsequent HFN as used in the old integrity protection configuration. This message shall also include IE "Receive PDCP sequence number" for RB#20. .

After step 5, the UE shall respond with a UE CAPABILITY INFORMATION message to SS and apply new ciphering configuration on UL SRB3.

After step 8, the UE shall respond with a IDENTITY RESPONSE message to SS

After step 9, UE shall start transmission on the RAB beginning with the PDCP SN equal to that included in the UTRAN MOBILITY INFORMATION CONFIRM message.

7.3.3.6 Cell Update: Lossless SRNS relocation in CELL_FACH (without pending of ciphering)

7.3.3.6.1 Definition

7.3.3.6.2 Conformance requirement

When the UTRAN receives a CELL UPDATE message, the UTRAN should:

1> in case the procedure was triggered by reception of a CELL UPDATE:

2> if SRNS relocation was performed:

3> transmit a CELL UPDATE CONFIRM message on the downlink DCCH.

2> otherwise:

3> update the START value for each CN domain as maintained in UTRAN (refer to TS 25.331 subclause 8.5.9) with "START" in the IE "START list" for the CN domain as indicated by "CN domain identity" in the IE "START list";

3> if this procedure was triggered while the UE was not in CELL_DCH state, then for each CN domain as indicated by "CN domain identity" in the IE "START list":

4> set the 20 MSB of the MAC-d HFN with the corresponding START value in the IE "START list";

4> set the remaining LSB of the MAC-d HFN to zero.

3> transmit a CELL UPDATE CONFIRM message on the downlink DCCH or optionally on the CCCH but only if ciphering is not required; and

3> optionally include the IE "RLC re-establish indicator (RB5 and upwards)" to request a RLC re-establishment in the UE, in which case the corresponding RLC entities should also be re-established in UTRAN; or

If the UE after the state transition remains in CELL_FACH state; and

- a C-RNTI is stored in the variable C_RNTI;

the UE shall:

1> if the variable PDCP_SN_INFO is non-empty:

2> include the IE "RB with PDCP information list" in any response message transmitted below and set it to the value of the variable PDCP_SN_INFO.

1> if the received CELL UPDATE CONFIRM message included the IE "Downlink counter synchronisation info":

2> re-establish RB2;

2> set the new uplink and downlink HFN component of the COUNT-C of RB2 to MAX(uplink HFN component of the COUNT-C of RB2, downlink HFN component of the COUNT-C of RB2);

2> increment by one the downlink and uplink values of the HFN component of the COUNT-C for RB2;

2> calculate the START value according to TS 25.331 subclause 8.5.9;

2> include the calculated START values for each CN domain in the IE "START list" in the IE "Uplink counter synchronisation info" in any response message transmitted below.

1> transmit a response message as specified in TS 25.331 subclause 8.3.1.7;

If the CELL UPDATE CONFIRM message:

- does not include "RB information elements"; and

- does not include "Transport channel information elements"; and
- does not include "Physical channel information elements"; and
- includes "CN information elements"; or
- includes the IE "Ciphering mode info"; or
- includes the IE "Integrity protection mode info"; or
- includes the IE "New C-RNTI"; or
- includes the IE "New U-RNTI":

the UE shall:

1> transmit a UTRAN MOBILITY INFORMATION CONFIRM as response message using AM RLC.

If the new state is CELL_DCH or CELL_FACH, the response message shall be transmitted using the new configuration after the state transition., and the UE shall:

1> if the IE "Downlink counter synchronisation info" was included in the received CELL UPDATE CONFIRM message:

2> when RLC has confirmed the successful transmission of the response message:

3> re-establish all AM and UM RLC entities with RB identities larger than 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the corresponding CN domain;

3> re-establish the RLC entities with RB identities 1, 3 and 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the CN domain stored in the variable LATEST_CONFIGURED_CN_DOMAIN;

3> set the remaining bits of the HFN component of the COUNT-C values of all UM RLC entities to zero;

3> re-initialise the PDCP header compression entities of each radio bearer in the variable ESTABLISHED_RABS as specified in [36].

1> if the variable PDCP_SN_INFO non-empty:

2> when RLC has confirmed the successful transmission of the response message:

3> for each radio bearer in the variable PDCP_SN_INFO:

4> if the IE "RB started" in the variable ESTABLISHED_RABS is set to "started":

5> configure the RLC entity for that radio bearer to "continue".

3> continue with the remainder of the procedure.

Reference

3GPP TS 25.331 clause 8.3.1

7.3.3.6.3 Test purpose

1. To confirm that the UE executes a cell update procedure after the successful reselection of another UTRA cell.
2. To confirm that the UE that support lossless SRNS relocation, sends the correct expected downlink PDCP sequence number to SS after a successful SRNS relocation.
3. To confirm that the UE sends calculated START values for each CN domain to SS after a successful SRNS relocation.

4. In the case that ciphering is applied by the network, to confirm that the UE applies the new ciphering algorithm following a successful SRNS relocation.

7.3.3.6.4 Method of test

Initial Condition

System Simulator: 2 cells - Cell 1 and 2 are active.

UE: PS-DCCH_FACH (state 6-8) as specified in clause 7.4 of TS 34.108.

Initial conditions message sequence

Step	Direction		Message	Comment
	UE	SS		
SS executes procedure Activate closed loop mode 1 inCELL_FACH case-as specified in clause 7.3.1.2.1.4				

Related ICS/IXIT statements

- Lossless SRNS relocation supported yes/no

- Support of RLC in-sequence delivery Yes/No

Specific Message Content

If network applies ciphering, the contents of SECURITY MODE COMMAND message in the initial condition set-up are identical to the same message sub-type found in [9] TS 34.108 clause 9, with the following exceptions:

Information Element	Value/remark
Ciphering mode info	
- Ciphering mode command	Start/restart
- Ciphering algorithm	UEA1
- Ciphering activation time for DPCH	Not Present
- Radio bearer downlink ciphering activation time info	
- Radio bearer activation time	
- RB identity	1
- RLC sequence number	Current RLC SN+2
- RB identity	2
- RLC sequence number	Current RLC SN+2
- RB identity	3
- RLC sequence number	Current RLC SN + 2
- RB identity	4
- RLC sequence number	Current RLC SN + 2

For RADIO BEARER SETUP message to be transmitted during P14 as specified in TS 34.108 clause 7.4, uses the message titled "Packet to CELL_FACH from CELL_FACH in PS" as found in TS 34.108 clause 9, with the following exception.

Information Element	Value/remark
- PDCP info	
- Support for lossless SRNS relocation	TRUE
- Max PDCP SN window size	sn65535
- PDCP PDU header	present

Test Procedure

Table 7.3.3.6

Parameter	Unit	Cell 1		Cell 2	
		T0	T1	T0	T1
UTRA RF Channel Number		Ch. 1		Ch. 1	
CPICH Ec (FDD)	dBm/3.84MHz	-60	-75	-75	-60

Table 7.3.3.6 illustrates the downlink power to be applied for the 2 cells at various time instants of the test execution. Columns marked "T0" denote the initial conditions.

The UE is in the CELL_FACH state in cell 1. If PS RAB has been established in the initial condition, SS initiates UE to enter loopback mode 1 and sends a PDCP PDU on the RAB. If ciphering is supported, the number of a PDCP PDU has to be decided so that the ciphering activation time is elapsed. SS shall suspend the sending of PDCP PDUs and wait for the last PDCP PDU to be send back by the UE and then note the next PDCP SN for the next PDCP PDU. SS configures its downlink transmission power settings according to columns "T1" in table 7.3.3.6. The UE shall find cell 2 to be more suitable for service and hence perform a cell reselection. After the completion of cell reselection, the UE shall transmits a CELL UPDATE message to the SS on the uplink CCCH of cell 2 and set IE "Cell update cause" to "Cell Reselection". SS then transmits a CELL UPDATE CONFIRM message, which includes a valid IE “New C-RNTI” and “New U-RNTI”, IE “Downlink counter synchronisation info” and IE “Integrity protection mode info”, to the UE on the downlink DCCH using UM RLC. SS verifies that the UE sends UTRAN MOBILITY INFORMATION CONFIRM message. This message also includes a calculated new START value according to the formula “$START_X$' = MSB_{20} (MAX {COUNT-C, COUNT-I | radio bearers and signalling radio bearers using the most recently configured CK_X and IK_X}) + 2”, calculated IE ”Integrity Check Info” using a new FRESH value as included in IE “Integrity protection initialisation number” in IE “Integrity protection mode info” in CELL UPDATE CONFIRM message and COUNT-I that includes subsequent HFN as used in the old integrity protection configuration, and “Receive PDCP sequence number”.

SS transmits UE CAPABILITY ENQUIRY message on the downlink DCCH using RLC-AM. The UE shall respond to downlink message with a UE CAPABILITY INFORMATION message on the uplink DCCH using RLC-AM. SS responds with UE CAPABILITY INFORMATION CONFIRM message. SS resumes the transmission of PDCP PDUs and checks that all transmitted PDCP PDUs are sent back by the UE.

Expected sequence

Step	Direction		Message	Comment
	UE	SS		
				The SS creates a TCP/IP packet without IP header compression (PDCP Data PDU).
1	←		PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet
1a				After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity.
1b				The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet
2a				After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
2b				The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU).
2c			Void	SS shall suspend the sending of PDCP PDUs and wait for the last PDCP PDU to be sent back by the UE and then note the next PDCP SN for the next PDCP PDU. After last ciphering activation time has elapsed and there is no pending ciphering activation time, SS applies the downlink transmission power settings, according to the values in columns "T1" of table 7.3.3.6. The UE shall find that the cell 2 is better for service and perform a reselection. SS waits for the maximum duration required for the UE to camp to cell 2.
3	→		CELL UPDATE	Value "cell reselection" shall be indicated in IE "Cell update cause"

4	←	CELL UPDATE CONFIRM	IE "RRC State Indicator" is set to "CELL_FACH". New C-RNTI and U-RNTI identities are assigned to the UE. IE "Downlink counter synchronisation info" includes the next PCDP sequence number that SS is expected to receive from the UE, otherwise only IE "Downlink counter synchronisation info" is included. New integrity protection configuration is applied on DL SRB1. LAI and RAI of cell 2 are given to the UE, and are the same as cell 1.
5	→	UTRAN MOBILITY INFORMATION CONFIRM	New calculated START value is included. IE "Receive PDCP sequence number" shall be included. New integrity protection configuration is applied on UL SRB2. If IE "Ciphering mode info" is present in step 4, new ciphering configuration is applied on UL SRB2 with the downlink and uplink values of the HFN component of COUNT-C for SRB2 is incremented by one.
6	←	UE CAPABILITY ENQUIRY	New integrity protection configuration is applied on DL SRB2. If IE "Ciphering mode info" is present in step 4, new ciphering configuration is applied on DL SRB2 with the same value as used in step 5.
7	→	UE CAPABILITY INFORMATION	SS confirms that new integrity protection configuration is applied on UL SRB2 by UE.
8	←	UE CAPABILITY INFORMATION CONFIRM	
9		Void	
10		Void	
			The SS creates a TCP/IP packet without IP header compression (PDCP Data PDU).
11	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet
12			After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity.

13			The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
14	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet
15			After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
16			The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU).
17			New ciphering configuration is applied on UL and DL RAB using the re-initialised COUNT-C HFN by the start value as stored in step 5.
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)			

Specific Message Contents

CELL UPDATE (Step 3)

The same message found in TS 34.108, clause 9 shall be transmitted by the UE on the uplink CCCH, with the exception of the following IEs:

Information Element	Value/remark
Cell Update Cause	Check to see if set to 'Cell Re-selection'

CELL UPDATE CONFIRM (Step 4)

Use the same message sub-type found in TS 34.108, clause 9, with the following exceptions:

Information Element	Value/remark
Ciphering mode info	If network does not apply ciphering, set this IE to "Not present". If network applies ciphering, this IE present with the values of the sub IEs as stated below.
- Ciphering mode command	Start/restart
- Ciphering algorithm	UEA0
- Ciphering activation time for DPCH	Not Present
- Radio bearer downlink ciphering activation time info	
- Radio bearer activation time	
- RB identity	1
- RLC sequence number	Current RLC SN+2
- RB identity	2
- RLC sequence number	Current RLC SN+2
- RB identity	3
- RLC sequence number	Current RLC SN+2
- RB identity	4
- RLC sequence number	Current RLC SN+2
- RB identity	20
- RLC sequence number	Current RLC SN+2
Integrity protection mode info - Integrity protection mode command - Downlink integrity protection activation info - Integrity protection algorithm - Integrity protection initialisation number	 Start Not Present UIA1 SS selects an arbitrary 32 bits number for FRESH
New U-RNTI - SRNC Identity - S-RNTI New C-RNTI CN Information info - PLMN identity - CN common GSM-MAP NAS system information - GSM-MAP NAS system information - CN domain related information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information Downlink counter synchronisation info - RB with PDCP information list - RB with PDCP information - RB identity - PDCP SN info	 An arbitrary 12-bits string which is different from original SRNC An arbitrary 20-bits string which is different from original S-RNTI Not Present Not present 00 01H PS 05 00H CS 1E 01H This IE is included 20 The next PCDP sequence number that SS is expected to receive from the UE.(X)

UTRAN MOBILITY INFORMATION CONFIRM (Step 5)

The same message sub-type found in TS 34.108, clause 9 shall be transmitted by the UE on the uplink DCCH with the following exceptions:

Information Element	Value/remark
Uplink counter synchronisation info	
- RB with PDCP information list	This IE is checked
- RB with PDCP information	
- RB identity	20
- PDCP SN info	Check that the PCDP sequence number is the next sequence number that SS would transmit to the UE
- START list	Check that this IE is correct value

Content of PDCP Data PDUs used for entire test case

Information Element	Value/remark
PDU type	000
PID	00000 (No header compression, PID = 0)
Data	PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

UE CAPABILITY ENQUIRY (Step 6)

Use the same message sub-type found in [9] TS 34.108 clause 9.

UE CAPABILITY INFORMATION (Step 7)

Check that the UE uses the same message sub-type found in TS 34.108 clause 9.

UE CAPABILITY INFORMATION CONFIRM (Step 8)

Use the same message sub-type found in [9] TS 34.108 clause 9.

7.3.3.6.5 Test requirement

After step 1, UE shall transmit back all the PDCP PDUs sent by the SS to the UE.

After step 2, UE shall transmit CELL UPDATE message with the value of IE "Cell update cause" set to "cell reselection".

After step 4, the UE shall transmit a UTRAN MOBILITY INFORMATION CONFIRM message on the uplink DCCH using AM RLC which includes which includes a calculated new START value according to the formula "$START_X$' = MSB_{20} (MAX {COUNT-C, COUNT-I | radio bearers and signalling radio bearers using the most recently configured CK_X and IK_X}) + 2", calculated IE "Integrity Check Info" using the new FRESH value as included in IE "Integrity protection initialisation number" in IE "Integrity protection mode info" in UTRAN MOBILITY INFORMATION message and COUNT-I that includes subsequent HFN as used in the old integrity protection configuration, this message shall also include IE "Receive PDCP sequence number" for RB#20.

After step 6, the UE shall respond with a UE CAPABILITY INFORMATION message to SS.

After step 10, UE shall start transmission on the RAB beginning with the PDCP SN equal to that included in the UTRAN MOBILITY INFORMATION CONFIRM message.

7.3.3.7 URA Update: Lossless SRNS relocation in CELL_FACH (without pending of ciphering)

7.3.3.7.1 Definition

7.3.3.7.2 Conformance requirement

When the UTRAN receives a URA UPDATE message, the UTRAN should:

1> in case the procedure was triggered by reception of a URA UPDATE:

2> if SRNS relocation was performed:

3> transmit a URA UPDATE CONFIRM message on the downlink DCCH.

If the UE after the state transition remains in CELL_FACH state; and

- a C-RNTI is stored in the variable C_RNTI;

the UE shall:

1> if the variable PDCP_SN_INFO is non-empty:

2> include the IE "RB with PDCP information list" in any response message transmitted below and set it to the value of the variable PDCP_SN_INFO.

1> if the received URA UPDATE CONFIRM message included the IE "Downlink counter synchronisation info":

2> re-establish RB2;

2> set the new uplink and downlink HFN component of the COUNT-C of RB2 to MAX(uplink HFN component of the COUNT-C of RB2, downlink HFN component of the COUNT-C of RB2);

2> increment by one the downlink and uplink values of the HFN component of the COUNT-C for RB2;

2> calculate the START value according to TS 25.331 subclause 8.5.9;

2> include the calculated START values for each CN domain in the IE "START list" in the IE "Uplink counter synchronisation info" in any response message transmitted below.

If the URA UPDATE CONFIRM message:

- includes "CN information elements"; or

- includes the IE "Ciphering mode info"; or

- includes the IE "Integrity protection mode info"; or

- includes any one or both of the IEs "New C-RNTI" and "New U-RNTI":

the UE shall:

1> transmit a UTRAN MOBILITY INFORMATION CONFIRM as response message using AM RLC.

If the new state is CELL_DCH or CELL_FACH, the response message shall be transmitted using the new configuration after the state transition., and the UE shall:

1> if the IE "Downlink counter synchronisation info" was included in the received CELL UPDATE CONFIRM or URA UPDATE CONFIRM message:

2> when RLC has confirmed the successful transmission of the response message:

3> re-establish all AM and UM RLC entities with RB identities larger than 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the corresponding CN domain;

3> re-establish the RLC entities with RB identities 1, 3 and 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the CN domain stored in the variable LATEST_CONFIGURED_CN_DOMAIN;

3> set the remaining bits of the HFN component of the COUNT-C values of all UM RLC entities to zero;

3> re-initialise the PDCP header compression entities of each radio bearer in the variable ESTABLISHED_RABS.

1> if the variable PDCP_SN_INFO non-empty:

2> when RLC has confirmed the successful transmission of the response message:

3> for each radio bearer in the variable PDCP_SN_INFO:

4> if the IE "RB started" in the variable ESTABLISHED_RABS is set to "started":

5> configure the RLC entity for that radio bearer to "continue".

Reference

3GPP TS 25.331 clause 8.3.1

7.3.3.7.3 Test purpose

1. To confirm that the UE executes a URA update procedure after the successful reselection of another UTRA cell.
2. To confirm that the UE that support lossless SRNS relocation, sends the correct expected downlink PDCP sequence number to SS after a successful SRNS relocation.
3. To confirm that the UE sends calculated START values for each CN domain to SS after a successful SRNS relocation.

7.3.3.7.4 Method of test

Initial Condition

System Simulator: 2 cells - Cell 1 and 3 are active.

UE: PS-DCCH _DCH(state 6-7) in cell 1 as specified in clause 7.4 of TS 34.108.

Initial conditions message sequence

Step	Direction		Message	Comment
	UE	SS		
SS executes procedure Activate closed loop mode 1 in CELL_DCH case-as specified in clause 7.3.1.2.1.44				
1			SS executes procedure P18 (clause 7.4.2.1.2 of TS 34.108)	
2				UE enters state URA_PCH

Related ICS/IXIT statements

- Lossless SRNS relocation supported yes/no

- Support of RLC in-sequence delivery Yes/No

Specific Message Content

If network applies ciphering, the contents of SECURITY MODE COMMAND message in the initial condition set-up are identical to the same message sub-type found in [9] TS 34.108 clause 9, with the following exceptions:

Information Element	Value/remark
Ciphering mode info	
- Ciphering mode command	Start/restart
- Ciphering algorithm	UEA1
- Ciphering activation time for DPCH	Not Present
- Radio bearer downlink ciphering activation time info	
- Radio bearer activation time	
- RB identity	1
- RLC sequence number	Current RLC SN+2
- RB identity	2
- RLC sequence number	Current RLC SN+2
- RB identity	3
- RLC sequence number	Current RLC SN + 2
- RB identity	4
- RLC sequence number	Current RLC SN + 2

For RADIO BEARER SETUP message to be transmitted during P14 as specified in TS 34.108 clause 7.4, uses the message titled "Packet to CELL_FACH from CELL_FACH in PS" as found in TS 34.108 clause 9, with the following exception.

Information Element	Value/remark
- PDCP info	
- Support for lossless SRNS relocation	TRUE
- Max PDCP SN window size	sn65535
- PDCP PDU header	present

Test Procedure

Table 7.3.3.7

Parameter	Unit	Cell 1		Cell 3	
		T0	T1	T0	T1
UTRA RF Channel Number		Ch. 1		Ch. 1	
CPICH Ec (FDD)	dBm/3.84MHz	-60	-75	-75	-60

Table 7.3.3.7 illustrates the downlink power to be applied for the 2 cells at various time instants of the test execution. Columns marked "T0" denote the initial conditions.

The UE is in the URA_PCH state, camping onto cell 1. If PS RAB has been established in the initial condition, SS initiates UE to enter loopback mode 1 and sends a PDCP PDUs on the RAB. If ciphering is supported, a PDCP PDUs has to be decided so that the ciphering activation time is elapsed. SS shall suspend the sending of PDCP PDUs and wait for the last PDCP PDU to be send back by the UE and then note the next PDCP SN for the next PDCP PDU. SS configures its downlink transmission power settings according to columns "T1" in table 7.3.3.7. The UE shall find cell 3 to be more suitable for service and hence perform a cell reselection. After the completion of cell reselection, the UE shall transmits a URA UPDATE message to the SS on the uplink CCCH of cell 3 and set IE "URA update cause" to "change of URA". After the SS receives this message, it transmits a URA UPDATE CONFIRM message, which includes a valid IE "New C-RNTI" and "New U-RNTI", IE "Downlink counter synchronisation info" and IE "Integrity protection mode info", to the UE on the downlink DCCH using UM RLC. SS verifies that the UE sends UTRAN MOBILITY INFORMATION CONFIRM message. This message also includes a calculated new START value according to the formula "$START_X' = MSB_{20}$ (MAX {COUNT-C, COUNT-I | radio bearers and signalling radio bearers using the most recently configured CK_X and IK_X}) + 2", calculated IE "Integrity Check Info" using a new FRESH value as included in IE "Integrity protection initialisation number" in IE "Integrity protection mode info" in CELL UPDATE CONFIRM message and COUNT-I that includes subsequent HFN as used in the old integrity protection configuration, and "Receive PDCP sequence number".

SS transmits UE CAPABILITY ENQUIRY message on the downlink DCCH using RLC-AM. The UE shall respond to downlink message with a UE CAPABILITY INFORMATION message on the uplink DCCH using RLC-AM. SS responds with UE CAPABILITY INFORMATION CONFIRM message. SS resumes the transmission of PDCP PDUs and checks that all transmitted PDCP PDUs are sent back by the UE.

Expected sequence

Step	Direction		Message	Comment
	UE	SS		
				The SS creates a TCP/IP packet without IP header compression (PDCP Data PDU).
1	←		PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet
1a				After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity.
1b				The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet
2a				After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
2b				The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU).
2c			Void	SS shall suspend the sending of PDCP PDUs and wait for the last PDCP PDU to be sent back by the UE and then note the next PDCP SN for the next PDCP PDU. After last ciphering activation time has elapsed and there is no pending ciphering activation time, SS applies the downlink transmission power settings, according to the values in columns "T1" of table 7.3.3.7. The UE shall find that the cell 2 is better for service and perform a reselection. SS waits for the maximum duration required for the UE to camp to cell 3.
3	→		URA UPDATE	Value "change of URA" shall be indicated in IE "URA update cause"

4	←	URA UPDATE CONFIRM	IE "RRC State Indicator" is set to "CELL_FACH". New C-RNTI and U-RNTI identities are assigned to the UE. IE "Downlink counter synchronisation info" includes the next PCDP sequence number that SS is expected to receive from the UE, otherwise only IE "Downlink counter synchronisation info" is included. New integrity protection configuration is applied on DL SRB1. LAI and RAI of cell 2 are given to the UE, and are the same as cell 1.
5	→	UTRAN MOBILITY INFORMATION CONFIRM	New calculated START value is included. IE "Receive PDCP sequence number" shall be included. New integrity protection configuration is applied on UL SRB2.
6	←	UE CAPABILITY ENQUIRY	New integrity protection configuration is applied on DL SRB2.
7	→	UE CAPABILITY INFORMATION	SS confirms that new integrity protection configuration is applied on UL SRB2 by UE.
8	←	UE CAPABILITY INFORMATION CONFIRM	
9		Void	
10		Void	
			The SS creates a TCP/IP packet without IP header compression (PDCP Data PDU).
11	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet
12			After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity.
13			The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
14	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet

15			After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
16			The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU).
17		Void	
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)			

Specific Message Contents

URA UPDATE (Step 3)

The same message found in TS 34.108, clause 9 shall be transmitted by the UE on the uplink CCCH, with the exception of the following IEs:

Information Element	Value/remark
URA Update Cause	Check to see if set to “change of URA”

URA UPDATE CONFIRM (Step 4)

Use the same message sub-type found in TS 34.108, clause 9, with the following exceptions:

Information Element	Value/remark
Ciphering mode info	Not present
Integrity protection mode info - Integrity protection mode command - Downlink integrity protection activation info - Integrity protection algorithm - Integrity protection initialisation number	 Start Not Present UIA1 SS selects an arbitrary 32 bits number for FRESH
New U-RNTI - SRNC Identity - S-RNTI New C-RNTI CN Information info - PLMN identity - CN common GSM-MAP NAS system information - GSM-MAP NAS system information - CN domain related information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information Downlink counter synchronisation info - RB with PDCP information list - RB with PDCP information - RB identity - PDCP SN info	 An arbitrary 12-bits string which is different from original SRNC An arbitrary 20-bits string which is different from original S-RNTI Not Present Not present 00 01H PS 05 00H CS 1E 01H This IE is included 20 The next PCDP sequence number that SS is expected to receive from the UE.(X)

UTRAN MOBILITY INFORMATION CONFIRM (Step 5)

The same message sub-type found in TS 34.108, clause 9 shall be transmitted by the UE on the uplink DCCH with the following exceptions:

Information Element	Value/remark
Uplink counter synchronisation info - RB with PDCP information list - RB with PDCP information - RB identity - PDCP SN info - START list	 This IE is checked 20 Check that the PCDP sequence number is the next sequence number that SS would transmit to the UE.(X) Check that this IE is correct value

Content of PDCP Data PDUs used for entire test case

Information Element	Value/remark
PDU type PID Data	000 00000 (No header compression, PID = 0) PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

UE CAPABILITY ENQUIRY (Step 6)

Use the same message sub-type found in [9] TS 34.108 clause 9.

UE CAPABILITY INFORMATION (Step 7)

Check that the UE uses the same message sub-type found in TS 34.108 clause 9.

UE CAPABILITY INFORMATION CONFIRM (Step 8)

Use the same message sub-type found in [9] TS 34.108 clause 9.

7.3.3.7.5 Test requirement

After step 1, UE shall transmit back all the PDCP PDUs sent by the SS to the UE.

After step 2, UE shall transmit URA UPDATE message with the value of IE "URA update cause" set to "change of URA".

After step 4, the UE shall transmit a UTRAN MOBILITY INFORMATION CONFIRM message on the uplink DCCH using AM RLC which includes which includes a calculated new START value according to the formula "$START_X$' = MSB_{20} (MAX {COUNT-C, COUNT-I | radio bearers and signalling radio bearers using the most recently configured CK_X and IK_X}) + 2", calculated IE "Integrity Check Info" using the new FRESH value as included in IE "Integrity protection initialisation number" in IE "Integrity protection mode info" in UTRAN MOBILITY INFORMATION message and COUNT-I that includes subsequent HFN as used in the old integrity protection configuration. This message shall also include IE "Receive PDCP sequence number" for RB#20.

After step 6, the UE shall respond with a UE CAPABILITY INFORMATION message to SS.

After step 9, the UE shall respond with an IDENTITY RESPONSE message to SS and apply new ciphering configuration on UL SRB3.

After step 10, UE shall start transmission on the RAB beginning with the PDCP SN equal to that included in the UTRAN MOBILITY INFORMATION CONFIRM message.

7.3.3.8 Radio Bearer Establishment for transition from CELL_DCH to CELL_DCH: Success (Lossless SRNS relocation) (without pending of ciphering)

7.3.3.8.1 Definition

7.3.3.8.2 Conformance requirement

1> if the reconfiguration procedure is simultaneous with SRNS relocation procedure:

2> if the transmitted message is a RADIO BEARER RECONFIGURATION:

3> include the IE "New U-RNTI".

2> else:

3> include the IE "Downlink counter synchronisation info".

The UE shall:

1> if the received reconfiguration message included the IE "Downlink counter synchronisation info";

2> re-establish RB2;

2> set the new uplink and downlink HFN component of COUNT-C of RB2 to MAX(uplink HFN component of COUNT-C of RB2, downlink HFN component of COUNT-C of RB2);

2> increment by one the downlink and uplink values of the HFN component of COUNT-C for RB2;

2> calculate the START value according to subclause 8.5.9;

2> include the calculated START values for each CN domain in the IE "START list" in the IE "Uplink counter synchronisation info".

1> if the variable PDCP_SN_INFO is not empty:

2> include the IE "RB with PDCP information list" and set it to the value of the variable PDCP_SN_INFO.

1> if the IE "Integrity protection mode info" was present in the received reconfiguration message:

2> start applying the new integrity protection configuration in the uplink for signalling radio bearer RB2 from and including the transmitted response message.

If the new state is CELL_DCH or CELL_FACH, the response message shall be transmitted using the new configuration after the state transition, and the UE shall:

1> if the IE "Downlink counter synchronisation info" was included in the reconfiguration message;

2> when RLC has confirmed the successful transmission of the response message:

3> re-establish all AM and UM RLC entities with RB identities larger than 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the corresponding CN domain;

3> re-establish the RLC entities with RB identities 1, 3 and 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the CN domain stored in the variable LATEST_CONFIGURED_CN_DOMAIN;

3> set the remaining bits of the HFN component of COUNT-C values of all UM RLC entities to zero;

3> re-initialise the PDCP header compression entities of each radio bearer in the variable ESTABLISHED_RABS as specified in [36].

1> if the variable PDCP_SN_INFO is non-empty:

2> when RLC has confirmed the successful transmission of the response message:

3> for each radio bearer in the variable PDCP_SN_INFO:

4> if the IE "RB started" in the variable ESTABLISHED_RABS is set to "started":

5> configure the RLC entity for that radio bearer to "continue".

3> perform the actions below.

Reference

3GPP TS 25.331 clause 8.2.2.

7.3.3.8.3 Test purpose

1. To confirm that the UE performs a combined hard handover and SRNS relocation and then transmit a RADIO BEARER SETUP COMPLETE message in the new cell.

2. In the case that ciphering is applied by the network, to confirm that the UE applies the new ciphering algorithm following a successful SRNS relocation.

7.3.3.8.4 Method of test

Initial Condition

System Simulator: 2 cells – Cell 1 and 2

UE: PS-DCCH _DCH (state 6-7) as specified in clause 7.4 of TS 34.108, depending on the CN domain(s) supported by the UE.

Initial conditions message sequence

Step	Direction		Message	Comment
	UE	SS		
SS executes procedure Activate closed loop mode 1 in CELL_DCH case-as specified in clause 7.3.1.2.1.4				

Related ICS/IXIT statements

- Lossless SRNS relocation supported yes/no

- Support of RLC in-sequence delivery Yes/No

Specific Message Content

If network applies ciphering, the contents of SECURITY MODE COMMAND message in the initial condition set-up are identical to the same message sub-type found in [9] TS 34.108 clause 9, with the following exceptions:

Information Element	Value/remark
Ciphering mode info	
- Ciphering mode command	Start/restart
- Ciphering algorithm	UEA0
- Ciphering activation time for DPCH	Not Present
- Radio bearer downlink ciphering activation time info	
- Radio bearer activation time	
- RB identity	1
- RLC sequence number	Current RLC SN+2
- RB identity	2
- RLC sequence number	Current RLC SN+2
- RB identity	3
- RLC sequence number	Current RLC SN + 2
- RB identity	4
- RLC sequence number	Current RLC SN + 2

For RADIO BEARER SETUP message to be transmitted during P13 as specified in TS 34.108 clause 7.4, use the message titled "Packet to CELL_DCH from CELL_DCH in PS" as found in TS 34.108 clause 9, with the following exception.

Information Element	Value/remark
RAB information for setup	
- RAB info	
- RAB identity	0000 0101B
- CN domain identity	PS domain
- NAS Synchronization Indicator	Not Present
- Re-establishment timer	UseT315
- RB information to setup	
- RB identity	20
- PDCP info	
- Support for lossless SRNS relocation	TRUE
- Max PDCP SN window size	sn65535
- PDCP PDU header	present
- CHOICE RLC info type	RLC info
- CHOICE Uplink RLC mode	AM RLC
- Transmission RLC discard	
- SDU discard mode	No discard
- MAX_DAT	15
- Transmission window size	128
- Timer_RST	500
- Max_RST	4
- Polling info	
- Timer_poll_prohibit	200
- Timer_poll	200
- Poll_PDU	Not Present
- Poll_SDU	1
- Last transmission PDU poll	TRUE
- Last retransmission PDU poll	TRUE
- Poll_Windows	99
- Timer_poll_periodic	Not Present
- CHOICE Downlink RLC mode	AM RLC
- In-sequence delivery	TRUE
- Receiving window size	128
- Downlink RLC status info	
- Timer_status_prohibit	200
- Timer_EPC	Not Present
- Missing PDU indicator	TRUE
- Timer_STATUS_periodic	Not Present
- RB mapping info	
- Information for each multiplexing option	2 RBMuxOptions
- RLC logical channel mapping indicator	Not Present
- Number of uplink RLC logical channels	1
- Uplink transport channel type	DCH
- UL Transport channel identity	1
- Logical channel identity	7
- CHOICE RLC size list	Configured
- MAC logical channel priority	8
- Downlink RLC logical channel info	
- Number of downlink RLC logical channels	1
- Downlink transport channel type	DCH
- DL DCH Transport channel identity	6
- DL DSCH Transport channel identity	Not Present
- Logical channel identity	7
- RLC logical channel mapping indicator	Not Present
- Number of uplink RLC logical channels	1
- Uplink transport channel type	RACH
- UL Transport channel identity	Not Present
- Logical channel identity	7
- CHOICE RLC size list	Explicit List
- RLC size index	Reference to TS34.108 clause 6 Parameter Set
- MAC logical channel priority	8
- Downlink RLC logical channel info	
- Number of downlink RLC logical channels	1
- Downlink transport channel type	FACH
- DL DCH Transport channel identity	Not Present
- DL DSCH Transport channel identity	Not Present

- Logical channel identity	7

Test Procedure

Table 7.3.3.8

Parameter	Unit	Cell 1		Cell 2	
		T0	T1	T0	T1
UTRA RF Channel Number		Ch. 1		Ch. 1	
CPICH Ec (FDD)	dBm/3.84MHz	-60	-75	-75	-60

Table 7.3.3.8 illustrates the downlink power to be applied for the 2 cells at various time instants of the test execution. Columns marked "T0" denote the initial conditions.

The UE is in the CELL_DCH state, camping onto cell 1. If PS RAB has been established in the initial condition, SS initiates UE to enter loopback mode 1 and sends a PDCP PDU on the RAB. If ciphering is supported, the a PDCP PDUs has to be decided so that the ciphering activation time is elapsed. SS shall suspend the sending of PDCP PDUs and wait for the last PDCP PDU to be send back by the UE and then note the next PDCP SN for the next PDCP PDU. SS configures its downlink transmission power settings according to columns "T1" in table 7.3.3.8. The SS sends a RADIO BEARER SETUP message on the downlink DCCH using AM RLC requesting the UE to do a handover combined with SRNS relocation. This message includes IE "RRC State Indicator" set to "CELL_DCH", IE “Downlink counter synchronisation info” and IE “Integrity protection mode info”. UE shall reselect to cell 2 and SS verifies that the UE sends RADIO BEARER SETUP COMPLETE message. This message also includes a calculated new START value according to the formula “$START_X' = MSB_{20}$ (MAX {COUNT-C, COUNT-I | radio bearers and signalling radio bearers using the most recently configured CK_X and IK_X}) + 2”, calculated IE ”Integrity Check Info” using a new FRESH value as included in IE “Integrity protection initialisation number” in IE “Integrity protection mode info” in RADIO BEARER SETUP message and COUNT-I that includes subsequent HFN as used in the old integrity protection configuration, and “Receive PDCP sequence number”.

SS transmits UE CAPABILITY ENQUIRY message on the downlink DCCH using RLC-AM. The UE shall respond to downlink message with a UE CAPABILITY INFORMATION message on the uplink DCCH using RLC-AM. SS responds with UE CAPABILITY INFORMATION CONFIRM message. SS resumes the transmission of PDCP PDUs and checks that all transmitted PDCP PDUs are sent back by the UE.

Expected sequence

Step	Direction		Message	Comment
	UE	SS		
				The SS creates a TCP/IP packet without IP header compression (PDCP Data PDU).
1	←		PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet
1a				After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity.
1b				The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet
2a				After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
2b				The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU).
2c			Void	SS shall suspend the sending of PDCP PDUs and wait for the last PDCP PDU to be sent back by the UE and then note the next PDCP SN for the next PDCP PDU. SS applies the downlink transmission power settings, according to the values in columns "T1" of table 7.3.3.8.

3	←	RADIO BEARER SETUP	If IE “Ciphering mode info” is present in the SECURITY MODE COMMAND during initial condition set-up, this message is sent after last ciphering activation time has elapsed and there is no pending ciphering activation time. IE “Downlink counter synchronisation info” includes the next PCDP sequence number that SS is expected to receive from the UE, otherwise only IE “Downlink counter synchronisation info” is included. New integrity protection configuration is applied on DL SRB1. LAI and RAI of cell 2 are given to the UE, and are the same as cell 1.
4	→	RADIO BEARER SETUP COMPLETE	The UE shall transmit this message after it reselects to cell 2. New calculated START value is included. IE “Receive PDCP sequence number” shall be included. New integrity protection configuration is applied on UL SRB2. If IE “Ciphering mode info” is present in step 3, new ciphering configuration is applied on UL SRB2 with the downlink and uplink values of the HFN component of COUNT-C for SRB2 is incremented by one.
5	←	UE CAPABILITY ENQUIRY	New integrity protection configuration is applied on DL SRB2. If IE “Ciphering mode info” is present in step 3, new ciphering configuration is applied on DL SRB2 with the same value as used in step 4.
6	→	UE CAPABILITY INFORMATION	SS confirms that new integrity protection configuration is applied on UL SRB2 by UE.
7	←	UE CAPABILITY INFORMATION CONFIRM	
8		Void	
9		Void	
			The SS creates a TCP/IP packet without IP header compression (PDCP Data PDU).
10	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet

11			After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity.
12			The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
13	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet
14			After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
15			The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU).
16			If IE "Ciphering mode info" is present in step 3, new ciphering configuration is applied on UL and DL RAB using the re-initialised COUNT-C HFN by the start value as stored in step 4.
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)			

Specific Message Contents

RADIO BEARER SETUP for PS only UE (Step 3)

Use the same message sub-type found in [9] TS 34.108 clause 9, which is entitled "Packet to CELL_DCH from CELL_DCH in PS", with the following exception:

Information Element	Value/remark
Ciphering mode info	If network does not apply ciphering, set this IE to "Not present". If network applies ciphering, this IE present with the values of the sub IEs as stated below.
- Ciphering mode command	Start/restart
- Ciphering algorithm	UEA1
- Ciphering activation time for DPCH	Not Present
- Radio bearer downlink ciphering activation time info	
- Radio bearer activation time	
- RB identity	1
- RLC sequence number	Current RLC SN+2
- RB identity	2
- RLC sequence number	Current RLC SN+2
- RB identity	3
- RLC sequence number	Current RLC SN+2
- RB identity	4
- RLC sequence number	Current RLC SN+2
- RB identity	20
- RLC sequence number	Current RLC SN+2
Integrity protection mode info - Integrity protection mode command - Downlink integrity protection activation info - Integrity protection algorithm - Integrity protection initialisation number	 Start Not Present UIA1 SS selects an arbitrary 32 bits number for FRESH
New U-RNTI - SRNC identity - S-RNTI	 0000 0000 0010B 0000 0000 0000 0000 0001B
CN Information info - PLMN identity - CN common GSM-MAP NAS system information - GSM-MAP NAS system information - CN domain related information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information	 Not present 00 01H PS 05 00H CS 1E 01H
RAB information for setup - RAB info - RAB identity - CN domain identity - NAS Synchronization Indicator - Re-establishment timer - RB information to setup - RB identity - PDCP info - Support for lossless SRNS relocation - Max PDCP SN window size - PDCP PDU header - Header compression information - CHOICE RLC info type - CHOICE Uplink RLC mode - Transmission RLC discard - SDU discard mode - MAX_DAT - Transmission window size - Timer_RST - Max_RST - Polling info - Timer_poll_prohibit - Timer_poll - Poll_PDU - Poll_SDU - Last transmission PDU poll - Last retransmission PDU poll	 0000 1100B PS domain Not Present UseT315 12 FALSE Not present Absent Not present RLC info AM RLC No discard 15 128 500 4 200 200 Not Present 1 TRUE TRUE

- Poll_Windows	99
- Timer_poll_periodic	Not Present
- CHOICE Downlink RLC mode	AM RLC
- In-sequence delivery	TRUE
- Receiving window size	128
- Downlink RLC status info	
- Timer_status_prohibit	200
- Timer_EPC	Not Present
- Missing PDU indicator	TRUE
- Timer_STATUS_periodic	Not Present
- RB mapping info	
- Information for each multiplexing option	2 RBMuxOptions
- RLC logical channel mapping indicator	Not Present
- Number of uplink RLC logical channels	1
- Uplink transport channel type	DCH
- UL Transport channel identity	1
- Logical channel identity	8
- CHOICE RLC size list	Configured
- MAC logical channel priority	8
- Downlink RLC logical channel info	
- Number of downlink RLC logical channels	1
- Downlink transport channel type	DCH
- DL DCH Transport channel identity	6
- DL DSCH Transport channel identity	Not Present
- Logical channel identity	8
- RLC logical channel mapping indicator	Not Present
- Number of uplink RLC logical channels	1
- Uplink transport channel type	RACH
- UL Transport channel identity	Not Present
- Logical channel identity	8
- CHOICE RLC size list	Explicit List
- RLC size index	Reference to TS34.108 clause 6 Parameter Set
- MAC logical channel priority	8
- Downlink RLC logical channel info	
- Number of downlink RLC logical channels	1
- Downlink transport channel type	FACH
- DL DCH Transport channel identity	Not Present
- DL DSCH Transport channel identity	Not Present
- Logical channel identity	8
Downlink counter synchronisation info - RB with PDCP information list - RB with PDCP information - RB identity - PDCP SN info	 This IE is included 20 The next PCDP sequence number that SS is expected to receive from the UE.
Downlink information for each radio links - Primary CPICH info - Primary Scrambling Code	 Set to same code as used for cell 2

RADIO BEARER SETUP for CS only UE (Step 3)

Use the same message sub-type found in [9] TS 34.108 clause 9, which is entitled “Non speech to CELL_DCH from CELL_DCH in CS”, with the following exception:

Information Element	Value/remark
Ciphering mode info	If network does not apply ciphering, set this IE to "Not present". If network applies ciphering, this IE present with the values of the sub IEs as stated below.
- Ciphering mode command	Start/restart
- Ciphering algorithm	UEA1
- Ciphering activation time for DPCH	(256+CFN-(CFN MOD 8 + 8))MOD 256
- Radio bearer downlink ciphering activation time info	
- Radio bearer activation time	
- RB identity	1
- RLC sequence number	Current RLC SN+2
- RB identity	2
- RLC sequence number	Current RLC SN+2
- RB identity	3
- RLC sequence number	Current RLC SN+2
- RB identity	4
- RLC sequence number	Current RLC SN+2
Integrity protection mode info - Integrity protection mode command - Downlink integrity protection activation info - Integrity protection algorithm - Integrity protection initialisation number	 Start Not Present UIA1 SS selects an arbitrary 32 bits number for FRESH
New U-RNTI - SRNC identity - S-RNTI	 0000 0000 0010B 0000 0000 0000 0000 0001B
CN Information info - PLMN identity - CN common GSM-MAP NAS system information - GSM-MAP NAS system information - CN domain related information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information	 Not present 00 01H PS 05 00H CS 1E 01H
RAB information for setup - RAB info - RAB identity - CN domain identity - NAS Synchronization Indicator - Re-establishment timer - RB information to setup - RB identity - PDCP info - CHOICE RLC info type - CHOICE Uplink RLC mode - Transmission RLC discard - Segmentation indication - CHOICE Downlink RLC mode - Segmentation indication - RB mapping info - Information for each multiplexing option - RLC logical channel mapping indicator - Number of uplink RLC logical channels - Uplink transport channel type - UL Transport channel identity - Logical channel identity - CHOICE RLC size list - MAC logical channel priority - Downlink RLC logical channel info - Number of downlink RLC logical channels - Downlink transport channel type - DL DCH Transport channel identity - DL DSCH Transport channel identity - Logical channel identity	 0000 1100B CS domain Not Present UseT314 13 Not Present RLC info TM RLC Not Present FALSE TM RLC FALSE Not Present 1 DCH 1 Not Present Configured 8 1 DCH 6 Not Present Not Present

Downlink counter synchronisation info - RB with PDCP information list	 Not present
Downlink information for each radio links - Primary CPICH info - Primary Scrambling Code	 Set to same code as used for cell 2

RADIO BEARER SETUP COMPLETE for PS only UE (Step 4)

Check that the UE uses the same message sub-type found in TS 34.108 clause 9, with the following exception.

Information Element	Value/remark
Uplink counter synchronisation info - RB with PDCP information list - RB with PDCP information - RB identity - PDCP SN info - RB identity - PDCP SN info - START list	 This IE is checked. 12 Check that the PCDP sequence number is the next sequence number that SS would transmit to the UE. 20 Check that the PCDP sequence number is the next sequence number that SS would transmit to the UE. Check that this IE is present.

RADIO BEARER SETUP COMPLETE for CS only UE (Step 4)

Check that the UE uses the same message sub-type found in TS 34.108 clause 9, with the following exception.

Information Element	Value/remark
Uplink counter synchronisation info - RB with PDCP information list - START list	 Not present Check that this IE is present.

Content of PDCP Data PDUs used for entire test case

Information Element	Value/remark
PDU type	000
PID	00000 (No header compression, PID = 0)
Data	PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

UE CAPABILITY ENQUIRY (Step 5)

Use the same message sub-type found in [9] TS 34.108 clause 9.

UE CAPABILITY INFORMATION (Step 6)

Check that the UE uses the same message sub-type found in TS 34.108 clause 9.

UE CAPABILITY INFORMATION CONFIRM (Step 7)

Use the same message sub-type found in [9] TS 34.108 clause 9.

7.3.3.8.5 Test requirement

After step 1, UE shall transmit back all the PDCP PDUs sent by the SS to the UE.

After step 3, the UE shall transmit a RADIO BEARER SETUP COMPLETE message on the uplink DCCH using AM RLC which includes which includes a calculated new START value according to the formula "$START_X' = MSB_{20}$ (MAX {COUNT-C, COUNT-I | radio bearers and signalling radio bearers using the most recently configured CK_X and IK_X}) + 2", calculated IE "Integrity Check Info" using the new FRESH value as included in IE "Integrity protection initialisation number” in IE ”Integrity protection mode info” in RADIO BEARER SETUP message and COUNT-I that includes subsequent HFN as used in the old integrity protection configuration. This message shall also include IE “Receive PDCP sequence number” for RB#20.

After step 5, the UE shall respond with a UE CAPABILITY INFORMATION message to SS.

After step 9, UE shall start transmission on the RAB beginning with the PDCP SN equal to that included in the RADIO BEARER RECONFIGURATION COMPLETE message.

7.3.3.9 Radio Bearer Reconfiguration for transition from CELL_DCH to CELL_DCH: Success (Lossless SRNS relocation) (without pending of ciphering)

7.3.3.9.1 Definition

7.3.3.9.2 Conformance requirement

1> if the reconfiguration procedure is simultaneous with SRNS relocation procedure:

2> if the transmitted message is a RADIO BEARER RECONFIGURATION:

3> include the IE "New U-RNTI".

2> else:

3> include the IE "Downlink counter synchronisation info".

The UE shall:

1> if the received reconfiguration message is a RADIO BEARER RECONFIGURATION and the IE "New U-RNTI" is included:

2> re-establish RB2;

2> set the new uplink and downlink HFN component of COUNT-C of RB2 to MAX(uplink HFN component of COUNT-C of RB2, downlink HFN component of COUNT-C of RB2);

2> increment by one the downlink and uplink values of the HFN component of COUNT-C for RB2;

2> calculate the START value according to subclause 8.5.9;

2> include the calculated START values for each CN domain in the IE "START list" in the IE "Uplink counter synchronisation info".

1> if the variable PDCP_SN_INFO is not empty:

2> include the IE "RB with PDCP information list" and set it to the value of the variable PDCP_SN_INFO.

1> if the IE "Integrity protection mode info" was present in the received reconfiguration message:

2> start applying the new integrity protection configuration in the uplink for signalling radio bearer RB2 from and including the transmitted response message.

If the new state is CELL_DCH or CELL_FACH, the response message shall be transmitted using the new configuration after the state transition, and the UE shall:

1> if the received reconfiguration message is a RADIO BEARER RECONFIGURATION and the IE "New U-RNTI" is included:

2> when RLC has confirmed the successful transmission of the response message:

3> re-establish all AM and UM RLC entities with RB identities larger than 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the corresponding CN domain;

3> re-establish the RLC entities with RB identities 1, 3 and 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the CN domain stored in the variable LATEST_CONFIGURED_CN_DOMAIN;

3> set the remaining bits of the HFN component of COUNT-C values of all UM RLC entities to zero;

3> re-initialise the PDCP header compression entities of each radio bearer in the variable ESTABLISHED_RABS as specified in [36].

1> if the variable PDCP_SN_INFO is non-empty:

2> when RLC has confirmed the successful transmission of the response message:

3> for each radio bearer in the variable PDCP_SN_INFO:

4> if the IE "RB started" in the variable ESTABLISHED_RABS is set to "started":

5> configure the RLC entity for that radio bearer to "continue".

3> perform the actions below.

Reference

3GPP TS 25.331 clause 8.2.2.

7.3.3.9.3 Test purpose

1. To confirm that the UE performs a combined hard handover and SRNS relocation and then transmit a RADIO BEARER RECONFIGURATION COMPLETE message in the new cell.
2. In the case that ciphering is applied by the network, to confirm that the UE applies the new ciphering algorithm following a successful SRNS relocation.

7.3.3.9.4 Method of test

Initial Condition

System Simulator: 2 cells – Cell 1 and 2

UE: PS-DCCH+ DCH (state 6-7) as specified in clause 7.4 of TS 34.108, depending on the CN domain(s) supported by the UE.

Initial conditions message sequence

<table>
<tr><th rowspan="2">Step</th><th colspan="2">Direction</th><th rowspan="2">Message</th><th rowspan="2">Comment</th></tr>
<tr><th>UE</th><th>SS</th></tr>
<tr><td colspan="5">SS executes procedure Activate closed loop mode 1 in CELL_DCH case as specified in clause 7.3.1.2.1.4</td></tr>
</table>

Related ICS/IXIT statements

- Lossless SRNS relocation supported yes/no

- Support of RLC in-sequence delivery Yes/No

Specific Message Content

If network applies ciphering, the contents of SECURITY MODE COMMAND message in the initial condition set-up are identical to the same message sub-type found in [9] TS 34.108 clause 9, with the following exceptions:

Information Element	Value/remark
Ciphering mode info	
- Ciphering mode command	Start/restart
- Ciphering algorithm	UEA1
- Ciphering activation time for DPCH	Not Present
- Radio bearer downlink ciphering activation time info	
- Radio bearer activation time	
- RB identity	1
- RLC sequence number	Current RLC SN+2
- RB identity	2
- RLC sequence number	Current RLC SN+2
- RB identity	3
- RLC sequence number	Current RLC SN + 2
- RB identity	4
- RLC sequence number	Current RLC SN + 2

For RADIO BEARER SETUP message to be transmitted during P13 as specified in TS 34.108 clause 7.4, use the message titled "Packet to CELL_DCH from CELL_DCH in PS" as found in TS 34.108 clause 9, with the following exception.

Information Element	Value/remark
- PDCP info - Support for lossless SRNS relocation - Max PDCP SN window size	 TRUE sn65535
- PDCP PDU header	present

Test Procedure

Table 7.3.3.9

Parameter	Unit	Cell 1		Cell 2	
		T0	T1	T0	T1
UTRA RF Channel Number		Ch. 1		Ch. 1	
CPICH Ec (FDD)	dBm/3.84MHz	-60	-75	-75	-60

Table 7.3.3.9 illustrates the downlink power to be applied for the 2 cells at various time instants of the test execution. Columns marked "T0" denote the initial conditions.

The UE is in the CELL_DCH state, camping onto cell 1. If PS RAB has been established in the initial condition, SS initiates UE to enter loopback mode 1. If ciphering is supported a PDCP PDU has to be decided so that the ciphering activation time is elapsed. SS shall suspend the sending of PDCP PDUs and wait for the last PDCP PDU to be send back by the UE and then note the next PDCP SN for the next PDCP PDU. SS configures its downlink transmission power settings according to columns "T1" in table 7.3.3.9. The SS sends a RADIO BEARER RECONFIGURATION message on the downlink DCCH using AM RLC requesting the UE to do a handover combined with SRNS relocation. This message includes IE "RRC State Indicator" set to "CELL_DCH", IE "New U-RNTI" and IE "Integrity protection mode info". UE shall reselect to cell 2 and SS verifies that the UE sends RADIO BEARER RECONFIGURATION COMPLETE message. This message also includes a calculated new START value according to the formula "$START_X$' = MSB_{20} (MAX {COUNT-C, COUNT-I | radio bearers and signalling radio bearers using the most recently configured CK_X and IK_X}) + 2", calculated IE "Integrity Check Info" using a new FRESH value as included in IE "Integrity protection initialisation number" in IE "Integrity protection mode info" in RADIO BEARER SETUP message and COUNT-I that includes subsequent HFN as used in the old integrity protection configuration, and "Receive PDCP sequence number".

SS transmits UE CAPABILITY ENQUIRY message on the downlink DCCH using RLC-AM. The UE shall respond to downlink message with a UE CAPABILITY INFORMATION message on the uplink DCCH using RLC-AM. SS responds with UE CAPABILITY INFORMATION CONFIRM message. SS resumes the transmission of PDCP PDUs and checks that all transmitted PDCP PDUs are sent back by the UE.

Expected sequence

Step	Direction UE	Direction SS	Message	Comment
				The SS creates a TCP/IP packet without IP header compression (PDCP Data PDU).
1	←		PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet
1a				After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity.
1b				The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet
2a				After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
2b				The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU).
2c			Void	SS shall suspend the sending of PDCP PDUs and wait for the last PDCP PDU to be sent back by the UE and then note the next PDCP SN for the next PDCP PDU. SS applies the downlink transmission power settings, according to the values in columns "T1" of table 7.3.3.8.

3	←	RADIO BEARER RECONFIGURATION	If IE "Ciphering mode info" is present in the SECURITY MODE COMMAND during initial condition set-up, this message is sent after last ciphering activation time has elapsed and there is no pending ciphering activation time. IE "RB information to reconfigure" includes the next PCDP sequence number that SS is expected to receive from the UE. New integrity protection configuration is applied on DL SRB1. LAI and RAI of cell 2 are given to the UE, and are the same as cell 1.
4	→	RADIO BEARER RECONFIGURATION COMPLETE	The UE shall transmit this message after it reselects to cell 2. New calculated START value is included. IE "Receive PDCP sequence number" shall be included. New integrity protection configuration is applied on UL SRB2. If IE "Ciphering mode info" is present in step 3, new ciphering configuration is applied on UL SRB2 with the downlink and uplink values of the HFN component of COUNT-C for SRB2 is incremented by one.
5	←	UE CAPABILITY ENQUIRY	New integrity protection configuration is applied on DL SRB2. If IE "Ciphering mode info" is present in step 3, new ciphering configuration is applied on DL SRB2 with the same value as used in step 4.
6	→	UE CAPABILITY INFORMATION	SS confirms that new integrity protection configuration is applied on UL SRB2 by UE.
7	←	UE CAPABILITY INFORMATION CONFIRM	
8		Void	
9		Void	
			The SS creates a TCP/IP packet without IP header compression (PDCP Data PDU).
10	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet
11			After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity.

12			The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
13	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet
14			After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
15			The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU).
16			If IE "Ciphering mode info" is present in step 3, new ciphering configuration is applied on UL and DL RAB using the re-initialised COUNT-C HFN by the start value as stored in step 4.
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)			

Specific Message Contents

RADIO BEARER RECONFIGURATION for PS only UE (Step 3)

Use the same message sub-type found in [9] TS 34.108 clause 9, which is entitled "Packet to CELL_DCH from CELL_DCH in PS", with the following exception:

Information Element	Value/remark
Ciphering mode info	If network does not apply ciphering, set this IE to "Not present". If network applies ciphering, this IE present with the values of the sub IEs as stated below.
- Ciphering mode command	Start/restart
- Ciphering algorithm	UEA0
- Ciphering activation time for DPCH	Not Present
- Radio bearer downlink ciphering activation time info	
- Radio bearer activation time	
- RB identity	1
- RLC sequence number	Current RLC SN+2
- RB identity	2
- RLC sequence number	Current RLC SN+2
- RB identity	3
- RLC sequence number	Current RLC SN+2
- RB identity	4
- RLC sequence number	Current RLC SN+2
- RB identity	20
- RLC sequence number	Current RLC SN+2
Integrity protection mode info - Integrity protection mode command - Downlink integrity protection activation info - Integrity protection algorithm - Integrity protection initialisation number	 Start Not Present UIA1 SS selects an arbitrary 32 bits number for FRESH
New U-RNTI - SRNC identity - S-RNTI	 0000 0000 0010B 0000 0000 0000 0000 0001B
CN Information info - PLMN identity - CN common GSM-MAP NAS system information - GSM-MAP NAS system information - CN domain related information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information	 Not present 00 01H PS 05 00H CS 1E 01H
RB information to reconfigure list - RB information to reconfigure - RB identity - PDCP info - PDCP SN info - RLC info - CHOICE Uplink RLC mode - Transmission RLC discard - SDU discard mode - MAX_DAT - Transmission window size - Timer_RST - Max_RST - Polling info - Timer_poll_prohibit - Timer_poll - Poll_PDU - Poll_SDU - Last transmission PDU poll - Last retransmission PDU poll - Poll_Window - Timer_poll_periodic - CHOICE Downlink RLC mode - In-sequence delivery - Receiving window size - Downlink RLC status info - Timer_status_prohibit - Timer_EPC	 (AM DCCH for RRC) 2 Not Present Not Present AM RLC No discard 15 128 400 4 150 150 Not present 1 TRUE TRUE 99 Not Present AM RLC TRUE 128 200 Not present

- Missing PDU indicator	TRUE
- Timer_STATUS_periodic	400
- RB mapping info	Not Present
- RB stop/continue	Not Present
- RB information to reconfigure	(AM DCCH for NAS_DT High priority)
- RB identity	3
- PDCP info	Not Present
- PDCP SN info	Not Present
- RLC info	
- CHOICE Uplink RLC mode	AM RLC
- Transmission RLC discard	
- SDU discard mode	No discard
- MAX_DAT	15
- Transmission window size	128
- Timer_RST	400
- Max_RST	4
- Polling info	
- Timer_poll_prohibit	150
- Timer_poll	150
- Poll_PDU	Not present
- Poll_SDU	1
- Last transmission PDU poll	TRUE
- Last retransmission PDU poll	TRUE
- Poll_Window	99
- Timer_poll_periodic	Not Present
- CHOICE Downlink RLC mode	AM RLC
- In-sequence delivery	TRUE
- Receiving window size	128
- Downlink RLC status info	
- Timer_status_prohibit	200
- Timer_EPC	Not present
- Missing PDU indicator	TRUE
- Timer_STATUS_periodic	400
- RB mapping info	Not Present
- RB stop/continue	Not Present
- RB information to reconfigure	(AM DCCH for NAS_DT Low priority)
- RB identity	4
- PDCP info	Not Present
- PDCP SN info	Not Present
- RLC info	
- CHOICE Uplink RLC mode	AM RLC
- Transmission RLC discard	
- SDU discard mode	No discard
- MAX_DAT	15
- Transmission window size	128
- Timer_RST	400
- Max_RST	4
- Polling info	
- Timer_poll_prohibit	150
- Timer_poll	150
- Poll_PDU	Not present
- Poll_SDU	1
- Last transmission PDU poll	TRUE
- Last retransmission PDU poll	TRUE
- Poll_Window	99
- Timer_poll_periodic	Not Present
- CHOICE Downlink RLC mode	AM RLC
- In-sequence delivery	TRUE
- Receiving window size	128
- Downlink RLC status info	
- Timer_status_prohibit	200
- Timer_EPC	Not Present
- Missing PDU indicator	TRUE
- Timer_STATUS_periodic	400
- RB mapping info	Not Present
- RB stop/continue	Not Present
- RB information to reconfigure	(AM DTCH)
- RB identity	20

- PDCP info	
- Support for lossless SRNS relocation	TRUE
- Max PDCP SN window size	sn65535
- PDCP PDU header	Present
- Header compression information	Not present
- PDCP SN info	The next PCDP sequence number that SS is expected to receive from the UE
- RLC info	
- CHOICE Uplink RLC mode	AM RLC
- Transmission RLC discard	
- SDU discard mode	No discard
- MAX_DAT	15
- Transmission window size	128
- Timer_RST	400
- Max_RST	4
- Polling info	
- Timer_poll_prohibit	150
- Timer_poll	150
- Poll_PDU	Not Present
- Poll_SDU	1
- Last transmission PDU poll	TRUE
- Last retransmission PDU poll	TRUE
- Poll_Window	99
- Timer_poll_periodic	Not Present
- CHOICE Downlink RLC mode	AM RLC
- In-sequence delivery	TRUE
- Receiving window size	128
- Downlink RLC status info	
- Timer_status_prohibit	200
- Timer_EPC	Not Present
- Missing PDU indicator	TRUE
- Timer_STATUS_periodic	400
- RB mapping info	Not Present
- RB stop/continue	Not Present
Downlink information for each radio links - Primary CPICH info - Primary Scrambling Code	 Set to same code as used for cell 2

RADIO BEARER RECONFIGURATION for CS only UE (Step 3)

Use the same message sub-type found in [9] TS 34.108 clause 9, which is entitled “Speech in CS” or “Non speech in CS”, with the following exception:

Information Element	Value/remark
Ciphering mode info	If network does not apply ciphering, set this IE to "Not present". If network applies ciphering, this IE present with the values of the sub IEs as stated below.
- Ciphering mode command	Start/restart
- Ciphering algorithm	UEA1
- Ciphering activation time for DPCH	(256+CFN-(CFN MOD 8 + 8))MOD 256
- Radio bearer downlink ciphering activation time info	
- Radio bearer activation time	
- RB identity	1
- RLC sequence number	Current RLC SN+2
- RB identity	2
- RLC sequence number	Current RLC SN+2
- RB identity	3
- RLC sequence number	Current RLC SN+2
- RB identity	4
- RLC sequence number	Current RLC SN+2
Integrity protection mode info - Integrity protection mode command - Downlink integrity protection activation info - Integrity protection algorithm - Integrity protection initialisation number	 Start Not Present UIA1 SS selects an arbitrary 32 bits number for FRESH
New U-RNTI - SRNC identity - S-RNTI	 0000 0000 0010B 0000 0000 0000 0000 0001B
CN Information info - PLMN identity - CN common GSM-MAP NAS system information - GSM-MAP NAS system information - CN domain related information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information	 Not present 00 01H PS 05 00H CS 1E 01H
RB information to reconfigure list - RB information to reconfigure - RB identity - PDCP info - PDCP SN info - RLC info - CHOICE Uplink RLC mode - Transmission RLC discard - SDU discard mode - MAX_DAT - Transmission window size - Timer_RST - Max_RST - Polling info - Timer_poll_prohibit - Timer_poll - Poll_PDU - Poll_SDU - Last transmission PDU poll - Last retransmission PDU poll - Poll_Window - Timer_poll_periodic - CHOICE Downlink RLC mode - In-sequence delivery - Receiving window size - Downlink RLC status info - Timer_status_prohibit - Timer_EPC - Missing PDU indicator - Timer_STATUS_periodic	 (AM DCCH for RRC) 2 Not Present Not Present AM RLC No discard 15 128 400 4 150 150 Not present 1 TRUE TRUE 99 Not Present AM RLC TRUE 128 200 Not present TRUE 400

- RB mapping info	Not Present
- RB stop/continue	Not Present
- RB information to reconfigure	(AM DCCH for NAS_DT High priority)
- RB identity	3
- PDCP info	Not Present
- PDCP SN info	Not Present
- RLC info	
- CHOICE Uplink RLC mode	AM RLC
- Transmission RLC discard	
- SDU discard mode	No discard
- MAX_DAT	15
- Transmission window size	128
- Timer_RST	400
- Max_RST	4
- Polling info	
- Timer_poll_prohibit	150
- Timer_poll	150
- Poll_PDU	Not present
- Poll_SDU	1
- Last transmission PDU poll	TRUE
- Last retransmission PDU poll	TRUE
- Poll_Window	99
- Timer_poll_periodic	Not Present
- CHOICE Downlink RLC mode	AM RLC
- In-sequence delivery	TRUE
- Receiving window size	128
- Downlink RLC status info	
- Timer_status_prohibit	200
- Timer_EPC	Not present
- Missing PDU indicator	TRUE
- Timer_STATUS_periodic	400
- RB mapping info	Not Present
- RB stop/continue	Not Present
- RB information to reconfigure	(AM DCCH for NAS_DT Low priority)
- RB identity	4
- PDCP info	Not Present
- PDCP SN info	Not Present
- RLC info	
- CHOICE Uplink RLC mode	AM RLC
- Transmission RLC discard	
- SDU discard mode	No discard
- MAX_DAT	15
- Transmission window size	128
- Timer_RST	400
- Max_RST	4
- Polling info	
- Timer_poll_prohibit	150
- Timer_poll	150
- Poll_PDU	Not present
- Poll_SDU	1
- Last transmission PDU poll	TRUE
- Last retransmission PDU poll	TRUE
- Poll_Window	99
- Timer_poll_periodic	Not Present
- CHOICE Downlink RLC mode	AM RLC
- In-sequence delivery	TRUE
- Receiving window size	128
- Downlink RLC status info	
- Timer_status_prohibit	200
- Timer_EPC	Not Present
- Missing PDU indicator	TRUE
- Timer_STATUS_periodic	400
- RB mapping info	Not Present
- RB stop/continue	Not Present
Downlink information for each radio links	
- Primary CPICH info	
- Primary Scrambling Code	Set to same code as used for cell 2

RADIO BEARER RECONFIGURATION COMPLETE for PS only UE (Step 4)

Check that the UE uses the same message sub-type found in TS 34.108 clause 9, with the following exception.

Information Element	Value/remark
Uplink counter synchronisation info	
- RB with PDCP information list	This IE is checked
- RB with PDCP information	
- RB identity	20
- PDCP SN info	Check that the PCDP sequence number is the next sequence number that SS would transmit to the UE.
- START list	Check that this IE is present.

RADIO BEARER RECONFIGURATION COMPLETE for CS only UE (Step 4)

Check that the UE uses the same message sub-type found in TS 34.108 clause 9, with the following exception.

Information Element	Value/remark
Uplink counter synchronisation info	
- RB with PDCP information list	Not present
- START list	Check that this IE is present.

Content of PDCP Data PDUs used for entire test case

Information Element	Value/remark
PDU type	000
PID	00000 (No header compression, PID = 0)
Data	PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

UE CAPABILITY ENQUIRY (Step 5)

Use the same message sub-type found in [9] TS 34.108 clause 9.

UE CAPABILITY INFORMATION (Step 6)

Check that the UE uses the same message sub-type found in TS 34.108 clause 9.

UE CAPABILITY INFORMATION CONFIRM (Step 7)

Use the same message sub-type found in [9] TS 34.108 clause 9.

7.3.3.9.5 Test requirement

After step 1, UE shall transmit back all the PDCP PDUs sent by the SS to the UE.

After step 3, the UE shall transmit a RADIO BEARER RECONFIGURATION COMPLETE message on the uplink DCCH using AM RLC which includes which includes a calculated new START value according to the formula "$START_X' = MSB_{20}$ (MAX {COUNT-C, COUNT-I | radio bearers and signalling radio bearers using the most recently configured CK_X and IK_X}) + 2", calculated IE "Integrity Check Info" using the new FRESH value as included in IE "Integrity protection initialisation number" in IE "Integrity protection mode info" in RADIO BEARER RECONFIGURATION message and COUNT-I that includes subsequent HFN as used in the old integrity protection configuration. This message shall also include IE "Receive PDCP sequence number" for RB#20.

After step 5, the UE shall respond with a UE CAPABILITY INFORMATION message to SS.

After step 9, UE shall start transmission on the RAB beginning with the PDCP SN equal to that included in the RADIO BEARER RECONFIGURATION COMPLETE message.

7.3.3.10 Radio Bearer Release for transition from CELL_DCH to CELL_DCH: Success (Lossless SRNS relocation) (without pending of ciphering)

7.3.3.10.1 Definition

7.3.3.10.2 Conformance requirement

1> if the reconfiguration procedure is simultaneous with SRNS relocation procedure:

2> if the transmitted message is a RADIO BEARER RECONFIGURATION:

3> include the IE "New U-RNTI".

2> else:

3> include the IE "Downlink counter synchronisation info".

The UE shall:

1> if the received reconfiguration message included the IE "Downlink counter synchronisation info";

2> re-establish RB2;

2> set the new uplink and downlink HFN component of COUNT-C of RB2 to MAX(uplink HFN component of COUNT-C of RB2, downlink HFN component of COUNT-C of RB2);

2> increment by one the downlink and uplink values of the HFN component of COUNT-C for RB2;

2> calculate the START value according to subclause 8.5.9;

2> include the calculated START values for each CN domain in the IE "START list" in the IE "Uplink counter synchronisation info".

1> if the variable PDCP_SN_INFO is not empty:

2> include the IE "RB with PDCP information list" and set it to the value of the variable PDCP_SN_INFO.

1> if the IE "Integrity protection mode info" was present in the received reconfiguration message:

2> start applying the new integrity protection configuration in the uplink for signalling radio bearer RB2 from and including the transmitted response message.

If the new state is CELL_DCH or CELL_FACH, the response message shall be transmitted using the new configuration after the state transition, and the UE shall:

1> if the IE "Downlink counter synchronisation info" was included in the reconfiguration message;

2> when RLC has confirmed the successful transmission of the response message:

3> re-establish all AM and UM RLC entities with RB identities larger than 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the corresponding CN domain;

3> re-establish the RLC entities with RB identities 1, 3 and 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the CN domain stored in the variable LATEST_CONFIGURED_CN_DOMAIN;

3> set the remaining bits of the HFN component of COUNT-C values of all UM RLC entities to zero;

3> re-initialise the PDCP header compression entities of each radio bearer in the variable ESTABLISHED_RABS as specified in [36].

1> if the variable PDCP_SN_INFO is non-empty:

2> when RLC has confirmed the successful transmission of the response message:

3> for each radio bearer in the variable PDCP_SN_INFO:

4> if the IE "RB started" in the variable ESTABLISHED_RABS is set to "started":

5> configure the RLC entity for that radio bearer to "continue".

3> perform the actions below.

Reference

3GPP TS 25.331 clause 8.2.2.

7.3.3.10.3 Test purpose

To confirm that the UE performs a combined hard handover and SRNS relocation and then transmit a RADIO BEARER RELEASE COMPLETE message in the new cell.

7.3.3.10.4 Method of test

Initial Condition

System Simulator: 2 cells – Cell 1 and 2

UE: PS -DCCH _DCH (state 6-7) or PS-DCCH_FACH (state 6-8) as specified in clause 7.4 of TS 34.108, depending on the CN domain(s) supported by the UE.

Initial conditions message sequence

Step	Direction		Message	Comment
	UE	SS		
SS executes procedure Activate closed loop mode 1 in CELL_DCH or CELL_FACH–as specified in clause 7.3.1.2.1.4				
1a			SS executes procedure P21 (clause 7.4.2.1.2 of TS 34.108)	(PS+PS DCCH+DTCH_DCH)
1b			SS executes procedure P23 (clause 7.4.2.1.2 of TS 34.108)	(PS+CS DCCH+DTCH_DCH)

NOTE: depending on CN domain(s) supported, either step 1a or step 1b shall be executed in order to reach the final initial condition state for this test case.

Related ICS/IXIT statements

- Lossless SRNS relocation supported yes/no

- Support of RLC in-sequence delivery Yes/No

Specific Message Content

If network applies ciphering, the contents of SECURITY MODE COMMAND message in the initial condition set-up are identical to the same message sub-type found in [9] TS 34.108 clause 9, with the following exceptions:

Information Element	Value/remark
Ciphering mode info	
- Ciphering mode command	Start/restart
- Ciphering algorithm	UEA1
- Ciphering activation time for DPCH	Not Present
- Radio bearer downlink ciphering activation time info	
- Radio bearer activation time	
- RB identity	1
- RLC sequence number	Current RLC SN+2
- RB identity	2
- RLC sequence number	Current RLC SN+2
- RB identity	3
- RLC sequence number	Current RLC SN + 2
- RB identity	4
- RLC sequence number	Current RLC SN + 2

For RADIO BEARER SETUP message to be transmitted during P13 as specified in TS 34.108 clause 7.4, use the message titled “Packet to CELL_DCH from CELL_DCH in PS” as found in TS 34.108 clause 9, with the following exception.

Information Element	Value/remark
- PDCP info	
- Support for lossless SRNS relocation	TRUE
- Max PDCP SN window size	sn65535
- PDCP PDU header	present

Test Procedure

Table 7.3.3.10

Parameter	Unit	Cell 1		Cell 2	
		T0	T1	T0	T1
UTRA RF Channel Number		Ch. 1		Ch. 1	
CPICH Ec (FDD)	dBm/3.84MHz	-60	-75	-75	-60

Table 7.3.3.10 illustrates the downlink power to be applied for the 2 cells at various time instants of the test execution. Columns marked "T0" denote the initial conditions.

The UE is in the CELL_DCH state, camping onto cell 1. If PS RAB has been established in the initial condition, SS initiates UE to enter loopback mode 1 and sends a PDCP PDUs on the RAB. If ciphering is supported, a PDCP PDU has to be decided so that the ciphering activation time is elapsed. SS shall suspend the sending of PDCP PDUs and wait for the last PDCP PDU to be send back by the UE and then note the next PDCP SN for the next PDCP PDU. SS configures its downlink transmission power settings according to columns "T1" in table 7.3.3.10. The SS sends a RADIO BEARER RELEASE message on the downlink DCCH using AM RLC requesting the UE to do a handover combined with SRNS relocation. This message includes IE "RRC State Indicator" set to "CELL_DCH", IE “Downlink counter synchronisation info” and IE “Integrity protection mode info”. UE shall reselect to cell 2 and SS verifies that the UE sends RADIO BEARER RELEASE COMPLETE message. This message also includes a calculated new START value according to the formula “$START_X' = MSB_{20}$ (MAX {COUNT-C, COUNT-I | radio bearers and signalling radio bearers using the most recently configured CK_X and IK_X}) + 2”, calculated IE ”Integrity Check Info” using a new FRESH value as included in IE “Integrity protection initialisation number” in IE “Integrity protection mode info” in RADIO BEARER RELEASE message and COUNT-I that includes subsequent HFN as used in the old integrity protection configuration, and “Receive PDCP sequence number”.

SS transmits UE CAPABILITY ENQUIRY message on the downlink DCCH using RLC-AM. The UE shall respond to downlink message with a UE CAPABILITY INFORMATION message on the uplink DCCH using RLC-AM. SS resumes the transmission of PDCP PDUs and checks that all transmitted PDCP PDUs are sent back by the UE.

Expected sequence

Step	Direction UE	SS	Message	Comment
				The SS creates a TCP/IP packet without IP header compression (PDCP Data PDU).
1	←		PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet
1a				After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity.
1b				The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet
2a				After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
2b				The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU).
2c			Void	SS shall suspend the sending of PDCP PDUs and wait for the last PDCP PDU to be sent back by the UE and then note the next PDCP SN for the next PDCP PDU. SS applies the downlink transmission power settings, according to the values in columns "T1" of table 7.3.3.10

3	←	RADIO BEARER RELEASE	This message is sent after last ciphering activation time has elapsed and there is no pending ciphering activation time. IE "RB information to reconfigure" includes the next PCDP sequence number that SS is expected to receive from the UE. New integrity protection configuration is applied on DL SRB1. LAI and RAI of cell 2 are given to the UE, and are the same as cell 1.
4	→	RADIO BEARER RELEASE COMPLETE	The UE shall transmit this message after it reselects to cell 2. New calculated START value is included. IE "Receive PDCP sequence number" shall be included. New integrity protection configuration is applied on UL SRB2.
5	←	UE CAPABILITY ENQUIRY	New integrity protection configuration is applied on DL SRB2.
6	→	UE CAPABILITY INFORMATION	SS confirms that new integrity protection configuration is applied on UL SRB2 by UE.
7	←	UE CAPABILITY INFORMATION CONFIRM	
8		Void	
9		Void	
			The SS creates a TCP/IP packet without IP header compression PDCP Data PDU).
10	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet
11			After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity.
12			The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
13	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet

14			After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
15			The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU).
16		Void	
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)			

Specific Message Contents

RADIO BEARER RELEASE for PS only UE (Step 3)

Use the same message sub-type found in [9] TS 34.108 clause 9, which is entitled “Packet to CELL_DCH from CELL_DCH in PS”, with the following exception:

Information Element	Value/remark
Ciphering mode info	Not present
Integrity protection mode info - Integrity protection mode command - Downlink integrity protection activation info - Integrity protection algorithm - Integrity protection initialisation number	 Start Not Present UIA1 SS selects an arbitrary 32 bits number for FRESH
New U-RNTI - SRNC identity - S-RNTI	 0000 0000 0010B 0000 0000 0000 0000 0001B
CN Information info - PLMN identity - CN common GSM-MAP NAS system information - GSM-MAP NAS system information - CN domain related information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information	 Not present 00 01H PS 05 00H CS 1E 01H
RB information to release - RB identity	 18
Downlink counter synchronisation info - RB with PDCP information list - RB with PDCP information - RB identity - PDCP SN info	 This IE is included 20 The next PCDP sequence number that SS is expected to receive from the UE.
Downlink information for each radio links - Primary CPICH info - Primary Scrambling Code	 Set to same code as used for cell 2

RADIO BEARER RELEASE for CS only UE (Step 3)

Use the same message sub-type found in [9] TS 34.108 clause 9, which is entitled “Packet to CELL_DCH from CELL_DCH in PS”, with the following exception:

Information Element	Value/remark
Ciphering mode info	Not present
Integrity protection mode info - Integrity protection mode command - Downlink integrity protection activation info - Integrity protection algorithm - Integrity protection initialisation number	 Start Not Present UIA1 SS selects an arbitrary 32 bits number for FRESH
New U-RNTI - SRNC identity - S-RNTI	 0000 0000 0010B 0000 0000 0000 0000 0001B
CN Information info - PLMN identity - CN common GSM-MAP NAS system information - GSM-MAP NAS system information - CN domain related information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information	 Not present 00 01H PS 05 00H CS 1E 01H
RB information to release - RB identity	 13
Downlink counter synchronisation info - RB with PDCP information list	 Not present
Downlink information for each radio links - Primary CPICH info - Primary Scrambling Code	 Set to same code as used for cell 2

RADIO BEARER RELEASE COMPLETE for PS only UE (Step 4)

Check that the UE uses the same message sub-type found in TS 34.108 clause 9, with the following exception.

Information Element	Value/remark
Uplink counter synchronisation info - RB with PDCP information list - RB with PDCP information - RB identity - PDCP SN info - START list	 This IE is checked 20 Check that the PCDP sequence number is the next sequence number that SS would transmit to the UE. Check that this IE is present.

RADIO BEARER RELEASE COMPLETE for CS only UE (Step 4)

Check that the UE uses the same message sub-type found in TS 34.108 clause 9, with the following exception.

Information Element	Value/remark
Uplink counter synchronisation info - RB with PDCP information list - START list	 Not present Check that this IE is present.

Content of PDCP Data PDUs used for entire test case

Information Element	Value/remark
PDU type PID Data	000 00000 (No header compression, PID = 0) PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

UE CAPABILITY ENQUIRY (Step 5)

Use the same message sub-type found in [9] TS 34.108 clause 9.

UE CAPABILITY INFORMATION (Step 6)

Check that the UE uses the same message sub-type found in TS 34.108 clause 9.

UE CAPABILITY INFORMATION CONFIRM (Step 7)

Use the same message sub-type found in [9] TS 34.108 clause 9.

7.3.3.10.5 Test requirement

After step 1, UE shall transmit back all the PDCP PDUs sent by the SS to the UE.

After step 3, the UE shall transmit a RADIO BEARER RELEASE COMPLETE message on the uplink DCCH using AM RLC which includes which includes a calculated new START value according to the formula " $START_X' = MSB_{20}$ (MAX {COUNT-C, COUNT-I | radio bearers and signalling radio bearers using the most recently configured CK_X and IK_X}) + 2", calculated IE "Integrity Check Info" using the new FRESH value as included in IE "Integrity protection initialisation number" in IE "Integrity protection mode info" in RADIO BEARER RELEASE message and COUNT-I that includes subsequent HFN as used in the old integrity protection configuration. This message shall also include IE "Receive PDCP sequence number" for RB#20.

After step 5, the UE shall respond with a UE CAPABILITY INFORMATION message to SS.

After step 9, UE shall start transmission on the RAB beginning with the PDCP SN equal to that included in the RADIO BEARER RELEASE COMPLETE message.

7.3.3.11 Transport Channel Reconfiguration for transition from CELL_DCH to CELL_DCH: Success (Lossless SRNS relocation) (without pending of ciphering)

7.3.3.11.1 Definition

7.3.3.11.2 Conformance requirement

1> if the reconfiguration procedure is simultaneous with SRNS relocation procedure:

  2> if the transmitted message is a RADIO BEARER RECONFIGURATION:

    3> include the IE "New U-RNTI".

  2> else:

    3> include the IE "Downlink counter synchronisation info".

The UE shall:

1> if the received reconfiguration message included the IE "Downlink counter synchronisation info"; or

  2> re-establish RB2;

  2> set the new uplink and downlink HFN component of COUNT-C of RB2 to MAX(uplink HFN component of COUNT-C of RB2, downlink HFN component of COUNT-C of RB2);

  2> increment by one the downlink and uplink values of the HFN component of COUNT-C for RB2;

  2> calculate the START value according to subclause 8.5.9;

  2> include the calculated START values for each CN domain in the IE "START list" in the IE "Uplink counter synchronisation info".

1> if the variable PDCP_SN_INFO is not empty:

  2> include the IE "RB with PDCP information list" and set it to the value of the variable PDCP_SN_INFO.

1> if the IE "Integrity protection mode info" was present in the received reconfiguration message:

  2> start applying the new integrity protection configuration in the uplink for signalling radio bearer RB2 from and including the transmitted response message.

If the new state is CELL_DCH or CELL_FACH, the response message shall be transmitted using the new configuration after the state transition, and the UE shall:

1> if the IE "Downlink counter synchronisation info" was included in the reconfiguration message; or

2> when RLC has confirmed the successful transmission of the response message:

3> re-establish all AM and UM RLC entities with RB identities larger than 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the corresponding CN domain;

3> re-establish the RLC entities with RB identities 1, 3 and 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the CN domain stored in the variable LATEST_CONFIGURED_CN_DOMAIN;

3> set the remaining bits of the HFN component of COUNT-C values of all UM RLC entities to zero;

3> re-initialise the PDCP header compression entities of each radio bearer in the variable ESTABLISHED_RABS as specified in [36].

1> if the variable PDCP_SN_INFO is non-empty:

2> when RLC has confirmed the successful transmission of the response message:

3> for each radio bearer in the variable PDCP_SN_INFO:

4> if the IE "RB started" in the variable ESTABLISHED_RABS is set to "started":

5> configure the RLC entity for that radio bearer to "continue".

3> perform the actions below.

Reference

3GPP TS 25.331 clause 8.2.2.

7.3.3.11.3 Test purpose

To confirm that the UE performs a combined hard handover and SRNS relocation and then transmit a TRANSPORT CHANNEL RECONFIGURATION COMPLETE message in the new cell.

7.3.3.11.4 Method of test

Initial Condition

System Simulator: 2 cells – Cell 1 and 2

UE: PS-DCCH _DCH (state 6-7) as specified in clause 7.4 of TS 34.108, depending on the CN domain(s) supported by the UE.

Initial conditions message sequence

Step	Direction		Message	Comment
	UE	SS		
SS executes procedure Activate closed loop mode 1 in CELL_DCH case as specified in clause 7.3.1.2.1.4				

Related ICS/IXIT statements

- Lossless SRNS relocation supported yes/no

- Support of RLC in-sequence delivery Yes/No

Specific Message Content

If network applies ciphering, the contents of SECURITY MODE COMMAND message in the initial condition set-up are identical to the same message sub-type found in [9] TS 34.108 clause 9, with the following exceptions:

Information Element	Value/remark
Ciphering mode info	
- Ciphering mode command	Start/restart
- Ciphering algorithm	UEA1
- Ciphering activation time for DPCH	Not Present
- Radio bearer downlink ciphering activation time info	
- Radio bearer activation time	
- RB identity	1
- RLC sequence number	Current RLC SN+2
- RB identity	2
- RLC sequence number	Current RLC SN+2
- RB identity	3
- RLC sequence number	Current RLC SN + 2
- RB identity	4
- RLC sequence number	Current RLC SN + 2

For RADIO BEARER SETUP message to be transmitted during P13 as specified in TS 34.108 clause 7.4, use the message titled “Packet to CELL_DCH from CELL_DCH in PS” as found in TS 34.108 clause 9, with the following exception.

Information Element	Value/remark
- PDCP info	
- Support for lossless SRNS relocation	TRUE
- Max PDCP SN window size	sn65535
- PDCP PDU header	present

Test Procedure

Table 7.3.3.11

Parameter	Unit	Cell 1		Cell 2	
		T0	T1	T0	T1
UTRA RF Channel Number		Ch. 1		Ch. 1	
CPICH Ec (FDD)	dBm/3.84MHz	-60	-75	-75	-60

Table 7.3.3.11 illustrates the downlink power to be applied for the 2 cells at various time instants of the test execution. Columns marked "T0" denote the initial conditions.

The UE is in the CELL_DCH state, camping onto cell 1. If PS RAB has been established in the initial condition, SS initiates UE to enter loopback mode 1 and sends a PDCP PDU on the RAB. If ciphering is supported, a PDCP PDU has to be decided so that the ciphering activation time is elapsed. SS shall suspend the sending of PDCP PDUs and wait for the last PDCP PDU to be send back by the UE and then note the next PDCP SN for the next PDCP PDU. SS configures its downlink transmission power settings according to columns "T1" in table 7.3.3.11. The SS sends a TRANSPORT CHANNEL RECONFIGURATION message requesting the UE to do a handover combined with SRNS relocation. This message includes IE "RRC State Indicator" set to "CELL_DCH", IE "Downlink counter synchronisation info" and IE "Integrity protection mode info". UE shall reselect to cell 2 and SS verifies that the UE sends TRANSPORT CHANNEL RECONFIGURATION COMPLETE message. This message also includes a calculated new START value according to the formula "$START_X$' = MSB_{20} (MAX {COUNT-C, COUNT-I | radio bearers and signalling radio bearers using the most recently configured CK_X and IK_X}) + 2", calculated IE "Integrity Check Info" using a new FRESH value as included in IE "Integrity protection initialisation number" in IE "Integrity protection mode info" in TRANSPORT CHANNEL RECONFIGURATION message and COUNT-I that includes subsequent HFN as used in the old integrity protection configuration, and "Receive PDCP sequence number".

SS transmits UE CAPABILITY ENQUIRY message on the downlink DCCH using RLC-AM. The UE shall respond to downlink message with a UE CAPABILITY INFORMATION message on the uplink DCCH using RLC-AM. SS resumes the transmission of PDCP PDUs and checks that all transmitted PDCP PDUs are sent back by the UE.

Expected sequence

Step	Direction		Message	Comment
	UE	SS		
				The SS creates a TCP/IP packet without IP header compression (PDCP Data PDU).
1	←		PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet
1a				After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity.
1b				The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet
2a				After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
2b				The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU).
2c			Void	SS shall suspend the sending of PDCP PDUs and wait for the last PDCP PDU to be sent back by the UE and then note the next PDCP SN for the next PDCP PDU. SS applies the downlink transmission power settings, according to the values in columns "T1" of 7.3.3.11.
3	←		TRANSPORT CHANNEL RECONFIGURATION	This message is sent after last ciphering activation time has elapsed and there is no pending ciphering activation time. IE “RB information to reconfigure” includes the next PCDP sequence number that SS is expected to receive from the UE. New integrity protection configuration is applied on DL SRB1. LAI and RAI of cell 2 are given to the UE, and are the same as cell 1.

4	→	TRANSPORT CHANNEL RECONFIGURATION COMPLETE	The UE shall transmit this message after it reselects to cell 2. New calculated START value is included. IE "Receive PDCP sequence number" shall be included. New integrity protection configuration is applied on UL SRB2.
5	←	UE CAPABILITY ENQUIRY	New integrity protection configuration is applied on DL SRB2.
6	→	UE CAPABILITY INFORMATION	SS confirms that new integrity protection configuration is applied on UL SRB2 by UE.
7	←	UE CAPABILITY INFORMATION CONFIRM	
8		Void	
9		Void	
			The SS creates a TCP/IP packet without IP header compression (PDCP Data PDU).
10	←	PDCP Data	The SS sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content to the UE: PDU type = 000 (PDCP Data PDU) PID = 0 (uncompressed IP header) data: below described TCP/IP packet
11			After having received the PDCP Data PDU, the UE decodes the PDU and recognizes PID value = 0 (no IP header compression) Therefore, no IP header decompression is applied for this packet. The data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity.
12			The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
13	→	PDCP Data	The UE sends a PDCP Data PDU using the RLC-AM-Data-Request Primitive with the following content back to the SS: data: previously received TCP/IP packet
14			After reception of this TCP/IP data packet, the SS applies the appropriate decoding function for the received data
15			The SS creates a UDP/IP packet without IP header compression (PDCP Data PDU).
16		Void	
Deactivate a UE terminated PS session using IP Header compression (using UE test loop mode 1)			

Specific Message Contents

TRANSPORT CHANNEL RECONFIGURATION for PS only UE (Step 3)

Use the same message sub-type found in [9] TS 34.108 clause 9, which is entitled "Packet to CELL_DCH from CELL_DCH in PS", with the following exception:

Information Element	Value/remark
Ciphering mode info	Not present.
Integrity protection mode info - Integrity protection mode command - Downlink integrity protection activation info - Integrity protection algorithm - Integrity protection initialisation number	 Start Not Present UIA1 SS selects an arbitrary 32 bits number for FRESH
New U-RNTI - SRNC identity - S-RNTI	 0000 0000 0010B 0000 0000 0000 0000 0001B
CN Information info - PLMN identity - CN common GSM-MAP NAS system information - GSM-MAP NAS system information - CN domain related information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information	 Not present 00 01H PS 05 00H CS 1E 01H
Downlink counter synchronisation info - RB with PDCP information list - RB with PDCP information - RB identity - PDCP SN info	 This IE is included. 20 The next PCDP sequence number that SS is expected to receive from the UE.
Downlink information for each radio links - Primary CPICH info - Primary Scrambling Code	 Set to same code as used for cell 2

TRANSPORT CHANNEL RECONFIGURATION for CS only UE (Step 3)

Use the same message sub-type found in [9] TS 34.108 clause 9, which is entitled "Speech in CS" or "Non speech in CS", with the following exception:

Information Element	Value/remark
Ciphering mode info	Not present.
Integrity protection mode info - Integrity protection mode command - Downlink integrity protection activation info - Integrity protection algorithm - Integrity protection initialisation number	 Start Not Present UIA1 SS selects an arbitrary 32 bits number for FRESH
New U-RNTI - SRNC identity - S-RNTI	 0000 0000 0010B 0000 0000 0000 0000 0001B
CN Information info - PLMN identity - CN common GSM-MAP NAS system information - GSM-MAP NAS system information - CN domain related information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information - CN domain identity - CN domain specific NAS system information - GSM-MAP NAS system information	 Not present 00 01H PS 05 00H CS 1E 01H
Downlink counter synchronisation info - RB with PDCP information list	 Not present
Downlink information for each radio links - Primary CPICH info - Primary Scrambling Code	 Set to same code as used for cell 2

TRANSPORT CHANNEL RECONFIGURATION COMPLETE for PS only UE (Step 4)

Check that the UE uses the same message sub-type found in TS 34.108 clause 9, with the following exception.

Information Element	Value/remark
Uplink counter synchronisation info - RB with PDCP information list - RB with PDCP information - RB identity - PDCP SN info - START list	 This IE is checked 20 Check that the PCDP sequence number is the next sequence number that SS would transmit to the UE. Check that this IE is present.

TRANSPORT CHANNEL RECONFIGURATION COMPLETE for CS only UE (Step 4)

Check that the UE uses the same message sub-type found in TS 34.108 clause 9, with the following exception.

Information Element	Value/remark
Uplink counter synchronisation info - RB with PDCP information list - START list	 Not present Check that this IE is present.

Content of PDCP Data PDUs used for entire test case

Information Element	Value/remark
PDU type PID Data	000 00000 (No header compression, PID = 0) PDCP test data type #1: TCP/IP data packet without IP header compression with any data content. The data shall be limited to 1500 bytes.

UE CAPABILITY ENQUIRY (Step 5)

Use the same message sub-type found in [9] TS 34.108 clause 9.

UE CAPABILITY INFORMATION (Step 6)

Check that the UE uses the same message sub-type found in TS 34.108 clause 9.

UE CAPABILITY INFORMATION CONFIRM (Step 7)

Use the same message sub-type found in [9] TS 34.108 clause 9.

7.3.3.11.5 Test requirement

After step 1, UE shall transmit back all the PDCP PDUs sent by the SS to the UE.

After step 3, the UE shall transmit a TRANSPORT CHANNEL RECONFIGURATION COMPLETE message on the uplink DCCH using AM RLC which includes which includes a calculated new START value according to the formula "$START_X' = MSB_{20}$ (MAX {COUNT-C, COUNT-I | radio bearers and signalling radio bearers using the most recently configured CK_X and IK_X}) + 2", calculated IE "Integrity Check Info" using the new FRESH value as included in IE "Integrity protection initialisation number" in IE "Integrity protection mode info" in TRANSPORT CHANNEL RECONFIGURATION message and COUNT-I that includes subsequent HFN as used in the old integrity protection configuration. This message shall also include IE "Receive PDCP sequence number" for RB#20.

After step 5, the UE shall respond with a UE CAPABILITY INFORMATION message to SS.

After step 9, UE shall start transmission on the RAB beginning with the PDCP SN equal to that included in the TRANSPORT CHANNEL RECONFIGURATION COMPLETE message.

7.3.4 PDCP configuration testing

7.3.4.1 PDCP configuration behaviour while RRC Radio bearer setup procedure

FFS

7.3.4.2 PDCP configuration behaviour while RRC Radio bearer release procedure

FFS

7.3.4.3 PDCP configuration behaviour while RRC Cell Update procedure

FFS

7.3.4.4 PDCP configuration behaviour for an invalid RRC configuration

FFS

7.3.5 PDCP RoHC testing

7.3.5.1 General

These test cases are only applicable for UEs supporting PDCP Rel-4 RoHC functions (based on IETF RFC 3095) as defined in TS 25.323 Release 4 onwards.

7.3.5.1.1 Preamble for extended RoHC conformance testing

If PDCP RoHC feature is supported, the following message contents are used if different from TS 34.108, clause 9

Contents of CONNECTION SETUP message:

Information Element	Value/remark
Capability update requirement	
- UE radio access capability update requirement	TRUE
- System specific capability update requirement list	UE only supports 1 system

Contents of CONNECTION SETUP COMPLETE message:

Information Element	Value/remark
UE radio access capability	Value will be checked. Stated capability must be compatible with 34.123-2 and the user settings
- Conformance test compliance	
- PDCP Capability	
- Max PDCP SN	
- Support of lossless SRNS relocation	
- Support for RFC3095	
- CID inclusion info	PDCP header
- Max_CID	15
- Profiles	Profile instance (decompressor supported profiles: UDP/RTP/IPv6, UDP/IPv6 or ESP/IPv6 or IPv6)
- MRRU	Maximum reconstructed reception unit. Default value is 0 (no segmentation).
- Packet _Sizes_Allowed	Packet size as defined in RFC 3095
- Reverse_Decompression_Depth	Determines whether reverse decompression should be used or not and the maximum number of packets that can be reverse decompressed by the decompressor. Default value is 0 (reverse decompression shall not be used).
- RLC Capability	
- Transport channel capability	
- RF Capability	
- Physical channel capability	
- UE multi-mode/multi-RAT capability	
- Security Capability	
- LCS Capability	
- Measurement capability	
UE system specific capability	Value will be check. UE must include the classmark information for the supported system

7.3.5.2 Compression / Decompression of a UDP/RTP/IPv6 header flow

7.3.5.2.1 UDP/RTP/IPv6 Unacknowledged - unidirectional Mode (U-Mode)

FFS

7.3.5.2.2 UDP/RTP/IPv6 Unacknowledged - Normal U-mode Transmission (without ack)

FFS

7.3.5.2.3 UDP/RTP/IPv6 Unacknowledged - Bi-directional Optimistic Mode (O-Mode)

FFS

7.3.5.2.4 UDP/RTP/IPv6 Unacknowledged - Bi-directional Reliable Mode (R-Mode)

FFS

7.3.5.2.5 UDP/RTP/IPv6 Unacknowledged - Transition Mode

FFS

7.3.5.2.6 UDP/RTP/IPv6 Unacknowledged - Flow Parameters

FFS

7.3.5.2.7 UDP/RTP/IPv6 Acknowledged - unidirectional Mode (U-Mode)

FFS

7.3.5.2.8 UDP/RTP/IPv6 Acknowledged - Normal U-mode Transmission (without ack) using the UE as compressor

FFS

7.3.5.2.9 UDP/RTP/IPv6 Acknowledged - Bi-directional Optimistic Mode (O-Mode)

FFS

7.3.5.2.10 UDP/RTP/IPv6 Acknowledged - Bi-directional Reliable Mode (R-Mode)

FFS

7.3.5.2.11 UDP/RTP/IPv6 Acknowledged - Transition Mode

FFS

7.3.5.2.12 UDP/RTP/IPv6 Acknowledged - Flow Parameters

FFS

7.3.5.3 ROHC Profile 2,3 and 4. Compression / Decompression of a UDP/IPv6 or ESP/IPv6 or IPv6 header flow

7.3.5.3.1 UDP/IPv6 or ESP/IPv6 or IPv6 Unacknowledged - unidirectional Mode (U-Mode)

FFS

7.3.5.3.2 UDP/IPv6 or ESP/IPv6 or IPv6 Unacknowledged - Normal U-mode Transmission (without ack)

7.3.5.3.2.1 Definition and applicability

Applicable for all UEs supporting PS PDCP ROHC header compression as describe in the RFC 3095. In this test case, compression unit of the UE and decompression unit of the UE is checked. The UE shall support Profile 2 (UDP/IPv6) streams.

7.3.5.3.2.2 Conformance requirement

Reference(s)

TBD, refer to IETF RFC 3095 clause 5.3.

7.3.5.3.2.3 Test purpose

To verify the unidirectional mode in the UE Decompressor unit without using acknowledgements.

7.3.5.3.2.4 Method of test

Initial conditions

Setup a UE terminated PS session using IP Header compression in AM RLC (using UE test loop mode 1) and ROHC negotiation has been established.

Compressor parameters as negotiated for UE and SS compression unit:

Reset: Non

L:3

K_1/n_1: 1

K_2/n_2: 1

Timer1: 256 packets

Timer2: 256 packets

M_1: 4

M_2: 4

Decompressor parameters as negotiated for UE and SS compression unit:

Mode:U

Clock_resolution: TBD

Reverse_decompressor_depth: Non

RoHC parameter negotiation as done in RB setup message:

MAX_CID: 255

LARGE_CIDs: non

Profiles: 0x0001

Feedback_for : 16

MRRU : 0

The UE compressor shall work in unidirectional mode.

Related ICS/IXIT Statement(s)

Support of IP header compression protocol RFC 3095 - YES/NO.

Support of RoHC profile 2 (UDP/IPv6) – YES / NO

Support of PS – Yes/No

px_test_ROHC_IR_Packet1 as descript in IETF 3095

px_test_ROHC_IR_Packet 2 as descript in IETF 3095

px_test_ROHC_IR_Packet3 as descript in IETF 3095

px_test_ROHC_IR-DYN_Packet 4 to 6 as descript in IETF 3095

px_test_ROHC_UOR-2_Packet 7 to 9 as descript in IETF 3095

px_test_ROHC error packet as descript in IETF 3095

Test procedure

NOTE: The unidirectional mode of operation has a transition logic based in 3 principles. These principles gives the upwards and downwards transition operation. The compressor controls this mode of operation and follows these principles to ensure the robustness of the protocol.

For this test case loop back mode 1 functionality is used in order to loop all received IP data within the UE.

a) The SS compressor unit is triggered to send a IR-DYN packet (px_test_ROHC_IR_DYN_Packet1) as first compressed packet.

b) On UE side, the UE decompressor has to drop the packet and does not initialise the context. This means, it does not forward the IP packet to its upper layer, Therefore no packet is looped back to the SS decompressor. (UE decompressor is in U-mode, No_Context state)

c) The SS compressor unit starts sending IP compressed packets (test_ROHC_IR_Packet1) on initialisation level of compression. This is repeated L times (L = 3), i.e. px_test_ROHC_IR_Packet1 to px_test_ROHC_IR_Packet3 is sent to the UE.

d) After having decompressed the first IR packet, the UE decompressor stores the header as the static part of context and forwards the IP data to its upper layer (UE decompressor switches to Static-Context state, U-Mode). The UE decompressor has to receive these IR compressed packets repeated L times and loops them back to the SS.

e) The SS compressor starts sending IR-DYN compressed IP packets, repeated L (L = 3) times), i.e. px_test_ROHC_IR-DYN_Packet1 to px_test_ROHC_IR-DYN_Packet3 is sent to the UE.

f) The UE decompressor stores the dynamic part of the header context and starts sending IP decompressed packets to upper layers (no the UE decompressor unit is in Full_Context state, U-Mode). The UE decompressor has to receive these IR-DYN compressed packets repeated L times and loops them back to the SS.

NOTE: If the UE Compressor sends the CRC in the compressed header packet then the SS Decompressor has to initialise the context.

g) The SS compressor sends an error packet (px_test ROHC error packet) to the UE decompressor unit.

h) The UE decompressor decreases its state from Full-Context to Static-Context (U-Mode).

i) The SS compressor sends UOR-2 packets (px_test _ROHC_UOR-2_packet 7 to 9) L times (L = 3). No UOR-2 packet shall be send to the SS compressor.

NOTE: The UE decompressor has to drop all the following packets unless packets received containing 7-8bit CRC which can update the context.

Specific Message Contents for the preamble

RADIO BEARER SETUP message

Information Element	Value/remark
RAB information for setup	
- RAB info	
- RAB identity	No. # 23 as described in TS 34.108, Table 6.10.2.1.1 Prioritised RABs. QoS parameter: Traffic Class: Interactive or Background, max. UL: 64 kbps and max. DL: 64 kbps as described in TS 34.108, including described physical channel parameters, configuration for AM RLC Residual BER as described in TS 34.108, clause: 6.10 Related Signalling RB UL: 3.4 kbps, DL: 3.4 kbps DCCH, No. #2 (as described in TS 34.108)
- CN domain identity	PS domain
- RB information to setup	
- RB identity	20
- PDCP info	
- Support of lossless SRNS relocation	False (IE "Support of lossless SRNS relocation" only present, if RLC "In-sequence delivery" is TRUE and in AM)
- PDCP PDU header	present
- Header compression information	1
CHOICE *algorithm type*	
- RFC3095	
- CID inclusion info	PDCP header
- Max_CID	255
- Profiles	Profile instance (decompressor supported profiles : 0x0001)
- MRRU	Maximum reconstructed reception unit. Default value is 0 (no segmentation).
- Packet _Sizes_Allowed	Packet size as defined in RFC 3095
- Reverse_Decompression_Depth	Determines whether reverse decompression should be used or not and the maximum number of packets that can be reverse decompressed by the decompressor. Default value is 0 (reverse decompression shall not be used).
- RLC info	
- Downlink RLC mode	(AM RLC)
- Uplink RLC mode	(AM RLC)

7.3.5.3.2.5 Test requirements

1. At step d), the UE has to loop back received IR packets to the SS decompressor in order to verify, that the decompression state was increased from No-Context state to Static-Context state (U-Mode).

2. At step f), the UE has to loop back received IR-DYN packets to the SS decompressor in order to verify, that the decompression state was increased from Static-Context state to Full-Context state(U-Mode).

3. At step i), the UE shall not loop back any received previously received UOR-2 packets to the SS decompressor in order to verify, that the decompression state was decreased from Full-Context state to Static-Context state (U-Mode).

7.3.6 PDCP RoHC performance testing

7.3.6.1 General

IETF RFC3095 "RObust Header Compression (ROHC)" [40] and RFC 4815: "RObust Header Compression (ROHC): Corrections and Clarifications to RFC 3095" [41] is the IP header compression method specially designed for real time IP services over wireless links. ROHC is specified as part of the Rel-4 of UTRAN as one of the compression schemes to be provided by the PDCP sublayer in the RNC. If the UE supports IMS, as described in 3GPP 23.228 [42], the UE shall support header compression according to RFC 3095 as defined in 3GPP 25.323 [30].

ROHC performance requirements have been specified in Rel-5 of the 3GPP 25.323 [30]. The ROHC performance requirements and the corresponding test cases in this clause are specified for profile 0x0001 for compression of RTP/UDP/IP headers.

7.3.6.1.1 Generic ROHC performance test procedure

Step	Direction		Message	Comments
	UE	SS		
1	<--		SYSTEM INFORMATION (BCCH)	Broadcast
2	<--		PAGING TYPE 1 (PCCH)	Paging (PS domain, P-TMSI)
3	-->		RRC CONNECTION REQUEST (CCCH)	RRC
4	<--		RRC CONNECTION SETUP (CCCH)	RRC
5	-->		RRC CONNECTION SETUP COMPLETE (DCCH)	RRC
6a	-->		SERVICE REQUEST (DCCH)	GMM
6b	<--		SECURITY MODE COMMAND	RRC see note 1
6c	-->		SECURITY MODE COMPLETE	RRC see note 1
7	<--		ACTIVATE RB TEST MODE (DCCH)	TC
8	-->		ACTIVATE RB TEST MODE COMPLETE (DCCH)	TC
9	<--		RADIO BEARER SETUP (DCCH)	RRC.
10	-->		RADIO BEARER SETUP COMPLETE (DCCH)	RRC
11	<--		CLOSE UE TEST LOOP (DCCH)	TC UE test mode 1 RLC SDU size is set to TBD
12	-->		CLOSE UE TEST LOOP COMPLETE (DCCH)	TC
13	<-->		ROHC performance test execution	Execute the actual ROHC performance test case
14	<--		OPEN UE TEST LOOP (DCCH)	TC
15	-->		OPEN UE TEST LOOP COMPLETE (DCCH)	TC
16	<--		RRC CONNECTION RELEASE	RRC
17	-->		RRC CONNECTION RELEASE COMPLETE	RRC

NOTE 1 In addition to activate integrity protection Step 6b and Step 6c are inserted in order to stop T3317 timer in the UE, which starts after transmitting SERVICE REQUEST message.

Specific Message Contents

RADIO BEARER SETUP message (Step 9)

Use the same message as specified for "Packet to CELL_DCH from CELL_DCH in PS" in TS34.108 clause 9 Default Message Contents to setup 6.11.4e Interactive or background / UL:64 DL: 64 kbps / PS RAB + UL:3.4 DL:3.4 kbps SRBs for DCCH, with the following exceptions:

Information Element	Value/remark
RAB information for setup	
- RAB info	
- RAB identity	TBD
- CN domain identity	PS domain
- RB information to setup	
- RB identity	TBD
- PDCP info	
- Support of lossless SRNS relocation	FALSE
- Max PDCP SN window size	sn255
- PDCP PDU header	present
- Header compression information	present
CHOICE *algorithm type*	
- RFC3095	
- Profiles	2
- Profile instance	1
- Uplink	
- Max_CID	15
- Downlink	
- Max_CID	15
- Reverse_Decompression_Depth	0
- PDCP ROHC target mode	depends on test case

7.3.6.2 Base test of ROHC RTP O-mode compressor

7.3.6.2.1 Definition and applicability

The purpose of the base test is to verify that the compressor implements an active and efficient compression for a regular IP/UDP/RTP packet stream, i.e. that it makes use of the most efficient compressed packet formats provided by ROHC RTP [40] for O-mode.

7.3.6.2.2 Conformance requirement

This subclause defines performance test cases for ROHC. The ROHC profile within scope is profile 0x0001 for compression of RTP/UDP/IP headers only. This subclause is not meant to bring incoherent limitations to implementations, and is not meant to create a sub-specification of RFC 3095 [40] either, as a consequence of the requirements on performance that it defines.

…

Compressor implementations are expected to implement robustness algorithms according to the optimistic approach for the U/O-modes of operation. The optimistic approach is the part of the selection of the packet format where a format that contains the necessary information to update a field is used a number N time, starting from the packet for which a new value has to be established in the decompressor context. While N is an implementation parameter, the metrics for each sequence in U/O-mode is expressed in terms of this parameter. Implementation should use the value N as an input parameter for the testing, to adapt to the expected robustness level required for the testing. The value of the parameter N is defined in test case definition separately (informative value is given in Annex B.2.3.). Similarly, R-mode operation requires that an update be conveyed to the decompressor until it gets acknowledged; however for R-mode, relevant test cases provide explicit feedback messages when necessary.

…

The feedback messages used in the test cases, when applicable, are artificially generated and interspersed with the input sequence of uncompressed packets. Feedback messages are generated according to the following format:

```
  0   1   2   3   4   5   6   7
+---+---+---+---+---+---+---+---+
| 1   1   1   1   0 |   Code    |  feedback type octet
+---+---+---+---+---+---+---+---+
|Acktype| Mode  |       SN      |
+---+---+---+---+---+---+---+---+
|              SN               |
+---+---+---+---+---+---+---+---+
| 0   0   0   1 | 0   0   0   1 |
+---+---+---+---+---+---+---+---+
|              CRC              |
+---+---+---+---+---+---+---+---+
```

Where:

- Code is set to 0x4 (indicates that feedback data above the type octet is 4 octets)
- Acktype is set to 0x0 (means ACK)
- Mode is set as defined by the test case
- SN is set as defined by the test case
- CRC is the 8-bit CRC computed over the entire feedback payload including any CID fields but excluding the packet type, the 'Size' field and the 'Code' octet, using the polynomial defined in RFC 3095.

NOTE: If compressor uses CID field in compressed packet, the CID field should be included in the feedback packet and the Code and CID should be set as defined in [40].

…

The purpose of the base test case is to verify that the compressor properly implements compression for a well-behaved IP/UDP/RTP packet flow, i.e. that t it makes use of efficient compressed packet formats available to ROHC RTP [40] when operating in O-mode.

A sequence consisting of 70 packets in total is used where all header fields are set according to the basic test packet structure, as described in subclause A.3, with addition of the following:

1. The RTP Sequence Number is a linearly increasing counter with a packet-to-packet delta of 1, set to 0x0000 for the first packet and thus ending with 0x0045 (69) in the last packet of the sequence
2. The RTP Time Stamp is a linearly increasing counter with a packet-to-packet delta of 160, set to 0x00000000 for the first packet and thus ending with 0x00002B20 (11040) in the last packet of the sequence.
3. The IP Identification is set to the same value as the RTP Sequence Number; this means that for IPv4 the IP-ID behaviour is not random, thus value(RND)=0 defined in [40] for both IPv4 and IPv6.

Between the 6th and 7th packets (SN=5 and SN=6) of the sequence, a ROHC feedback packet of feedback type 2 is to be given to the ROHC compressor to trigger an immediate transition to O-mode operation. The format of that packet is as follows:

```
  0   1   2   3   4   5   6   7
+---+---+---+---+---+---+---+---+
| 1   1   1   1   0 |   Code    |  feedback type octet
+---+---+---+---+---+---+---+---+
|Acktype| Mode  |       SN      |
+---+---+---+---+---+---+---+---+
|              SN               |
+---+---+---+---+---+---+---+---+
| 0   0   0   1 | 0   0   0   1 |
+---+---+---+---+---+---+---+---+
|              CRC              |
+---+---+---+---+---+---+---+---+
```

Where:

- Code is set to 0x4 (indicates that feedback data above the type octet is 4 octets)
- Acktype is set to 0x0 (means ACK)
- Mode is set to 0x2 (means O-mode)

- SN is set to 0x000
- CRC is the 8-bit CRC computed over the entire feedback payload including any CID fields but excluding the packet type, the 'Size' field and the 'Code' octet, using the polynomial defined in RFC 3095.

NOTE: If compressor uses CID field in compressed packet, the CID field should be included in the feedback packet and the Code and CID should be set as defined in [40].

Reference(s)

3GPP TS 25.323 clauses A.1, A.1.1, A.2.1.

7.3.6.2.3 Test purpose

To verify that the ROHC compressor successfully transfers to O-mode operation and makes use of efficient compressed packet formats available to ROHC RTP.

7.3.6.2.4 Method of test

Initial conditions

User Equipment:

The UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108. Execute the generic ROHC performance test procedure for a mobile terminating packet switched session according to clause 7.3.6.1.1.

Profile 0x0001 for compression of RTP/UDP/IP headers only is used

N=4

Related ICS/IXIT Statement(s)

Support of PS	Yes/No
Support of ROHC	Yes/No
UE Supports IPv4	Yes/No
UE Supports IPv6	Yes/No

Test procedure

After the session setup the UE ROHC compressor is in the U-mode operation in accordance with RFC3095 and in the IR state. The SS starts to send IP packets to the UE, the test sequence consists of 70 packets. The UE returns the IP packets in ROHC U-mode using the test loop function. Between the 6^{th} and 7^{th} packets (SN=5 and SN=6) of the sequence, a ROHC feedback packet of feedback type 2 is sent to the UE ROHC compressor to trigger an immediate transition to O-mode operation. When all the expected compressed headers have been received by the SS, the SS disconnects the session. The SS calculates the Average Compressed Header Size and checks if it meets the test requirements for the IP version used.

1. The RTP Sequence Number is a linearly increasing counter with a packet-to-packet delta of 1, set to 0x0000 for the first packet and thus ending with 0x0045 (69) in the last packet of the sequence.

2. The RTP Time Stamp is a linearly increasing counter with a packet-to-packet delta of 160, set to 0x00000000 for the first packet and thus ending with 0x00002B20 (11040) in the last packet of the sequence.

3. The IP Identification is set to the same value as the RTP Sequence Number; this means that for IPv4 the IP-ID behaviour is not random, thus value(RND)=0 defined in RFC3095 for both IPv4 and IPv6.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		

1			After the PS session setup the UE is in ROHC U-mode operation and in the IR state.
2	←	70 test packets	The SS starts sending test packets
3	→	Test packets in U-mode operation.	The UE starts returning test packets in U-mode operation using the test loop function.
4	←	ROHC feedback packet of feedback type 2	Between the 6th and 7th packet (SN=5 and SN=6) of the sequence, a ROHC feedback packet of feedback type 2 is sent to the ROHC compressor to trigger an immediate transition to O-mode operation.
5	UE		The UE changes immediately to O-mode operation and continues to send the test packets
6	→	Test packets in O-mode operation.	
7	SS	After the SS has received all 70 packets in the test sequence the SS disconnects the PS session.	

Specific Message Contents

RADIO BEARER SETUP message (during Generic ROHC performance test procedure in clause 7.3.6.1.1)

Use the same message as specified for "Packet to CELL_DCH from CELL_DCH in PS" in TS 34.108 clause 9 Default Message Contents, with the exceptions defined in clause 7.3.6.1.1 and the following exception:

Information Element	Value/remark
- PDCP ROHC target mode	O-mode

ROHC feedback packet of feedback type 2 (Step 3)

```
  0   1   2   3   4   5   6   7
+---+---+---+---+---+---+---+---+
| 1   1   1   1   0 |   Code    |  feedback type octet
+---+---+---+---+---+---+---+---+
|Acktype| Mode  |       SN      |
+---+---+---+---+---+---+---+---+
|              SN               |
+---+---+---+---+---+---+---+---+
| 0   0   0   1 | 0   0   0   1 |
+---+---+---+---+---+---+---+---+
|              CRC              |
+---+---+---+---+---+---+---+---+
```

Where:

- Code is set to 0x4 (indicates that feedback data above the type octet is 4 octets)
- Acktype is set to 0x0 (means ACK)
- Mode is set to 0x2 (means O-mode)
- SN is set to 0x000
- CRC is the 8-bit CRC computed over the entire feedback payload including any CID fields but excluding the packet type, the 'Size' field and the 'Code' octet, using the polynomial defined in RFC 3095.

7.3.6.2.5 Test requirements

The average compressed header size shall not exceed the limits specified in Table 7.3.6.2.

Table 7.3.6.2: Test Requirement for ROHC RTP O-mode compressor

	Average Compressed Header Size, IPv4	Average Compressed Header size, IPv6
SN <= N-1	44 octets	68 octets
SN >= N	5 octets	5 octets

With N value equal to 4 (which is smaller than 8).

The sequence of expected compressed headers can be illustrated as follow (informative):

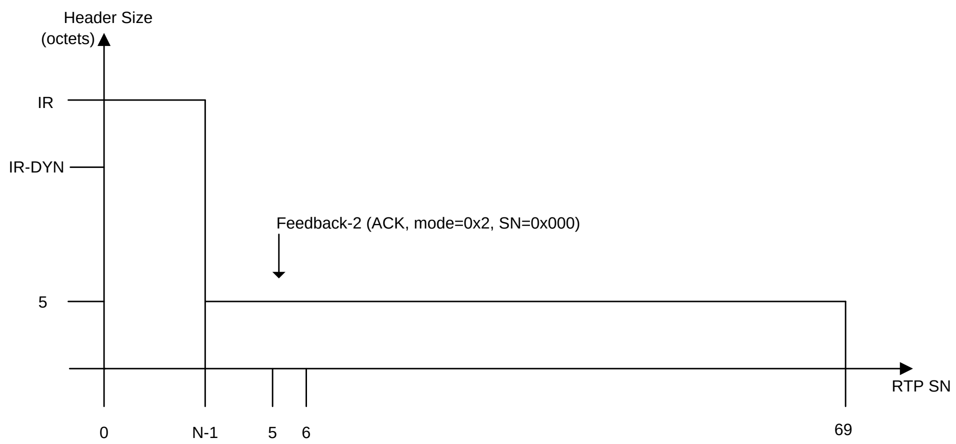


Figure 7.3.6.2: Expected outcome for ROHC RTP O-mode compressor test

7.3.6.3 Base test of ROHC RTP R-mode compressor

7.3.6.3.1 Definition and applicability

The purpose of the base test case is to verify that the compressor properly implements compression for a well-behaved IP/UDP/RTP packet flow, i.e. that it makes use of efficient compressed packet formats available to ROHC RTP [40] when operating in R-mode.

7.3.6.3.2 Conformance requirement

This subclause defines performance test cases for ROHC. The ROHC profile within scope is profile 0x0001 for compression of RTP/UDP/IP headers only. This subclause is not meant to bring incoherent limitations to implementations, and is not meant to create a sub-specification of RFC 3095 [40] either, as a consequence of the requirements on performance that it defines.

…

Compressor implementations are expected to implement robustness algorithms according to the optimistic approach for the U/O-modes of operation. The optimistic approach is the part of the selection of the packet format where a format that contains the necessary information to update a field is used a number N time, starting from the packet for which a new value has to be established in the decompressor context. While N is an implementation parameter, the metrics for each sequence in U/O-mode is expressed in terms of this parameter. Implementation should use the value N as an input parameter for the testing, to adapt to the expected robustness level required for the testing. The value of the parameter N is defined in test case definition separately (informative value is given in Annex B.2.3.). Similarly, R-mode operation requires that an update be conveyed to the decompressor until it gets acknowledged; however for R-mode, relevant test cases provide explicit feedback messages when necessary.

…

The feedback messages used in the test cases, when applicable, are artificially generated and interspersed with the input sequence of uncompressed packets. Feedback messages are generated according to the following format:

```
  0   1   2   3   4   5   6   7
+---+---+---+---+---+---+---+---+
| 1   1   1   1   0 |   Code    |  feedback type octet
+---+---+---+---+---+---+---+---+
|Acktype| Mode  |       SN      |
+---+---+---+---+---+---+---+---+
|              SN               |
+---+---+---+---+---+---+---+---+
| 0   0   0   1 | 0   0   0   1 |
+---+---+---+---+---+---+---+---+
|              CRC              |
+---+---+---+---+---+---+---+---+
```

Where:

- Code is set to 0x4 (indicates that feedback data above the type octet is 4 octets)
- Acktype is set to 0x0 (means ACK)
- Mode is set as defined by the test case
- SN is set as defined by the test case
- CRC is the 8-bit CRC computed over the entire feedback payload including any CID fields but excluding the packet type, the 'Size' field and the 'Code' octet, using the polynomial defined in RFC 3095.

NOTE: If compressor uses CID field in compressed packet, the CID field should be included in the feedback packet and the Code and CID should be set as defined in [40].

…

A sequence consisting of 70 packets in total is used where all header fields are set according to the basic test packet structure, as described in subclause A.3, with addition of the following:

1. The RTP Sequence Number is a linearly increasing counter with a packet-to-packet delta of 1, set to 0x0000 for the first packet and thus ending with 0x0045 (69) in the last packet of the sequence.
2. The RTP Time Stamp is a linearly increasing counter with a packet-to-packet delta of 160, set to 0x00000000 for the first packet and thus ending with 0x00002B20 (11040) in the last packet of the sequence.
3. The IP Identification is set to the same value as the RTP Sequence Number; this means that for IPv4 the IP-ID behaviour is not random, thus value(RND)=0 defined in [40] for both IPv4 and IPv6.

Between the 6th and 7th (SN=5 and SN=6) packet of the sequence, the first ROHC feedback packet of feedback type 2 is to be given to the ROHC compressor to initiate transition to R-mode operation. The format of that packet is as follows:

```
  0   1   2   3   4   5   6   7
+---+---+---+---+---+---+---+---+
| 1   1   1   1   0 |   Code    |  feedback type octet
+---+---+---+---+---+---+---+---+
|Acktype| Mode  |       SN      |
+---+---+---+---+---+---+---+---+
|              SN               |
+---+---+---+---+---+---+---+---+
| 0   0   0   1 | 0   0   0   1 |
+---+---+---+---+---+---+---+---+
|              CRC              |
+---+---+---+---+---+---+---+---+
```

Where:

- Code is set to 0x4 (indicates that feedback data above the type octet is 4 octets)
- Acktype is set to 0x0 (means ACK)
- Mode is set to 0x3 (means R-mode)
- SN is set to 0x000

- CRC is the 8-bit CRC computed over the entire feedback payload including any CID fields but excluding the packet type, the 'Size' field and the 'Code' octet, using the polynomial defined in RFC 3095.

Reference(s)

3GPP TS 25.323 clauses A1, A.2.2, A.3 and B.2.3.

7.3.6.3.3 Test purpose

To verify that the ROHC compressor successfully transfers to R-mode operation and makes use of efficient compressed packet formats available to ROHC RTP.

7.3.6.3.4 Method of test

Initial conditions

User Equipment:

The UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108. Execute the generic ROHC performance test procedure for a mobile terminating packet switched session according to clause 7.3.6.1.1.

Profile 0x0001 for compression of RTP/UDP/IP headers only is used

N=4

Related ICS/IXIT Statement(s)

Support of PS Yes/No

Support of ROHC Yes/No

UE Supports IPv4 Yes/No

UE Supports IPv6 Yes/No

Test procedure

After the session setup the ROHC compressor is in the U-mode operation in accordance with RFC3095 and in the IR state. The SS starts to send IP packets to the UE, the test sequence consists of 70 packets. The UE returns the IP packets in ROHC U-mode using the test loop function. Between the 6th and 7th packets (SN=5 and SN=6) of the sequence, the first ROHC feedback packet of feedback type 2 is sent to the UE ROHC compressor to trigger an immediate transition to R-mode operation. When all the expected compressed headers have been received by the SS, the SS disconnects the session. The SS calculates the Average Compressed Header Size and checks if it meets the test requirements for the IP version used.

1. The RTP Sequence Number is a linearly increasing counter with a packet-to-packet delta of 1, set to 0x0000 for the first packet and thus ending with 0x0045 (69) in the last packet of the sequence.

2. The RTP Time Stamp is a linearly increasing counter with a packet-to-packet delta of 160, set to 0x00000000 for the first packet and thus ending with 0x00002B20 (11040) in the last packet of the sequence.

3. The IP Identification is set to the same value as the RTP Sequence Number; this means that for IPv4 the IP-ID behaviour is not random, thus value(RND)=0 defined in RFC3095 for both IPv4 and IPv6.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		

1			After the PS session setup the UE is in ROHC U-mode operation and in the IR state.
2	←	70 test packets	The SS starts sending test packets
3	→	Test packets in U-mode operation.	The UE starts returning test packets in U-mode operation using the test loop function.
4	←	ROHC feedback packet of feedback type 2	Between the 6th and 7th (SN=5 and SN=6) packet of the sequence the SS initiates a transition to R-mode operation.
5	UE		The UE changes immediately to R-mode operation and continues to send the test packets
6	→	Test packets in R-mode operation.	The UE returns test packets in R-mode operation using the test loop function.
6a	←	ROHC feedback packet of feedback type 2	During the test case the SS generates a feedback message when the ROHC packet type octet of the received compressed header matches any of the values as described in the table 7.3.6.3.1.
7	SS	After the SS has received all 70 packets in the test sequence the SS disconnects the PS session.	

Specific Message Contents

RADIO BEARER SETUP message (during Generic ROHC performance test procedure in clause 7.3.6.1.1)

Use the same message as specified for "Packet to CELL_DCH from CELL_DCH in PS" in TS 34.108 clause 9 Default Message Contents, with the exceptions defined in clause 7.3.6.1.1 and the following exception:

Information Element	Value/remark
- PDCP ROHC target mode	R-mode

ROHC feedback packet of feedback type 2 (Step 4 and 6a)

```
  0   1   2   3   4   5   6   7
+---+---+---+---+---+---+---+---+
| 1   1   1   1   0 |   Code    |  feedback type octet
+---+---+---+---+---+---+---+---+
|Acktype| Mode  |       SN      |
+---+---+---+---+---+---+---+---+
|               SN              |
+---+---+---+---+---+---+---+---+
| 0   0   0   1 | 0   0   0   1 |
+---+---+---+---+---+---+---+---+
|               CRC             |
+---+---+---+---+---+---+---+---+
```

Where:

- Code is set to 0x4 (indicates that feedback data above the type octet is 4 octets)
- Acktype is set to 0x0 (means ACK)
- Mode is set to 0x3 (means R-mode)
- SN is set to 0x000
- CRC is the 8-bit CRC computed over the entire feedback payload including any CID fields but excluding the packet type, the 'Size' field and the 'Code' octet, using the polynomial defined in RFC 3095.

The test equipment waits for a UOR-2, IR-DYN or IR packet from the RoHC compressor with the mode transition parameter set to R. The value of x is the RTP SN of this received packet for which the test equipment generates the second feedback packet of type 2.

The SS shall generate a feedback message when the ROHC packet type octet of the received compressed header matches any of the values as described in the table 7.3.6.3.1. The compressed header type can be identified by inspecting the packet type octet of the compressed header, i.e. the first octet of the ROHC base header.

Table 7.3.6.3.1: Bitmasks for feedback generation

Compressed Header Type (binary mask)	Packet Type	Outcome
01xxxxxx	R-0-CRC	Send feedback
110xxxxx	UOR-2*	Send feedback
1111110x	IR	Send feedback
11111000	IR-DYN	Send feedback
Other values	Other packets	No feedback

where 'x' means 'any value'.

In the feedback message:

- Mode is set to 0x3 (means R-mode)
- SN is set to the RTP SN corresponding to the received compressed header

The SS shall index the input sequence of uncompressed headers using the RTP Sequence Number, and it shall associate the correct RTP SN to each compressed header that it receives back from the compressor. The SS can derive the RTP SN by counting the number of received compressed headers.

NOTE: The purpose of this mechanism is only to provide feedback to the compressor when operating in R-mode; it is not meant to make further verifications of any specific ROHC functionality and applies only to the test cases defined in this annex.

7.3.6.3.5 Test requirements

The average compressed header size shall not exceed the limits specified in Table 7.3.6.3.2

Table 7.3.6.3.2: Test Requirement for ROHC RTP R-mode compressor

	Average Compressed Header Size, IPv4	Average Compressed Header size, IPv6
SN <= N-1	44 octets	68 octets
N <= SN <= 5	5 octets	5 octets
6 <= SN <= x	9 octets	9 octets
SN >= x+1	5 octets	5 octets

N shall be equal to 4 in the test case.

The sequence of expected compressed headers can be illustrated as follow (informative):

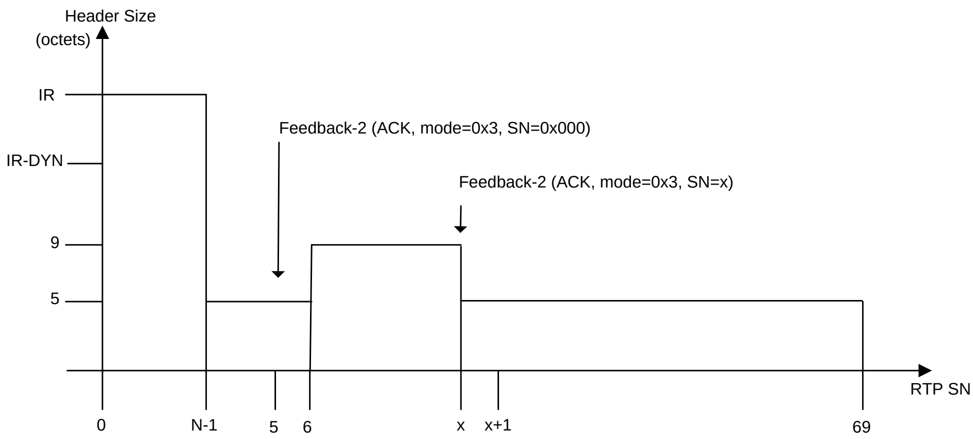


Figure 7.3.6.3: Expected outcome for ROHC RTP R-mode compressor test

7.3.6.4 Re-establishment of TS function after DTX in O-mode

7.3.6.4.1 Definition and applicability

The purpose of the TS re-establishment test case is to verify that the compressor re-establishes the proper TS value after a DTX period, i.e. that it uses efficient header formats available to ROHC RTP [40] when operating in O-mode.

7.3.6.4.2 Conformance requirement

The outline of each test case follows the same format with respect to the input sequences and the requirements Test 1a and 1b are base tests using a well-behaving flow of packets as one of the inputs. All subsequent tests are based on test 1a or test 1b, each with specific test events added to the packet flow of the base tests.

…

The test sequence is the same as in subclause A.2.1, with the following exception:

1. The RTP Time Stamp is a linearly increasing counter with a packet-to-packet delta of 160, set to 0x00000000 for the first packet.
2. For packet with SN= 20, TS is increased to represent a 32 (0.64 seconds) packet skip (32x160) and is thus set to (20+32)x160=8320 (0x00002080). Then TS continues to grow as stated in 1 above.
3. For packet with SN= 30, TS is increased to represent a 128 (2.56 seconds) packet skip (128x160) and is thus set to (30+32+128)x160=30400 (0x000076C0). Then TS continues to grow as stated in 1 above.
4. For packet with SN= 40, TS is increased to represent a 2048 (40.96 seconds) packet skip (2048x160) and is thus set to (40+32+128+2048)x160=359680 (0x00057D00). Then TS continues to grow as stated in 1 above.
5. TS thus ends at 364320 (0x00058F20) in the last packet of the sequence with RTP sequence number 69.

Reference(s)

3GPP TS 25.323 clauses A1.2, A.2.5, A.2.1, A.3, B.2.3.

7.3.6.4.3 Test purpose

To verify that the ROHC compressor re-establishes the proper TS value after a DTX period, i.e. that it uses efficient header formats available to ROHC RTP when operating in O-mode.

7.3.6.4.4 Method of test

Initial conditions

User Equipment:

The UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108. Execute the generic ROHC performance test procedure for a mobile terminating packet switched session according to clause 7.3.6.1.1.

Profile 0x0001 for compression of RTP/UDP/IP headers only is used

N=4

Related ICS/IXIT Statement(s)

Support of PS Yes/No

Support of ROHC Yes/No

UE Supports IPv4 Yes/No

UE Supports IPv6 Yes/No

Test procedure

After the session setup the UE ROHC compressor is in the U-mode operation in accordance with RFC3095 and in the IR state. The SS starts to send IP packets to the UE, the test sequence consists of 70 packets. The UE returns the IP packets in ROHC U-mode using the test loop function. Between the 6th and 7th packets (SN=5 and SN=6) of the sequence, a ROHC feedback packet of feedback type 2 is sent to the UE ROHC compressor to trigger an immediate transition to O-mode operation. When all the expected compressed headers have been received by the SS, the SS disconnects the session.

The SS calculates the Average Compressed Header Size and checks if it meets the test requirements as in clause 7.3.6.4.2, for the IP version used with the following exceptions:

1. The RTP Time Stamp is a linearly increasing counter with a packet-to-packet delta of 160, set to 0x00000000 for the first packet.
2. For packet with SN= 20, TS is increased to represent a 32 (0.64 seconds) packet skip (32x160) and is thus set to (20+32)x160=8320 (0x00002080). Then TS continues to grow as stated in 1 above.
3. For packet with SN= 30, TS is increased to represent a 128 (2.56 seconds) packet skip (128x160) and is thus set to (30+32+128)x160=30400 (0x000076C0). Then TS continues to grow as stated in 1 above.
4. For packet with SN= 40, TS is increased to represent a 2048 (40.96 seconds) packet skip (2048x160) and is thus set to (40+32+128+2048)x160=359680 (0x00057D00). Then TS continues to grow as stated in 1 above.
5. TS thus ends at 364320 (0x00058F20) in the last packet of the sequence with RTP sequence number 69.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		

1			After the PS session setup the UE is in ROHC U-mode operation and in the IR state.
2	←	70 test packets	The SS starts sending test packets
3	→	Test packets in U-mode operation.	The UE starts returning test packets in U-mode operation using the test loop function.
4	←	ROHC feedback packet of feedback type 2	Between the 6th and 7th packet (SN=5 and SN=6) of the sequence, a ROHC feedback packet of feedback type 2 is sent to the ROHC compressor to trigger an immediate transition to O-mode operation.
5	UE		The UE changes immediately to O-mode operation and continues to send the test packets
6	→	Test packets in O-mode operation.	
7	SS		For packet with SN= 20, the SS increases TS to represent a 32 packet skip and sets it to (20+32)x160=8320.
8	SS		For packet with SN= 30, the SS increases TS to represent a 128 packet skip and sets it to (30+32+128)x160=30400.
9	SS		For packet with SN= 40, the SS increases TS to represent a 2048 packet skip and sets it to (40+32+128+2048)x160=359680.
10	SS	After the SS has received all 70 packets in the test sequence the SS disconnects the PS session.	

Specific Message Contents

RADIO BEARER SETUP message (during Generic ROHC performance test procedure in clause 7.3.6.1.1)

Use the same message as specified for "Packet to CELL_DCH from CELL_DCH in PS" in TS 34.108 clause 9 Default Message Contents, with the exceptions defined in clause 7.3.6.1.1 and the following exception:

Information Element	**Value/remark**
- PDCP ROHC target mode	O-mode

ROHC feedback packet of feedback type 2 (Step 3)

```
  0   1   2   3   4   5   6   7
+---+---+---+---+---+---+---+---+
| 1   1   1   1   0 |   Code    |  feedback type octet
+---+---+---+---+---+---+---+---+
|Acktype| Mode  |       SN      |
+---+---+---+---+---+---+---+---+
|              SN               |
+---+---+---+---+---+---+---+---+
| 0   0   0   1 | 0   0   0   1 |
+---+---+---+---+---+---+---+---+
|              CRC              |
+---+---+---+---+---+---+---+---+
```

Where:

- Code is set to 0x4 (indicates that feedback data above the type octet is 4 octets)
- Acktype is set to 0x0 (means ACK)
- Mode is set to 0x2 (means O-mode)

- SN is set to 0x000
- CRC is the 8-bit CRC computed over the entire feedback payload including any CID fields but excluding the packet type, the 'Size' field and the 'Code' octet, using the polynomial defined in RFC 3095.

7.3.6.4.5 Test requirements

The average compressed header size shall not exceed the limits specified in Table 7.3.6.4.

Table 7.3.6.4: Test Requirement for ROHC Test 7.3.6.4

	Average Compressed Header Size, IPv4	Average Compressed Header size, IPv6
SN <= 19	See Test 1a (Test 7.3.6.2 in TS 34.123-1)	
20 <= SN <= 19 + N **30 <= SN <= 29 + N**	10 octets	10 octets
40 <= SN <= 39 + N	10 octets	10 octets
Other SN values	5 octets	5 octets

With N value equal to 4.

The sequence of expected compressed headers can be illustrated as follow (informative):

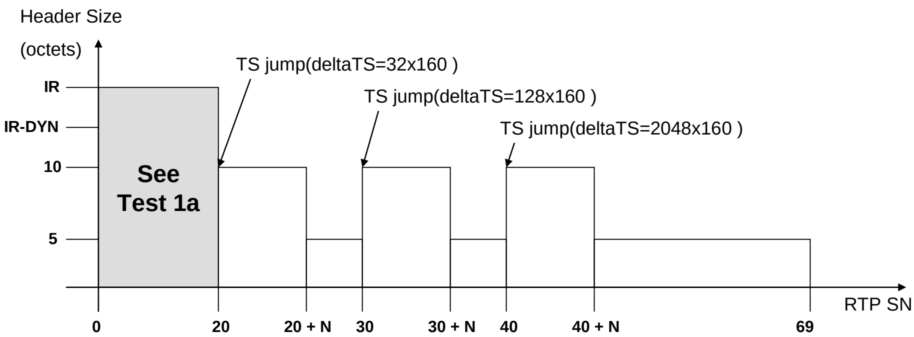


Figure 7.3.6.4: Expected outcome for ROHC Test 7.3.6.4

7.3.6.5 Re-establishment of TS function after DTX in R-mode

7.3.6.5.1 Definition and applicability

The purpose of the TS (Timestamp) re-establishment test case is to verify that the compressor re-establishes the proper TS value after a DTX period, i.e. that it uses the efficient header formats available to ROHC RTP [40] when operating in R-mode.

7.3.6.5.2 Conformance requirement

This subclause defines performance test cases for ROHC. The ROHC profile within scope is profile 0x0001 for compression of RTP/UDP/IP headers only. This subclause is not meant to bring incoherent limitations to implementations, and is not meant to create a sub-specification of RFC 3095 [40] either, as a consequence of the requirements on performance that it defines.

…

Compressor implementations are expected to implement robustness algorithms according to the optimistic approach for the U/O-modes of operation. The optimistic approach is the part of the selection of the packet format where a format that contains the necessary information to update a field is used a number N time, starting from the packet for which a new value has to be established in the decompressor context. While N is an implementation parameter, the metrics for each sequence in U/O-mode is expressed in terms of this parameter. Implementation should use the value N as an input parameter for the testing, to adapt to the expected robustness level required for the testing. The value of the parameter N is defined in test case definition separately (informative value is given in Annex B.2.3.). Similarly, R-mode operation requires that an update be conveyed to the decompressor until it gets acknowledged; however for R-mode, relevant test cases provide explicit feedback messages when necessary.

…

The feedback messages used in the test cases, when applicable, are artificially generated and interspersed with the input sequence of uncompressed packets. Feedback messages are generated according to the following format:

```
  0   1   2   3   4   5   6   7
+---+---+---+---+---+---+---+---+
| 1   1   1   1   0 |   Code    |  feedback type octet
+---+---+---+---+---+---+---+---+
|Acktype| Mode  |      SN       |
+---+---+---+---+---+---+---+---+
|              SN               |
+---+---+---+---+---+---+---+---+
| 0   0   0   1 | 0   0   0   1 |
+---+---+---+---+---+---+---+---+
|              CRC              |
+---+---+---+---+---+---+---+---+
```

Where:

- Code is set to 0x4 (indicates that feedback data above the type octet is 4 octets)
- Acktype is set to 0x0 (means ACK)
- Mode is set as defined by the test case
- SN is set as defined by the test case
- CRC is the 8-bit CRC computed over the entire feedback payload including any CID fields but excluding the packet type, the 'Size' field and the 'Code' octet, using the polynomial defined in RFC 3095.

NOTE: If compressor uses CID field in compressed packet, the CID field should be included in the feedback packet and the Code and CID should be set as defined in [40].

…

The test sequence is the same as in subclause A.2.2, with the following exception:

1. The RTP Time Stamp is a linearly increasing counter with a packet-to-packet delta of 160, set to 0x00000000 for the first packet.
2. For packet with SN= 20, TS is increased to represent a 32 (0.64 seconds) packet skip (32x160) and is thus set to (20+32)x160=8320 (0x00002080). Then TS continues to grow as stated in 1 above.
3. For packet with SN= 30, TS is increased to represent a 128 (2.56 seconds) packet skip (128x160) and is thus set to (30+32+128)x160=30400 (0x000076C0). Then TS continues to grow as stated in 1 above.
4. For packet with SN= 40, TS is increased to represent a 2048 (40.96 seconds) packet skip (2048x160) and is thus set to (40+32+128+2048)x160=359680 (0x00057D00). Then TS continues to grow as stated in 1 above.
5. TS thus ends at 393120 (0x0005FFA0) in the last packet of the sequence with RTP sequence number 69.

Reference(s)

3GPP TS 25.323 clauses A.1, A.2.6, A.3 and B.2.3.

7.3.6.5.3 Test purpose

To verify that the compressor re-establishes the proper TS value after a DTX period, i.e. that it uses the efficient header formats available to ROHC RTP when operating in R-mode.

7.3.6.5.4 Method of test

Initial conditions

User Equipment:

The UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108. Execute the generic ROHC performance test procedure for a mobile terminating packet switched session according to clause 7.3.6.1.1.

Profile 0x0001 for compression of RTP/UDP/IP headers only is used

N=4

Related ICS/IXIT Statement(s)

Support of PS Yes/No

Support of ROHC Yes/No

UE Supports IPv4 Yes/No

UE Supports IPv6 Yes/No

Test procedure

After the session setup the ROHC compressor is in the U-mode operation in accordance with RFC3095 and in the IR state. The SS starts to send IP packets to the UE, the test sequence consists of 70 packets. The UE returns the IP packets in ROHC U-mode using the test loop function. Between the 6th and 7th packets (SN=5 and SN=6) of the sequence, the first ROHC feedback packet of feedback type 2 is sent to the UE ROHC compressor to trigger an immediate transition to R-mode operation. The SS continues to send IP packets to the UE.

For packet with SN= 20, the SS increases TS to represent a 32 (0.64 seconds) packet skip (32x160) and sets it to (20+32)x160=8320 (0x00002080). Then TS continues to grow linearly with a packet-to-packet delta of 160.

For packet with SN= 30, the SS increases TS to represent a 128 (2.56 seconds) packet skip (128x160) and sets it to (30+32+128)x160=30400 (0x000076C0). Then TS continues to grow linearly with a packet-to-packet delta of 160.

For packet with SN= 40, the SS increases TS to represent a 2048 (40.96 seconds) packet skip (2048x160) and sets it to (40+32+128+2048)x160=359680 (0x00057D00). Then TS continues to grow linearly with a packet-to-packet delta of 160.

The test sequence ends with TS at 393120 (0x0005FFA0) in the last packet of the sequence with RTP sequence number 69.

When all the expected compressed headers have been received by the SS, the SS disconnects the session. The SS calculates the Average Compressed Header Size and checks if it meets the test requirements for the IP version used.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		

1			After the PS session setup the UE is in ROHC U-mode operation and in the IR state.
2	←	Test packets	The SS starts sending test packets. The test sequence consists of 70 packets.
3	→	Test packets in U-mode operation.	The UE starts returning test packets in U-mode operation using the test loop function.
4	←	ROHC feedback packet of feedback type 2	Between the 6th and 7th (SN=5 and SN=6) packet of the sequence the SS initiates a transition to R-mode operation.
5	UE		The UE changes immediately to R-mode operation and continues to send the test packets
6	→	Test packets in R-mode operation.	The UE returns test packets in R-mode operation using the test loop function.
6a	←	ROHC feedback packet of feedback type 2	During the test case the SS generates a feedback message when the ROHC packet type octet of the received compressed header matches any of the values as described in the table 7.3.6.3.1.
7	SS		For packet with SN= 20, the SS increases TS to represent a 32 packet skip and sets it to (20+32)x160=8320.
8	SS		For packet with SN= 30, the SS increases TS to represent a 128 packet skip and sets it to (30+32+128)x160=30400.
9	SS		For packet with SN= 40, the SS increases TS to represent a 2048 packet skip and sets it to (40+32+128+2048)x160=359680.
10	SS	After the SS has received all 70 packets in the test sequence the SS disconnects the PS session.	

Specific Message Contents

RADIO BEARER SETUP message (during Generic ROHC performance test procedure in clause 7.3.6.1.1)

Use the same message as specified for "Packet to CELL_DCH from CELL_DCH in PS" in TS 34.108 clause 9 Default Message Contents, with the exceptions defined in clause 7.3.6.1.1 and the following exception:

Information Element	Value/remark
- PDCP ROHC target mode	R-mode

ROHC feedback packet of feedback type 2 (Step 4 and 6a)

```
  0   1   2   3   4   5   6   7
+---+---+---+---+---+---+---+---+
| 1   1   1   1   0 |   Code    |  feedback type octet
+---+---+---+---+---+---+---+---+
|Acktype| Mode  |      SN       |
+---+---+---+---+---+---+---+---+
|              SN               |
+---+---+---+---+---+---+---+---+
| 0   0   0   1 | 0   0   0   1 |
+---+---+---+---+---+---+---+---+
|              CRC              |
```

```
+---+---+---+---+---+---+---+---+
```

Where:

- Code is set to 0x4 (indicates that feedback data above the type octet is 4 octets)
- Acktype is set to 0x0 (means ACK)
- Mode is set to 0x3 (means R-mode)
- SN is set to 0x000
- CRC is the 8-bit CRC computed over the entire feedback payload including any CID fields but excluding the packet type, the 'Size' field and the 'Code' octet, using the polynomial defined in RFC 3095.

  The test equipment waits for a UOR-2, IR-DYN or IR packet from the RoHC compressor with the mode transition parameter set to R. The value of x is the RTP SN of this received packet for which the test equipment generates the second feedback packet of type 2.

7.3.6.5.5 Test requirements

The average compressed header size shall not exceed the limits specified in Table 7.3.6.5.1

Table 7.3.6.5.1: Test Requirement for Re-establishment of TS function after DTX in R-mode

	Average Compressed Header Size, IPv4	Average Compressed Header size, IPv6
SN <= 19	See Test 1b (Test case 7.3.6.3 in TS 34.123-1)	
20 <= SN <= 19 + x **30 <= SN <= 29 + x**	10 octets	10 octets
40 <= SN <= 39 + x	10 octets	10 octets
Other SN values	5 octets	5 octets

The sequence of expected compressed headers can be illustrated as follow (informative):

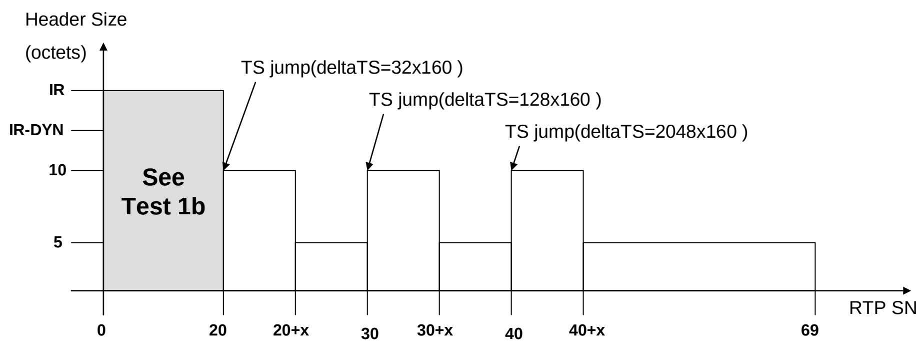


Figure 7.3.6.5: Expected outcome for Re-establishment of TS function after DTX in R-mode test

7.3.6.6 Compressor response to single lost packets in O-mode

7.3.6.6.1 Definition and applicability

Same as in 34.123-1 clause 7.3.6.2.1.

7.3.6.6.2 Conformance requirement

Same as in 34.123-1 clause 7.3.6.2.2.

7.3.6.6.3 Test purpose

The purpose of this test is to verify that the compressor does not panic just because there is a single missing packet, i.e. the compressed packet size should not increase due to such events.

7.3.6.6.4 Method of test

The method is the same as in 34.123-1 clause 7.3.6.2.4 except that test packets with SN 20, 30 and 40 are removed from the sequence.

7.3.6.6.5 Test requirements

The maximal compressed header overhead shall be the same as in 34.123-1 clause 7.3.6.2.5.

7.3.6.7 Compressor response to single lost packets in R-mode

7.3.6.7.1 Definition and applicability

Same as in 34.123-1 clause 7.3.6.3.1.

7.3.6.7.2 Conformance requirement

Same as in 34.123-1 clause 7.3.6.3.2.

7.3.6.7.3 Test purpose

The purpose of this test is to verify that the compressor does not panic just because there is a single missing packet, i.e. the compressed packet size should not increase due to such events

7.3.6.7.4 Method of test

The method is the same as in 34.123-1 clause 7.3.6.3.4 except that test packets with SN 20, 30 and 40 are removed from the sequence.

7.3.6.7.5 Test requirements

The maximal compressed header overhead shall be the same as in 34.123-1 clause 7.3.6.3.5.

7.3.6.8 TS function during DTX with varying delta in O-mode

7.3.6.8.1 Definition and applicability

The purpose of this test case is to verify that the compressor properly handles variations in the function between the TS value and the SN during and after a DTX period, during which SID packets are sent periodically, i.e. that it uses efficient header formats available to ROHC RTP [40] when operating in O-mode.

7.3.6.8.2 Conformance requirement

The outline of each test case follows the same format with respect to the input sequences and the requirements Test 1a and 1b are base tests using a well-behaving flow of packets as one of the inputs. All subsequent tests are based on test 1a or test 1b, each with specific test events added to the packet flow of the base tests.

…

The test sequence is the same as in subclause A.2.1, with the following exception:

1. The RTP Time Stamp is a linearly increasing counter with a packet-to-packet delta of 160, set to 0x00000000 for the first packet.
2. For packets SN = 20, 21 and 22, TS is increased to represent a 7 (0.14 seconds) packet skip (7x160) and is thus set to (20+7)x160=4320 (0x000010E0), (21+7+7)x160=5600(0x000015E0) and (22+7+7+7)x160=6880(0x00001AE0), respectively.
3. For packets SN = 30, 31, 32, 33 and 34, TS is increased to represent a 7 (0.14 seconds) packet skip (7x160) and is thus set to 9280 (0x00002440), 10560 (0x00002940), 11840 (0x00002E40), 13120 (0x00003340) and 14400 (0x00003840) respectively.
4. For packets SN = 40, 41, 42, 43, 44, 45, and 46, TS is increased to represent a 7 (0.14 seconds) packet skip (7x160) and is thus set to 16480 (0x00004060), 17760 (0x00004560), 19040 (0x00004A60), 20320 (0x00004F60), 21600 (0x00005460), 22880 (0x00005960) and 24160 (0x00005E60) respectively.
5. TS thus ends at 27840 (0x00006CC0) in the last packet of the sequence with RTP sequence number 69

Reference(s)

3GPP TS 25.323 clauses A.1.2,A.2.11, A.2.1, A.3, B.2.3.

7.3.6.8.3 Test purpose

To verify that the ROHC compressor properly handles variations in the function between the TS value and the SN during and after a DTX period, during which SID packets are sent periodically, i.e. that it uses efficient header formats available to ROHC RTP when operating in O-mode.

7.3.6.8.4 Method of test

Initial conditions

User Equipment:

The UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108. Execute the generic ROHC performance test procedure for a mobile terminating packet switched session according to clause 7.3.6.1.1.

Profile 0x0001 for compression of RTP/UDP/IP headers only is used

N=4

Related ICS/IXIT Statement(s)

Support of PS Yes/No

Support of ROHC Yes/No

UE Supports IPv4 Yes/No

UE Supports IPv6 Yes/No

Test procedure

After the session setup the UE ROHC compressor is in the U-mode operation in accordance with RFC3095 and in the IR state. The SS starts to send IP packets to the UE, the test sequence consists of 70 packets. The UE returns the IP packets in ROHC U-mode using the test loop function. Between the 6^{th} and 7^{th} packets (SN=5 and SN=6) of the sequence, a ROHC feedback packet of feedback type 2 is sent to the UE ROHC compressor to trigger an immediate transition to O-mode operation.

When all the expected compressed headers have been received by the SS, the SS disconnects the session. The SS calculates the Average Compressed Header Size and checks if it meets the test requirements as in clause 7.3.6.4.2, for the IP version used with the following exceptions:

1. The RTP Time Stamp is a linearly increasing counter with a packet-to-packet delta of 160, set to 0x00000000 for the first packet.
2. For packets SN = 20, 21 and 22, TS is increased to represent a 7 (0.14 seconds) packet skip (7x160) and is thus set to (20+7)x160=4320 (0x000010E0), (21+7+7)x160=5600 (0x000015E0) and (22+7+7+7)x160=6880 (0x00001AE0), respectively.
3. For packets SN = 30, 31, 32, 33 and 34, TS is increased to represent a 7 (0.14 seconds) packet skip (7x160) and is thus set to 9280 (0x00002440), 10560 (0x00002940), 11840 (0x00002E40), 13120 (0x00003340) and 14400 (0x00003840) respectively.
4. For packets SN = 40, 41, 42, 43, 44, 45, and 46, TS is increased to represent a 7 (0.14 seconds) packet skip (7x160) and is thus set to 16480 (0x00004060), 17760 (0x00004560), 19040 (0x00004A60), 20320 (0x00004F60), 21600 (0x00005460), 22880 (0x00005960) and 24160 (0x00005E60) respectively.
5. TS thus ends at 27840 (0x00006CC0) in the last packet of the sequence with RTP sequence number 69.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		

1			After the PS session setup the UE is in ROHC U-mode operation and in the IR state.
2	←	70 test packets	The SS starts sending test packets
3	→	Test packets in U-mode operation.	The UE starts returning test packets in U-mode operation using the test loop function.
4	←	ROHC feedback packet of feedback type 2	Between the 6th and 7th packet (SN=5 and SN=6) of the sequence, a ROHC feedback packet of feedback type 2 is sent to the ROHC compressor to trigger an immediate transition to O-mode operation.
5	UE		The UE changes immediately to O-mode operation and continues to send the test packets
6	→	Test packets in O-mode operation.	
7	SS		For packets SN = 20, 21 and 22, the SS increases TS to represent a 7 packet skip and sets TS to (20+7)x160=4320, (21+7+7)x160=5600 and (22+7+7+7)x160=6880 respectively.
8	SS		For packets SN = 30, 31, 32, 33 and 34, the SS increases TS to represent a 7 packet skip and sets TS to 9280, 10560, 11840, 13120 and 14400 respectively.
9	SS		For packets SN = 40, 41, 42, 43, 44, 45, and 46, the SS increases TS to represent a 7 packet skip and sets TS to 16480, 17760, 19040, 20320, 21600, 22880 and 24160 respectively.
10	SS	After the SS has received all 70 packets in the test sequence the SS disconnects the PS session.	

Specific Message Contents

RADIO BEARER SETUP message (during Generic ROHC performance test procedure in clause 7.3.6.1.1)

Use the same message as specified for "Packet to CELL_DCH from CELL_DCH in PS" in TS 34.108 clause 9 Default Message Contents, with the exceptions defined in clause 7.3.6.1.1 and the following exception:

Information Element	Value/remark
- PDCP ROHC target mode	O-mode

ROHC feedback packet of feedback type 2 (Step 3)

```
  0   1   2   3   4   5   6   7
+---+---+---+---+---+---+---+---+
| 1   1   1   1   0 |   Code    |  feedback type octet
+---+---+---+---+---+---+---+---+
|Acktype| Mode  |       SN      |
+---+---+---+---+---+---+---+---+
|              SN               |
+---+---+---+---+---+---+---+---+
| 0   0   0   1 | 0   0   0   1 |
+---+---+---+---+---+---+---+---+
|              CRC              |
+---+---+---+---+---+---+---+---+
```

Where:

- Code is set to 0x4 (indicates that feedback data above the type octet is 4 octets)
- Acktype is set to 0x0 (means ACK)
- Mode is set to 0x2 (means O-mode)
- SN is set to 0x000
- CRC is the 8-bit CRC computed over the entire feedback payload including any CID fields but excluding the packet type, the 'Size' field and the 'Code' octet, using the polynomial defined in RFC 3095.

7.3.6.8.5 Test requirements

The average compressed header size shall not exceed the limits specified in Table 7.3.6.8.

Table 7.3.6.8: Test Requirement for ROHC Test 7.3.6.8

	Average Compressed Header Size, IPv4	Average Compressed Header size, IPv6
SN <= 19	See Test 1a (Test 7.3.6.2 in TS 34.123-1)	
20 <= SN <= 22 + N **30 <= SN <= 34 + N** **40 <= SN <= 46 + N**	15 octets	15 octets
Other SN values	5 octets	5 octets

With N value equal to 4.

The sequence of expected compressed headers can be illustrated as follow (informative):

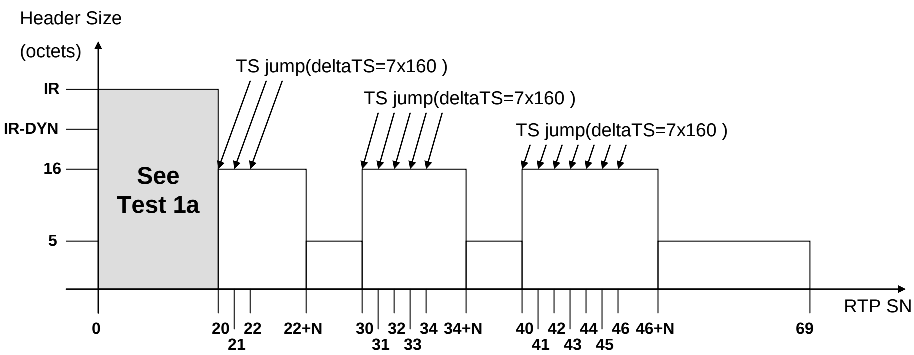


Figure 7.3.6.8: Expected outcome for ROHC Test 7.3.6.8

7.3.6.9 TS function during DTX with varying delta in R-mode

7.3.6.9.1 Definition and applicability

The purpose of this test case is to verify how efficiently the compressor handles variations in the function between the TS value and the SN during and after a DTX period, during which SID packets are sent periodically, i.e. that it uses the efficient header formats available to ROHC RTP [40] when operating in R-mode.

7.3.6.9.2 Conformance requirement

This subclause defines performance test cases for ROHC. The ROHC profile within scope is profile 0x0001 for compression of RTP/UDP/IP headers only. This subclause is not meant to bring incoherent limitations to implementations, and is not meant to create a sub-specification of RFC 3095 [40] either, as a consequence of the requirements on performance that it defines.

…

Compressor implementations are expected to implement robustness algorithms according to the optimistic approach for the U/O-modes of operation. The optimistic approach is the part of the selection of the packet format where a format that contains the necessary information to update a field is used a number N time, starting from the packet for which a new value has to be established in the decompressor context. While N is an implementation parameter, the metrics for each sequence in U/O-mode is expressed in terms of this parameter. Implementation should use the value N as an input parameter for the testing, to adapt to the expected robustness level required for the testing. The value of the parameter N is defined in test case definition separately (informative value is given in Annex B.2.3.). Similarly, R-mode operation requires that an update be conveyed to the decompressor until it gets acknowledged; however for R-mode, relevant test cases provide explicit feedback messages when necessary.

…

The feedback messages used in the test cases, when applicable, are artificially generated and interspersed with the input sequence of uncompressed packets. Feedback messages are generated according to the following format:

```
  0   1   2   3   4   5   6   7
+---+---+---+---+---+---+---+---+
| 1   1   1   1   0 |   Code    |  feedback type octet
+---+---+---+---+---+---+---+---+
|Acktype| Mode  |      SN       |
+---+---+---+---+---+---+---+---+
|              SN               |
+---+---+---+---+---+---+---+---+
| 0   0   0   1 | 0   0   0   1 |
+---+---+---+---+---+---+---+---+
|              CRC              |
+---+---+---+---+---+---+---+---+
```

Where:

- Code is set to 0x4 (indicates that feedback data above the type octet is 4 octets)
- Acktype is set to 0x0 (means ACK)
- Mode is set as defined by the test case
- SN is set as defined by the test case
- CRC is the 8-bit CRC computed over the entire feedback payload including any CID fields but excluding the packet type, the 'Size' field and the 'Code' octet, using the polynomial defined in RFC 3095.

NOTE: If compressor uses CID field in compressed packet, the CID field should be included in the feedback packet and the Code and CID should be set as defined in [40].

…

The test sequence is the same as in subclause A.2.2, with the following exception:

1. The RTP Time Stamp is a linearly increasing counter with a packet-to-packet delta of 160, set to 0x00000000 for the first packet.
2. For packets SN = 20, 21 and 22, TS is increased to represent a 7 (0.14 seconds) packet skip (7x160) and is thus set to (20+7)x160=4320 (0x000010E0), (21+7+7)x160=5600(0x000015E0) and (22+7+7+7)x160=6880(0x00001AE0), respectively.
3. For packets SN = 30, 31, 32, 33 and 34, TS is increased to represent a 7 (0.14 seconds) packet skip (7x160) and is thus set to 9280 (0x00002440), 10560 (0x00002940), 11840 (0x00002E40), 13120 (0x00003340) and 14400 (0x00003840) respectively.
4. For packets SN = 40, 41, 42, 43, 44, 45, and 46, TS is increased to represent a 7 (0.14 seconds) packet skip (7x160) and is thus set to 16480 (0x00004060), 17760 (0x00004560), 19040 (0x00004A60), 20320 (0x00004F60), 21600 (0x00005460), 22880 (0x00005960) and 24160 (0x00005E60) respectively.
5. TS thus ends at 27840 (0x00006CC0) in the last packet of the sequence with RTP sequence number 69.

Reference(s)

3GPP TS 25.323 clauses A.1, A.2.12, A.3 and B.2.3.

7.3.6.9.3 Test purpose

To verify how efficiently the compressor handles variations in the function between the TS value and the SN during and after a DTX period, during which SID packets are sent periodically, i.e. that it uses the efficient header formats available to ROHC RTP when operating in R-mode.

7.3.6.9.4 Method of test

Initial conditions

User Equipment:

The UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108. Execute the generic ROHC performance test procedure for a mobile terminating packet switched session according to clause 7.3.6.1.1.

Profile 0x0001 for compression of RTP/UDP/IP headers only is used

N=4

Related ICS/IXIT Statement(s)

Support of PS Yes/No

Support of ROHC Yes/No

UE Supports IPv4 Yes/No

UE Supports IPv6 Yes/No

Test procedure

After the session setup the ROHC compressor is in the U-mode operation in accordance with RFC3095 and in the IR state. The SS starts to send IP packets to the UE, the test sequence consists of 70 packets. The UE returns the IP packets in ROHC U-mode using the test loop function. Between the 6th and 7th packets (SN=5 and SN=6) of the sequence, the first ROHC feedback packet of feedback type 2 is sent to the UE ROHC compressor to trigger an immediate transition to R-mode operation. The SS continues to send IP packets to the UE.

For packets SN = 20, 21 and 22, the SS increases TS to represent a 7 (0.14 seconds) packet skip (7x160) and sets TS to (20+7)x160=4320 (0x000010E0), (21+7+7)x160=5600 (0x000015E0) and (22+7+7+7)x160=6880 (0x00001AE0), respectively.

For packets SN = 30, 31, 32, 33 and 34, the SS increases TS to represent a 7 (0.14 seconds) packet skip (7x160) and sets TS to 9280 (0x00002440), 10560 (0x00002940), 11840 (0x00002E40), 13120 (0x00003340) and 14400 (0x00003840) respectively.

For packets SN = 40, 41, 42, 43, 44, 45, and 46, the SS increases TS to represent a 7 (0.14 seconds) packet skip (7x160) and sets TS to 16480 (0x00004060), 17760 (0x00004560), 19040 (0x00004A60), 20320 (0x00004F60), 21600 (0x00005460), 22880 (0x00005960) and 24160 (0x00005E60) respectively.

The test sequence ends with TS at 27840 (0x00006CC0) in the last packet of the sequence with RTP sequence number 69.

When all the expected compressed headers have been received by the SS, the SS disconnects the session. The SS calculates the Average Compressed Header Size and checks if it meets the test requirements for the IP version used.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		

1			After the PS session setup the UE is in ROHC U-mode operation and in the IR state.
2	←	Test packets	The SS starts sending test packets. The test sequence consists of 70 packets.
3	→	Test packets in U-mode operation.	The UE starts returning test packets in U-mode operation using the test loop function.
4	←	ROHC feedback packet of feedback type 2	Between the 6th and 7th (SN=5 and SN=6) packet of the sequence the SS initiates a transition to R-mode operation.
5	UE		The UE changes immediately to R-mode operation and continues to send the test packets
6	→	Test packets in R-mode operation.	The UE returns test packets in R-mode operation using the test loop function.
6a	←	ROHC feedback packet of feedback type 2	During the test case the SS generates a feedback message when the ROHC packet type octet of the received compressed header matches any of the values as described in the table 7.3.6.3.1.
7	SS		For packets SN = 20, 21 and 22, the SS increases TS to represent a 7 packet skip and sets TS to (20+7)x160=4320, (21+7+7)x160=5600 and (22+7+7+7)x160=6880 respectively.
8	SS		For packets SN = 30, 31, 32, 33 and 34, the SS increases TS to represent a 7 packet skip and sets TS to 9280, 10560, 11840, 13120 and 14400 respectively.
9	SS		For packets SN = 40, 41, 42, 43, 44, 45, and 46, the SS increases TS to represent a 7 packet skip and sets TS to 16480, 17760, 19040, 20320, 21600, 22880 and 24160 respectively.
10	SS	After the SS has received all 70 packets in the test sequence the SS disconnects the PS session.	

Specific Message Contents

RADIO BEARER SETUP message (during Generic ROHC performance test procedure in clause 7.3.6.1.1)

Use the same message as specified for "Packet to CELL_DCH from CELL_DCH in PS" in TS 34.108 clause 9 Default Message Contents, with the exceptions defined in clause 7.3.6.1.1 and the following exception:

Information Element	**Value/remark**
- PDCP ROHC target mode	R-mode

ROHC feedback packet of feedback type 2 (Step 4 and 6a)

```
  0   1   2   3   4   5   6   7
+---+---+---+---+---+---+---+---+
| 1   1   1   1   0 |   Code    |  feedback type octet
+---+---+---+---+---+---+---+---+
|Acktype| Mode  |      SN       |
+---+---+---+---+---+---+---+---+
```

```
|               SN              |
+---+---+---+---+---+---+---+---+
| 0   0   0   1 | 0   0   0   1 |
+---+---+---+---+---+---+---+---+
|               CRC             |
+---+---+---+---+---+---+---+---+
```

Where:

- Code is set to 0x4 (indicates that feedback data above the type octet is 4 octets)
- Acktype is set to 0x0 (means ACK)
- Mode is set to 0x3 (means R-mode)
- SN is set to 0x000
- CRC is the 8-bit CRC computed over the entire feedback payload including any CID fields but excluding the packet type, the 'Size' field and the 'Code' octet, using the polynomial defined in RFC 3095.

  The test equipment waits for a UOR-2, IR-DYN or IR packet from the RoHC compressor with the mode transition parameter set to R. The value of x is the RTP SN of this received packet for which the test equipment generates the second feedback packet of type 2.

7.3.6.9.5 Test requirements

The average compressed header size shall not exceed the limits specified in Table 7.3.6.9.1

Table 7.3.6.9.1: Test Requirement for TS function during DTX with varying delta in R-mode

	Average Compressed Header Size, IPv4	Average Compressed Header size, IPv6
SN <= 19	See Test 1b (Test case 7.3.6.3 in TS 34.123-1)	
20 <= SN <= 22 + x **30 <= SN <= 34 + x** **40 <= SN <= 46 + x**	15 octets	15 octets
Other SN values	5 octets	5 octets

The sequence of expected compressed headers can be illustrated as follow (informative):

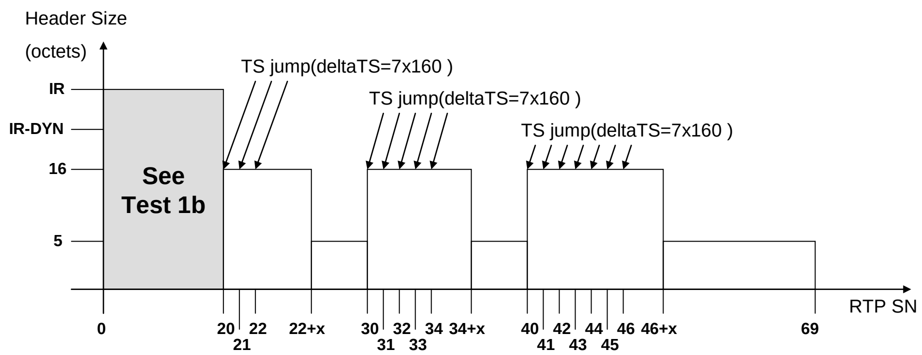


Figure 7.3.6.9: Expected outcome for TS function during DTX with varying delta in R-mode test

7.3.6.10 SRNS relocation for ROHC RTP O-mode compressor

7.3.6.10.1 Definition and applicability

The purpose of this test case is to verify that the compressor does not interrupt efficient header compression upon reception of the indication about SRNS relocation being performed, i.e. that it makes use of efficient compressed packet formats available to ROHC RTP [40] when operating in O-mode when data transmission is resumed after SRNS relocation.

7.3.6.10.2 Conformance requirement

The header compression context relocation is performed by the decision of upper layers in source RNC based on the UE radio capabilities. The decision is done independently every time the SRNS relocation occurs and is specific for each header compression protocol. It is indicated to UE as a part of the SRNS relocation signalling of the upper layer and the selected relocation method is configured to UE PDCP by the upper layer.

The header compression context relocation shall not be performed if the radio bearer is configured to support the lossless SRNS Relocation.

In the UE, upon reception of the indication about SRNS relocation being performed:

- the upper layer configures PDCP (*CPDCP-CONFIG.Req*) to perform either re-initialisation (R) or the context relocation (C) of header compression protocols;
- if the context relocation is to be applied for RFC3095 header compression protocol:
  - if the **compressor** (M-HC) is operating in **R mode**:
    - uplink data may be compressed and transmitted normally.
  - if the **compressor** (M-HC) is operating in **O mode**:
    - compress and transmit uplink data as specified in [8] using the assumption that all ROHC uplink packets transmitted are likely to be lost. When SRNS relocation is completed, M-HC should return to normal operation.

NOTE: When the M-HC is using the assumption that all ROHC uplink packets transmitted are likely to be lost:
- the M-HC can not transit to a higher compression state;
- for W-LSB encoding, the M-HC updates the set of candidate reference values used by the decompressor by adding newly transmitted values but not removing old values.

…

The outline of each test case follows the same format with respect to the input sequences and the requirements Test 1a and 1b are base tests using a well-behaving flow of packets as one of the inputs. All subsequent tests are based on test 1a or test 1b, each with specific test events added to the packet flow of the base tests.

…

The purpose of the base test case is to verify that the compressor properly implements compression for a well-behaved IP/UDP/RTP packet flow, i.e. that t it makes use of efficient compressed packet formats available to ROHC RTP [40] when operating in O-mode.

A sequence consisting of 70 packets in total is used where all header fields are set according to the basic test packet structure, as described in subclause A.3, with addition of the following:

1. The RTP Sequence Number is a linearly increasing counter with a packet-to-packet delta of 1, set to 0x0000 for the first packet and thus ending with 0x0045 (69) in the last packet of the sequence
2. The RTP Time Stamp is a linearly increasing counter with a packet-to-packet delta of 160, set to 0x00000000 for the first packet and thus ending with 0x00002B20 (11040) in the last packet of the sequence.
3. The IP Identification is set to the same value as the RTP Sequence Number; this means that for IPv4 the IP-ID behaviour is not random, thus value(RND)=0 defined in [40] for both IPv4 and IPv6.

Between the 6th and 7th packets (SN=5 and SN=6) of the sequence, a ROHC feedback packet of feedback type 2 is to be given to the ROHC compressor to trigger an immediate transition to O-mode operation. The format of that packet is as follows:

```
  0   1   2   3   4   5   6   7
+---+---+---+---+---+---+---+---+
| 1   1   1   1   0 |   Code    |  feedback type octet
+---+---+---+---+---+---+---+---+
|Acktype| Mode  |       SN      |
+---+---+---+---+---+---+---+---+
|              SN               |
+---+---+---+---+---+---+---+---+
| 0   0   0   1 | 0   0   0   1 |
+---+---+---+---+---+---+---+---+
|              CRC              |
+---+---+---+---+---+---+---+---+
```

Where:

- Code is set to 0x4 (indicates that feedback data above the type octet is 4 octets)
- Acktype is set to 0x0 (means ACK)
- Mode is set to 0x2 (means O-mode)
- SN is set to 0x000
- CRC is the 8-bit CRC computed over the entire feedback payload including any CID fields but excluding the packet type, the 'Size' field and the 'Code' octet, using the polynomial defined in RFC 3095.

NOTE: If compressor uses CID field in compressed packet, the CID field should be included in the feedback packet and the Code and CID should be set as defined in [40].

…

The test sequence is the same as in subclause A.2.1, with the following exceptions:

Packets with SN = 10 to SN = 59 are removed from the sequence.

SRNS relocation occurs between packet with SN = 9 and packet with SN = 60, thus simulating a 1s long SRNS relocation that affects compression of the IP/UDP/RTP packet flow.

NOTE: The operation of the ROHC compressor is not affected by the time interval between packets with SN = 9 and SN = 60 (timer-based compression is not allowed because no appropriate feedback is provided).

Reference(s)

3GPP TS 25.323 clauses 5.4.2, A.1.2, A.2.1, A.2.13.

7.3.6.10.3 Test purpose

To verify that the compressor does not interrupt efficient header compression upon reception of the indication about SRNS relocation being performed, i.e. that it makes use of efficient compressed packet formats available to ROHC RTP [40] when operating in O-mode when data transmission is resumed after SRNS relocation.

To verify the ROHC compressor shall normally add information to the compression context as new uplink data are compressed, but not remove any existing information from the compression context upon reception of the indication about SRNS relocation being performed and if the context relocation is to be applied for RFC3095 header compression protocol when operating in O-mode.

To verify that normal operation is applied when SRNS relocation with header compression context relocation is completed.

7.3.6.10.4 Method of test

Initial conditions

User Equipment:

The UE is in Idle mode (state 3 or state 7) as specified in clause 7.4 of TS 34.108. Execute the generic ROHC performance test procedure for a mobile terminating packet switched session according to clause 7.3.6.1.1.

Profile 0x0001 for compression of RTP/UDP/IP headers only is used

N=4

Related ICS/IXIT Statement(s)

Support of PS Yes/No

Support of ROHC Yes/No

Support of context relocation Yes/No

UE Supports IPv4 Yes/No

UE Supports IPv6 Yes/No

Test procedure

After the session setup the UE ROHC compressor is in the U-mode operation in accordance with RFC3095 and in the IR state. The SS starts to send IP packets to the UE, the test sequence consists of 70 packets. The UE returns the IP packets in ROHC U-mode using the test loop function. Between the 6th and 7th packets (SN=5 and SN=6) of the sequence, a ROHC feedback packet of feedback type 2 is sent to the UE ROHC compressor to trigger an immediate transition to O-mode operation.

The SS transmits a RADIO BEARER RECONFIGURATION message. Packets with SN = 10 to SN = 59 are removed from the sequence.

The UE performs a combined hard handover and SRNS relocation with header compression context relocation and then transmits a RADIO BEARER RECONFIGURATION COMPLETE message in the new cell. The SS resumes the transmission of IP packets and checks that all transmitted IP Packets are sent back by the UE.

When all the expected compressed headers have been received by the SS, the SS disconnects the session. The SS calculates the Average Compressed Header Size and checks if it meets the test requirements for the IP version used.

Expected sequence

Step	Direction UE	SS	Message	Comments
1				After the PS session setup the UE is in ROHC U-mode operation and in the IR state.
2	←		Test packets	The SS starts sending test packets
3	→		Test packets in U-mode operation.	The UE starts returning test packets in U-mode operation using the test loop function.
4	←		ROHC feedback packet of feedback type 2	Between the 6th and 7th packet (SN=5 and SN=6) of the sequence, a ROHC feedback packet of feedback type 2 is sent to the ROHC compressor to trigger an immediate transition to O-mode operation.
5	UE			The UE changes immediately to O-mode operation and continues to send the test packets
6	→		Test packets in O-mode operation.	
7	←		RADIO BEARER RECONFIGURATION	
				The SS stop sending test packets
8	→		RADIO BEARER RECONFIGURATION COMPLETE	
9	←		Test packets	The SS resumes sending test packets.
10	→		Test packets in O-mode operation.	

11	SS	After the SS has received all the packets in the test sequence the SS disconnects the PS session.	

Specific Message Contents

RADIO BEARER SETUP message (during Generic ROHC performance test procedure in clause 7.3.6.1.1)

Use the same message as specified for "Packet to CELL_DCH from CELL_DCH in PS" in TS 34.108 clause 9 Default Message Contents, with the exceptions defined in clause 7.3.6.1.1 and the following exception:

Information Element	Value/remark
- PDCP ROHC target mode	O-mode

ROHC feedback packet of feedback type 2 (Step 4)

```
  0   1   2   3   4   5   6   7
+---+---+---+---+---+---+---+---+
| 1   1   1   1   0 |   Code    |  feedback type octet
+---+---+---+---+---+---+---+---+
|Acktype| Mode  |       SN      |
+---+---+---+---+---+---+---+---+
|              SN               |
+---+---+---+---+---+---+---+---+
| 0   0   0   1 | 0   0   0   1 |
+---+---+---+---+---+---+---+---+
|              CRC              |
+---+---+---+---+---+---+---+---+
```

Where:

- Code is set to 0x4 (indicates that feedback data above the type octet is 4 octets)
- Acktype is set to 0x0 (means ACK)
- Mode is set to 0x2 (means O-mode)
- SN is set to 0x000
- CRC is the 8-bit CRC computed over the entire feedback payload including any CID fields but excluding the packet type, the 'Size' field and the 'Code' octet, using the polynomial defined in RFC 3095.

RADIO BEARER RECONFIGURATION (Step 7)

Use the same message sub-type found in [9] TS 34.108 clause 9, which is entitled “Packet to CELL_DCH from CELL_DCH in PS”, with the following exceptions:

Information Element	Value/remark
RB information to reconfigure list	
- RB information to reconfigure	
- RB identity	TBD
- PDCP info	
- Support for lossless SRNS relocation	FALSE
- PDCP PDU header	Present
- Header compression information	present
CHOICE *algorithm type*	
- RFC3095	
- RLC info	
- CHOICE Uplink RLC mode	UM RLC
- CHOICE Downlink RLC mode	UM RLC
RB with PDCP context relocation info list	
- PDCP context relocation info	
- RB identity	TBD
- Downlink RFC 3095 context relocation indication	TRUE
- Uplink RFC 3095 context relocation indication	TRUE

7.3.6.10.5 Test requirements

The average compressed header size shall not exceed the limits specified in Table 7.3.6.10.

Table 7.3.6.10: Test Requirement for SRNS relocation for ROHC RTP O-mode compressor

	Average Compressed Header Size, IPv4	Average Compressed Header size, IPv6
SN <= N-1	44 octets	68 octets
N <= SN <= 9	5 octets	5 octets
60 <= SN <= 59+N	8 octets	8 octets
SN >= 60+N	5 octets	5 octets

With N value equal to 4.

The sequence of expected compressed headers can be illustrated as follow (informative):

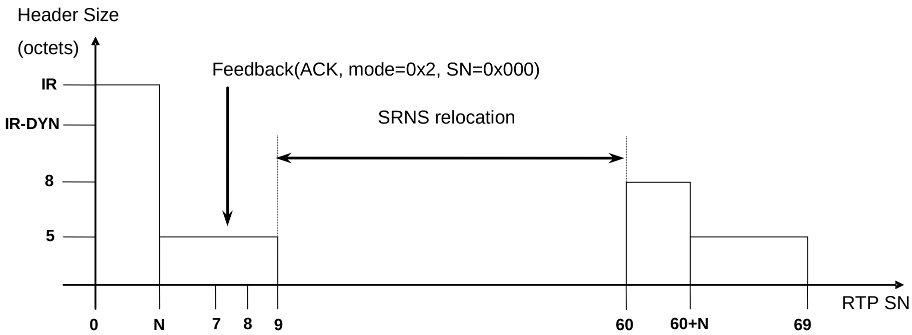


Figure 7.3.6.10: Expected outcome for SRNS relocation for RTP O-mode compressor test

7.3.7 PDCP AMR Data PDU testing

7.3.7.1 PDCP AMR Data PDU testing

7.3.7.1.1 Definition and applicability

Applicable for all UEs supporting CS Voice over HSPA and a Radio Bearer as described in the Common Test Sequences.

The UE shall be capable to deal with AMR data PDU and to correctly set the value of the CS counter.

7.3.7.1.2 Conformance requirement

The Packet Data Convergence Protocol shall perform the following functions:

- header compression and decompression of IP data streams (e.g., TCP/IP and RTP/UDP/IP headers for IPv4 and IPv6) at the transmitting and receiving entity, respectively.
- transfer of user data. This function is used for conveyance of data between users of PDCP services.
- maintenance of PDCP sequence numbers for radio bearers that are configured to support lossless SRNS Relocation or lossless DL RLC PDU size change.
- transfer of CS counter if the radio bearer is configured to convey AMR and AMR WB frames.
- add and remove the padding in PDCP PDU for octet alignment.

PDCP uses the services provided by the Radio Link Control (RLC) sublayer.

(…)

If radio bearer is configured to convey AMR or AMR WB frames for every 20ms, the sender shall :

- if the PDCP SDU length is of 0 bit or no PDCP SDU is received by PDCP entity:
  - discard the PDCP SDU if any and no PDCP PDU is submitted to the lower layer;
- if the PDCP SDU length is of 1 or more bits:
  - include the CS counter in the PDCP AMR Data PDU as specified in subclause 5.6.1.4 of TS 25.323;
  - indicate the PDCP AMR PDU type in the PDU type field;
  - fill the data field of the PDCP AMR PDU type with the PDCP SDU and add padding bits as specified in subclause 8.2.4 of TS 25.323
- increment the CS counter;

When the PDCP entity at the Receiver receives the PDCP PDU from lower layers, it shall:

- if the received PDCP PDU is of type PDCP AMR Data PDU:
  - the PDCP SDU is derived from the data field of the PDCP AMR Data PDU. The receiver determines the bit aligned data content and Frame Type from the PDU Data field length, as possible AMR and AMR WB payload has a unique size when being octet aligned;
- deliver the PDCP SDU and CS counter from the received PDCP header to the upper layer. (…)

In case the radio bearer is configured to convey AMR or AMR WB frames, the CS counter shall be included in the PDCP AMR Data PDU.

The value of the CS counter shall be set to the first to fifth LSBs of the CFN at which the packet has been received from higher layers.

(…)

The PDU type field indicates the PDCP Data PDU type.

Bit	PDU Type
000	PDCP Data PDU (Table 7)
001	PDCP SeqNum PDU (Table 8)
010	PDCP AMR Data PDU (Table 9)
011-111	Reserved (PDUs with this encoding are invalid for this version of the protocol)

(…)

The PDCP AMR Data PDU is used to convey:

- a PDCP SDU containing AMR or AMR WB frame

The format of the PDCP AMR Data PDU is shown in Table 9.

Table 9: PDCP AMR Data PDU format

PDU type	CS counter
Data	

The PDCP PDU is octet aligned but the actual PDCP SDU carrying the AMR or AMR WB frame may not be octet aligned. The AMR classes are always encoded in the order of class A, B and C, where the first bit of data follows immediately after the CS counter field and any padding for octet alignment is inserted at the end of the data field.

(…)

Length: 5 bits

CS counter field value indicates the timing of AMR or AMR WB frame.

Reference(s)

TS 25.323 clauses 5, 5.3, 5.6.1.4, 8.3.1, 8.2.4, 8.3.5

7.3.7.1.3 Test purpose

1. To verify that the UE transmits and receives AMR Data PDU in unacknowledged mode (RLC UM) as configured by higher layers.
2. To verify that the UE includes the CS counter and sets it to the first to fifth LSBs of the CFN at which the packet has been received from higher layers.

7.3.7.1.4 Method of test

Initial conditions

UE is in Idle mode (state 2 or state 7) as specified in clause 7.4 of TS 34.108.

Related ICS/IXIT Statement(s)

Support of CS Voice over HSPA (Yes/No)

Test procedure

a) The SS setups a circuit switched session including radio bearer and UE test loop mode 1 in RLC UM using Common test procedures for mobile terminated CS switched sessions. Usage of "PDCP AMR Data" PDU has been configured by higher layers.

b) The SS sends an AMR data packet.

c) After having received the AMR data packet, the PDCP entity of the UE shall recognize the PDCP PDU type and shall handle the received AMR data packet with the appropriate decoding method. Then it forwards the data to its Radio Bearer Loop Back entity. The received data shall be returned by the UE via its PDCP configuration using PDCP AMR Data PDU. The CS counter field of the PDCP AMR Data PDU looped back shall be set to the first to fifth LSBs of the CFN at which the packet has been received from higher layers.

d) The SS receives and decodes the data packet. The decoded data packet shall be identical with the data as sent before. The SS verifies that the CS counter is set to the first to fifth LSBs of a CFN value comprised between (current CFN - 4) and (current CFN).

e) Steps b) through d) are repeated 10 times, with 500 ms between the sending of each AMR data packet in the downlink.

f) The SS deactivates the UE test loop mode and terminates the connection.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
Setup a UE terminated CS session (using UE test loop mode 1)				
1	←		PDCP Data	The SS creates an AMR data packet (PDCP AMR Data PDU). The SS sends a PDCP AMR Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 010 (PDCP AMR Data PDU) CS counter = first to fifth LSBs of the CFN at which the packet has been received from higher layers data: below described AMR frames After having received the PDCP AMR Data PDU, the UE decodes the PDU and recognizes PDU type = 010 (PDCP AMR Data PDU) The AMR data packet is forwarded via PDCP-SAP to its Radio Bearer Loop Back (RB LB) entity. The RB LB entity in UE test loop mode 1 returns the received data packet and sends it back to its PDCP entity.
2	→		PDCP Data	The UE sends a PDCP AMR Data PDU using the RLC-UM-Data-Request Primitive with the following content back to the SS: PDU type = 010 (PDCP AMR Data PDU) CS counter = first to fifth LSBs of the CFN at which the packet has been received from higher layers data: previously received AMR frames After reception of this AMR data packet, the SS applies the appropriate decoding function for the received data and verifies that CS counter is set to the first to fifth LSBs of a CFN value comprised between (current CFN - 4) and (current CFN)
				Steps 1-2 are repeated 10 times, with 500 ms between the sending of each AMR data packet in the downlink
Deactivate a UE terminated CS session (using UE test loop mode 1)				

Specific Message Contents

RRC CONNECTION SETUP message

The contents of the RRC CONNECTION SETUP message applied in the preamble "Setup a UE terminated CS session in UM RLC" of this test case are identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] (CS connection) with the following exceptions:

Information Element	Value/remark
Capability update requirement - UE radio access capability update requirement	 TRUE NOTE: Value will be checked. Stated capability must be compatible with 34.123-2 (c.f. PICS/PIXIT statements in GSM) and the user settings

RADIO BEARER SETUP message

The contents of the RADIO BEARER SETUP message are identical to “Speech to CELL_DCH / E-DCH / HS-DSCH CS RAB with DTX/DRX and enhanced data rate using one multiplexing option (1/1) and SRBs mapped on E-DCH/HS-DSCH (Condition A23) , with the following exceptions

Information Element	Value/remark
- CS-HSPA information	
- UL AMR rate	Not Present
- Max CS delay	100

Content of PDCP Data PDU (Step 1)

Information Element	Value/remark
PDU type CS counter Data	010 first to fifth LSBs of the CFN at which the packet has been received from higher layers 244 bits of AMR data + 4 bits of padding

Content of PDCP Data PDU (Step 2)

Information Element	Value/remark
PDU type CS counter Data	010 first to fifth LSBs of the CFN at which the packet has been received from higher layers Same content as Data from PDCP Data PDU at Step 1

7.3.7.1.5 Test requirements

After having received the AMR data packet conveyed with the "PDCP AMR Data" PDU, the UE shall return the data packets as indication that the previous packets have been received and handled correctly (PDCP AMR Data PDU).

The CS counter in the PDCP AMR Data PDUs received from the UE shall be set to the first to fifth LSBs of a CFN value comprised between (current CFN – 4) and (current CFN).

7.3.7.2 PDCP Unrecoverable Error Detection

7.3.7.2.1 Definition and applicability

Applicable for all UEs supporting CS Voice over HSPA and a Radio Bearer as described in the Common Test Sequences.

7.3.7.2.2 Conformance requirement

Length: 3 bits.

The PDU type field indicates the PDCP Data PDU type.

Bit	PDU Type
000	PDCP Data PDU (Table 7)
001	PDCP SeqNum PDU (Table 8)
010	PDCP AMR Data PDU (Table 9)
011-111	Reserved (PDUs with this encoding are invalid for this version of the protocol)

(…)

The PDCP AMR Data PDU is used to convey:

- a PDCP SDU containing AMR or AMR WB frame

The format of the PDCP AMR Data PDU is shown in Table 9.

Table 9: PDCP AMR Data PDU format

PDU type	CS counter
Data	

The PDCP PDU is octet aligned but the actual PDCP SDU carrying the AMR or AMR WB frame may not be octet aligned. The AMR classes are always encoded in the order of class A, B and C, where the first bit of data follows immediately after the CS counter field and any padding for octet alignment is inserted at the end of the data field.

(…)

If a PDCP entity receives a PDCP PDU with a PDU Type set to Reserved (see subclause 8.3.1), it shall:

- discard the PDCP PDU.

If a PDCP entity is not configured for lossless SRNS Relocation or lossless DL RLC PDU size change and receives a PDCP SeqNum PDU, it shall:

- discard the PDCP SeqNum PDU.

…

If a PDCP entity receives a PDCP PDU with a PID value that is not mapped with a valid packet type (see subclause 5.1.1), it shall:

- discard the PDCP PDU.

(…)

For each radio bearer that is configured to perform PDCP Unrecoverable Error Detection:

- if the PDCP entity receives 2 or 3 consecutive PDCP PDUs with an unexpected or invalid PDU Type or PID value:
  - the UE PDCP entity may indicate PDCP Unrecoverable Error to upper layer [2].
- if the PDCP entity receives 4 consecutive PDCP PDUs with an unexpected or invalid PDU Type or PID value:
  - the UE PDCP entity shall indicate PDCP Unrecoverable Error to upper layer [2].

NOTE1: Until the UE receives 4 consecutive PDCP PDUs with an unexpected or invalid PDU Type or PID value, the UE may apply a self-recovery mechanism. For example, the UE PDCP entity may indicate to RLC layer that HFN can be incremented.

NOTE2: The PDCP unrecoverable error detection is performed before the invalid PDU type check specified in subclause 9.1.

NOTE3: PDCP unrecoverable error detection in the UE can only detect the problem in the downlink.

(…)

1> Radio link failure:

2> if none of the criteria for performing cell update with the causes specified above in the current subclause is met:

3> if the UE is in CELL_DCH state and the criteria for radio link failure are met as specified in subclause 8.5.6; or

3> if the transmission of the UE CAPABILITY INFORMATION message fails as specified in subclause 8.1.6.6; or

3> if the UE detects PDCP Unrecoverable Error [36] in a PDCP entity

4> perform cell update using the cause "radio link failure".

(…)

If IE "PDCP info" is included, the UE shall:

1> if the radio bearer is connected to a CS domain radio access bearer:

2> if the IE "PDCP info" is included in any other message than the RADIO BEARER SETUP, CELL UPDATE CONFIRM or the HANDOVER TO UTRAN COMMAND message; or

2> if the IE "PDCP PDU header" is set to the value "absent"; or

2> if the IE "Support for lossless SRNS relocation or for lossless DL RLC PDU size change" is set to TRUE; or

2> if the IE "Header compression information" is present; or

2> if the UE does not support CS voice service over HSDPA and EDCH:

3> set the variable INVALID_CONFIGURATION to TRUE.

2> else

3> include PDCP headers in both uplink and downlink PDCP PDUs.

3> configure "PDCP Unrecoverable Error Detection" in lower layer.

(…)

Reference(s)

TS 25.323 clauses 8.2.4, 8.3.1, 9.1, 9.2, 9.3

TS 25.331 clauses 8.3.1.2, 8.6.4.10

7.3.7.2.3 Test purpose

1. To verify that the UE discards PDCP PDUs with invalid header.
2. To verify that UE transmits CELL UPDATE with cause "radio link failure" when UE receives consecutive PDCP PDUs with the wrong header.

7.3.7.2.4 Method of test

Initial conditions

UE is in Idle mode (state 2 or state 7) as specified in clause 7.4 of TS 34.108.

Related ICS/IXIT Statement(s)

Support of CS Voice over HSPA

Test procedure

a) The SS setups a circuit switched session including radio bearer and UE test loop mode 1 in RLC UM using common test procedures for mobile terminated CS switched sessions. Usage of "PDCP AMR Data" PDU has been configured by higher layers.

b) The SS sends a PDCP AMR data packet with invalid header.

c) After having received the AMR data packet, the PDCP entity of the UE shall recognise the PDCP header is invalid and discard the data packet.

d) Step b shall be repeated and SS should verify the expected response in step c.

e) After 2 consecutive PDCP PDUs with invalid header are sent by SS, the UE may optionally send CELL UPDATE.

f) SS transmits another 2 consecutive PDCP PDUs with invalid header.

g) UE shall discard the data packets and may optionally transmit CELL UPDATE after the reception of the 3rd PCDP PDU with invalid header. The UE shall transmit CELL UPDATE after the reception of the 4th PDCP PDU with invalid header.

h) SS shall transmit CELL UPDATE CONFIRM in response to CELL UPDATE from the UE. The SS requests the UE to transit to CELL_DCH state and provides the physical channel configuration to resume the interrupted radio bearer mapped on E-DCH / HS-DSCH and configures UL DTX.

   The UE sets up the physical channels associated to E-DCH / HS-DSCH, enters CELL_DCH state and sends a PHYSICAL CHANNEL RECONFIGURATION COMPLETE message.

i) The SS sends an AMR data packet with a valid header.

j) The received data shall be looped back by the UE via its PDCP configuration using PDCP AMR Data PDU.

k) The SS receives and decodes the data packet. The decoded data packet shall be identical with the data as sent before.

l) Steps i) through k) are repeated 10 times, with 500 ms between the sending of each AMR data packet in the downlink.

m) The SS deactivates the UE test loop mode and terminates the connection.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
Setup a UE terminated CS session (using UE test loop mode 1). Refer to section 7.3.1 of TS 34.123-1 for common test procedure sequence.				
				The SS creates an AMR data packet (PDCP AMR Data PDU).
1	←		PDCP Data with invalid PDU type	The SS sends a PDCP AMR Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 011 (Invalid PDU type) CS counter = first to fifth LSBs of the CFN at which the packet has been received from higher layers
2				After having received the PDCP Data PDU, the UE decodes the PDU and recognizes that the PDU type is an Invalid type. The data packet is discarded. SS checks that PDCP data is not looped back Repeat steps 1 and 2 once
3	→		CELL UPDATE	Optional step, see note 1. If CELL_UPDATE is sent by UE then go to step 8
4	←		PDCP Data with invalid PDU type	The SS sends a third PDCP AMR Data PDU with Invalid PDU type
5	→		CELL UPDATE	Optional step, see note 1. If CELL_UPDATE is sent by UE then go to step 8
6	←		PDCP Data with invalid PDU type	The SS sends a fourth PDCP AMR Data PDU with invalid PDU type
7	→		CELL UPDATE	No data loop back. CELL UPDATE is mandatory if not already received in preceding steps 3 and 5.
8	←		CELL UPDATE CONFIRM	
8a	→		PHYSICAL CHANNEL RECONFIGURATION COMPLETE	
9	←		PDCP Data	The SS sends a PDCP AMR Data PDU using the RLC-UM-Data-Request Primitive with the following content to the UE: PDU type = 010 (PDCP AMR Data PDU) CS counter = first to fifth LSBs of the CFN at which the packet has been received from higher layers
10	→		PDCP Data	The UE loops back PDCP AMR Data PDU with the following content back to the SS: PDU type = 010 (PDCP AMR Data PDU) CS counter = first to fifth LSBs of the CFN at which the packet has been received from higher layers data: previously received AMR frames
				Steps 9 and 10 are repeated 10 times, with 500 ms between the sending of each AMR data packet in the downlink
Deactivate a UE terminated CS session (using UE test loop mode 1). Refer to section 7.3.1 of TS 34.123-1 for common test procedure sequence.				
Note 1: CELL UPDATE can optionally be transmitted by UE at steps 3 or 5. If CELL UPDATE is transmitted by the UE at either step then the expected test sequence goes direct to step 8.				

Specific Message Contents

RADIO BEARER SETUP message

"Speech to CELL_DCH / E-DCH / HS-DSCH CS RAB with DTX/DRX and enhanced data rate using one multiplexing option (1/1) and SRBs mapped on E-DCH/HS-DSCH (Condition A23), with the following exceptions

Information Element	Value/remark
- RAB information for setup	
- CS-HSPA information	
- UL AMR rate	Not Present
- Max CS delay	100
- RB information to be affected	
- RB identity	1 (UM DCCH for RRC)
- Information for each multiplexing option	2 RBMuxOption
- RLC logical channel mapping indicator	Not Present
- Number of uplink RLC logical channels	1
- Uplink transport channel type	E-DCH
- Logical channel identity	1
- E-DCH MAC-d flow identity	1
- CHOICE RLC PDU size	Fixed size
- DDI	1
- RLC PDU size list	1 RLC PDU size
- RLC PDU size	144 bits
- Include in scheduling info	FALSE
- MAC logical channel priority	1
- Downlink RLC logical channel info	
- Number of RLC logical channels	1
- Downlink transport channel type	HS-DSCH
- DL DCH Transport channel identity	Not present
- DL DSCH Transport channel identity	Not present
- CHOICE DL MAC header type	MAC-ehs
- DL HS-DSCH MAC-ehs Queue Id	1
- Logical channel identity	1
- RLC logical channel mapping indicator	Not Present
- Number of RLC logical channels	1
- Uplink transport channel type	RACH
- UL Transport channel identity	Not Present

- Logical channel identity	1
- CHOICE RLC size list	Explicit List
- RLC size index	According to clause 6.10.2.4.1.3 (standalone 13.6 kbps signalling radio bearer)
- MAC logical channel priority	1
- Downlink RLC logical channel info	
- Number of RLC logical channels	1
- Downlink transport channel type	FACH
- DL DCH Transport channel identity	Not Present
- DL DSCH Transport channel identity	Not Present
- Logical channel identity	1
- RB identity	2 (AM DCCH for RRC)
- Information for each multiplexing option	2 RBMuxOption
- RLC logical channel mapping indicator	Not Present
- Number of uplink RLC logical channels	1
- Uplink transport channel type	E-DCH
- Logical channel identity	2
- E-DCH MAC-d flow identity	1
- CHOICE RLC PDU size	Fixed size
- DDI	2
- RLC PDU size list	1 RLC PDU size
- RLC PDU size	144 bits
- Include in scheduling info	FALSE
- MAC logical channel priority	2
- Downlink RLC logical channel info	
- Number of RLC logical channels	1
- Downlink transport channel type	HS-DSCH
- DL DCH Transport channel identity	Not present
- DL DSCH Transport channel identity	Not present
- CHOICE DL MAC header type	MAC-ehs
- DL HS-DSCH MAC-ehs Queue Id	1
- Logical channel identity	2
- RLC logical channel mapping indicator	Not Present
- Number of RLC logical channels	1
- Uplink transport channel type	RACH
- UL Transport channel identity	Not Present
- Logical channel identity	2
- CHOICE RLC size list	Explicit List
- RLC size index	According to clause 6.10.2.4.1.3 (standalone 13.6 kbps signalling radio bearer)
- MAC logical channel priority	2
- Downlink RLC logical channel info	
- Number of RLC logical channels	1
- Downlink transport channel type	FACH
- DL DCH Transport channel identity	Not Present
- DL DSCH Transport channel identity	Not Present
- Logical channel identity	2
- RB identity	3 (AM DCCH for RRC)
- Information for each multiplexing option	2 RBMuxOption
- RLC logical channel mapping indicator	Not Present
- Number of uplink RLC logical channels	1
- Uplink transport channel type	E-DCH
- Logical channel identity	3
- E-DCH MAC-d flow identity	1
- CHOICE RLC PDU size	Fixed size
- DDI	3
- RLC PDU size list	1 RLC PDU size
- RLC PDU size	144 bits
- Include in scheduling info	FALSE
- MAC logical channel priority	3
- Downlink RLC logical channel info	
- Number of RLC logical channels	1
- Downlink transport channel type	HS-DSCH
- DL DCH Transport channel identity	Not present
- DL DSCH Transport channel identity	Not present
- CHOICE DL MAC header type	MAC-ehs
- DL HS-DSCH MAC-ehs Queue Id	1
- Logical channel identity	3

- RLC logical channel mapping indicator	Not Present
- Number of RLC logical channels	1
- Uplink transport channel type	RACH
- UL Transport channel identity	Not Present
- Logical channel identity	3
- CHOICE RLC size list	Explicit List
- RLC size index	According to clause 6.10.2.4.1.3 (standalone 13.6 kbps signalling radio bearer)
- MAC logical channel priority	3
- Downlink RLC logical channel info	
- Number of RLC logical channels	1
- Downlink transport channel type	FACH
- DL DCH Transport channel identity	Not Present
- DL DSCH Transport channel identity	Not Present
- Logical channel identity	3
- RB identity	4 (AM DCCH for RRC)
- Information for each multiplexing option	2 RBMuxOption
- RLC logical channel mapping indicator	Not Present
- Number of uplink RLC logical channels	1
- Uplink transport channel type	E-DCH
- Logical channel identity	4
- E-DCH MAC-d flow identity	1
- CHOICE RLC PDU size	Fixed size
- DDI	4
- RLC PDU size list	1 RLC PDU size
- RLC PDU size	144 bits
- Include in scheduling info	FALSE
- MAC logical channel priority	4
- Downlink RLC logical channel info	
- Number of RLC logical channels	1
- Downlink transport channel type	HS-DSCH
- DL DCH Transport channel identity	Not present
- DL DSCH Transport channel identity	Not present
- CHOICE DL MAC header type	MAC-ehs
- DL HS-DSCH MAC-ehs Queue Id	1
- Logical channel identity	4
- RLC logical channel mapping indicator	Not Present
- Number of RLC logical channels	1
- Uplink transport channel type	RACH
- UL Transport channel identity	Not Present
- Logical channel identity	4
- CHOICE RLC size list	Explicit List
- RLC size index	According to clause 6.10.2.4.1.3 (standalone 13.6 kbps signalling radio bearer)
- MAC logical channel priority	4
- Downlink RLC logical channel info	
- Number of RLC logical channels	1
- Downlink transport channel type	FACH
- DL DCH Transport channel identity	Not Present
- DL DSCH Transport channel identity	Not Present
- Logical channel identity	4

Content of PDCP Data PDU (Step 1, 4, 6)

Information Element	Value/remark
PDU type	011
CS counter	first to fifth LSBs of the CFN at which the packet has been received from higher layers
Data	244 bits of AMR data + 4 bits of padding

Content of CELL UPDATE (step 3, 5, 7)

The same message found in TS 34.108 clause 9.1.1 shall be transmitted by the UE on the uplink CCCH, with the exception of the following IEs:

Information Element	Value/remark
Cell Update Cause	Check to see if set to 'radio link failure'

CELL UPDATE CONFIRM (Step 8)

Use the same message content found in TS 34.108 clause 9.1.1 with the following exception:

Information Element	Value/remark
RRC State indicator	CELL_DCH
DTX-DRX timing information	Same as the set defined in RADIO BEARER SETUP message found in TS 34.108 clause 9 under condition A23.
Uplink DPCH info	Same as the set defined in RADIO BEARER SETUP message found in TS 34.108 clause 9 under condition A23.
E-DCH Info	Same as the set defined in RADIO BEARER SETUP message found in TS 34.108 clause 9 under condition A23.
Downlink HS-PDSCH information	Same as the set defined in RADIO BEARER SETUP message found in TS 34.108 clause 9 under condition A23.
Downlink information common for all radio links	
- Timing Indication	Initialise
- Downlink F-DPCH power control information	
- DPC mode	0 (single)
- TPC command error rate target	0.04
- CHOICE mode	FDD
- DPCH compressed mode info	Not Present
- TX Diversity mode	None
- Default DPCH Offset Value	Arbitrary set to value 0..306688 by step of 512
- MAC-hs reset indicator	TRUE
Downlink information per radio link list	Same as the set defined in RADIO BEARER SETUP message found in TS 34.108 clause 9 under condition A23.

Content of PDCP Data PDU (Step 9)

Information Element	Value/remark
PDU type	010
CS counter	first to fifth LSBs of the CFN at which the packet has been received from higher layers
Data	244 bits of AMR data + 4 bits of padding

Content of PDCP Data PDU (Step 10)

Information Element	Value/remark
PDU type	010
CS counter	first to fifth LSBs of the CFN at which the packet has been received from higher layers
Data	Same content as Data from PDCP Data PDU at Step 1

7.3.7.2.5 Test requirements

After receiving 2, 3 or 4 consecutive PDCP PDUs with invalid PDU type the UE shall transmit CELL UPDATE with cause value "radio link failure"

After receiving the AMR data packets conveyed with a valid header, the UE shall successfully loop back all the data packets

7.4 BMC

General

For BMC testing, the UE manufacturers shall define CB data as PIXIT (CB-Data 1 and 2) for different CB message types and for CB Data41 (ANSI-41 data) and it shall describe how the reception is indicated in a clear way on UE side.

Only Cell Broadcast Services (CBS) as distributed BMC service is applied. For a UE supporting BMC, it is assumed, that there is a BMC entity established, if Initial conditions are reached.

If not otherwise mentioned, the same procedures as used in RRC test specification [TS 34.123-1] are applied to reach Initial conditions for BMC testing.

It shall be possible to activate and deactivate a CB message types by using the Message ID of CB data 1, 2 and CB41 data 1 on UE side.

7.4.1 BMC RAB + SRBs for CCCH + SRB for DCCH + SRB for BCCH

7.4.1.1 Transport channel parameters of BMC RAB and SRBs for CCCH, SRB for DCCH, and SRB for BCCH

Higher layer	RAB/signalling RB		SRB#1	SRB#2	SRB#3	SRB#4	SRB#5	SRB#6	RAB#30
	User of Radio Bearer		RRC	RRC	RRC	NAS_DT High prio	NAS_DT Low prio	RRC	-
RLC	Logical channel type		CCCH	DCCH	DCCH	DCCH	DCCH	BCCH	CTCH
	RLC mode		UM	UM	AM	AM	AM	TM	UM
	Payload sizes, bit		152	136 or 120*	128	128	128	166	152
	Max data rate, bps		45600	40800 or 36000	38400	38400	38400	49800	45600
	AMD/UMD/TrD PDU header, bit		8	8	16	16	16	0	8
MAC	MAC header, bit		8	24 or 40	24	24	24	2	8
	MAC multiplexing		7 logical channel multiplexing						
Layer 1	TrCH type		FACH						
	TB sizes, bit		168						
	TFS	TF0, bits	0x168						
		TF1, bits	1x168						
		TF2, bits	2x168						
		TF3, bits	3x168						
	TTI, ms		10						
	Coding type		CC 1/2						
	CRC, bit		16						
	Max number of bits/TTI before rate matching		1136						
	RM attribute		200-240						

* MAC header size and RLC payload size depend on use of U-RNTI or C-RNTI.

7.4.1.2 TFCS

TFCS size	4
TFCS	(BMC RAB and SRBs for CCCH/DCCH/BCCH) = TF0, TF1, TF2, TF3

7.4.1.3 Physical channel parameters

SCCPCH	DTX position	Flexible
	Spreading factor	64

	Number of TFCI bits/slot	8
	Number of Pilot bits/slot	0
	Number of data bits/slot	72
	Number of data bits/frame	1080

7.4.2 General BMC message reception

7.4.2.1 UE in RRC Idle mode

7.4.2.1.1 Definition and applicability

Applicable only for a UE supporting Cell Broadcast Services (CBS) as a type of Broadcast/Multicast Services.

It shall be possible to indicate the reception of certain CBS message contents carried with certain activated CB message types in a clear way on UE side.

7.4.2.1.2 Conformance requirement

A UE supporting Cell Broadcast Services shall be capable to receive BMC messages in the RRC Idle mode.

Reference(s)

TS 25.324 clause 9.1

7.4.2.1.3 Test purpose

To verify, that a BMC configuration for a UE is able to receive activated CBS messages when in RRC Idle mode.

7.4.2.1.4 Method of test

Initial conditions

UE is in RRC Idle mode; BMC entity is established

SS: 1 cell,

NOTE: The CB message ID stored on the SIM shall be known for this test (parameter for CBS PDU's). The CBS data type shall be allocated and activated in the UE.

Related ICS/IXIT Statement(s)

Support of BMC – Yes/No

Support of PS – Yes/No

ICS: CBS message support - YES/No

IXIT: CBS-Data 1: Octet string of N (where N≥1 and less than 1246)

NOTE: For CB-Data 1 IXIT, the manufacturer shall define CBS data as Octet string together with the CB message ID used for transmitting this CB data, which is indicated by the UE after reception in a clear way according to the capabilities stored on the SIM. Furthermore, the manufacturer shall describe the indication on UE side (e.g. certain CBS traffic information)

Test procedure

a) The UE in RRC Idle mode is triggered to wait for the next system information. The UE is activated to receive CBS messages,

b) The UE and the SS have configured their RLC, MAC and PHYs layers with all CB related system information, broadcasted by SS

c) The SS sends the CBS message containing an activated CBS message type according to CB-Data 1 to the UE; this shall be repeated for "CPREP" times (indicated by parameter "repetition period")

d) The UE indicates in an unambiguous way, that this message was received, by certain clear indications (e.g. a unique part of the CB data contents)

Expected sequence

Step	Direction UE	SS	Message	Comments
1	←		SYSTEM INFORMATION	Transmit this message as described below on the BCCH, in addition to the regular BCCH transmissions (see RRC test description). Included are CB related system information parameter of the CBS: - CTCH ID, - FACH ID and associated format set, - S-CCPCH ID, - BMC Schedule Level 1 information (N,K)
2				The SS waits for about 10 s to make sure, that the UE is configured to receive CBS data
3	←		BMC CBS Message	Activated CBS message with CB Data 1 message content as described by the manufacturer. This message shall be repeated "CPREP" times, Parameter: - Message_ID, - Serial-No, - Data coding scheme, - CB-Data 1,
4				After having received the BMC CBS message the UE shall indicate the reception of CB Data 1 in a clear way.

Specific Message Contents

SYSTEM INFORMATION TYPE 5 AND 6

The contents of SYSTEM INFORMATION TYPE 5 AND 6 Information Element in this test case are identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] with the following exceptions:

Information Element	Value/remark
CHOICE mode	(see RRC default test settings)
- CTCH allocation period	N
- CTCH frame offset	K
Secondary CCPCH system	1
- Secondary CCPCH information	(see RRC default test settings)
- TFCS	1
- FACH/PCH information	(see RRC default test settings)
- TFS	TRUE
- CTCH indicator	

BMC CBS Message

Information Element	Value/remark
Message Type	1 (CBS message)
Message ID	Bitstring (16) CB message ID, it shall fit to the stored Message ID in the SIM inserted in the UE (source and type) [see TS 23.041] according to the transmitted CB-Data 1 content.
Serial Number	[see TS 23.041]
- Geographic Scope Indicator (2 bit)	11 (Normal Cell wide)
- Message Code (10 bit)	in accordance with the Message ID
- Update Number (4 bit)	for a new message: 0000, incremented by one for each repetition
Data Coding Scheme	Bitstring (16) ID of the alphabet/coding and the applied language [see TS 23.041]
CB Data	Octetstring, [see IXIT value: CB-Data 1]

7.4.2.1.5 Test requirements

The UE shall store and decode a received activated CBS message.

7.4.2.2 UE in RRC Connected mode, state CELL_PCH

7.4.2.2.1 Definition and applicability

Applicable only for a UE supporting Cell Broadcast Services (CBS) as a type of Broadcast/Multicast Services.

It shall be possible to indicate the reception of certain CBS message contents carried with certain activated CB message types in a clear way on UE side.

7.4.2.2.2 Conformance requirement

A UE supporting Cell Broadcast Service (CBS) shall be capable to receive BMC messages (...) in CELL_PCH RRC-state of Connected mode.

Reference(s)

TS 25.324 clause 9.1

7.4.2.2.3 Test purpose

To verify, that a BMC configuration for a UE is able to receive activated CBS messages when in RRC Connected mode, state CELL_PCH.

7.4.2.2.4 Method of test

Initial conditions

UE is in Connected mode state CELL_PCH; BMC entity is established

SS: 1 cell,

NOTE: The CB message ID stored on the SIM shall be known for this test (parameter for CBS PDU's). The CBS data type shall be allocated and activated in the UE.

Related ICS/IXIT Statement(s)

ICS:

Support of BMC – Yes/No

Support of PS – Yes/No

CBS message support - YES/No

IXIT: CBS-Data 1: Octetstring of N (where N≥1 and less than 1246)

NOTE: For CB-Data 1 IXIT, the manufacturer shall define CBS data as Octetstring together with the CB message ID used for transmitting this CB data, which is indicated by the UE after reception in a clear way according to the capabilities stored on the SIM. Furthermore, the manufacturer shall describe the indication on UE side (e.g. certain CBS traffic information)

Test procedure

a) The UE in RRC CELL_PCH is triggered to wait for the next system information. The UE is activated to receive CBS messages.

b) The UE and the SS have configured their RLC, MAC and PHYs layers with all CB related system information, broadcasted by SS.

c) The SS sends the CBS message containing an activated CBS message type according to CB-Data 1 to the UE; this shall be repeated for "CPREP" times (indicated by parameter "repetition period").

d) The UE indicates in an unambiguous way, that this message was received, by certain clear indications (e.g. a unique part of the CB data contents).

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1 2	←		SYSTEM INFORMATION	Transmit this message as described below on the BCCH, in addition to the regular BCCH transmissions (see RRC test description). Included are CB related system information parameter of the CBS: - CTCH ID, - FACH ID and associated format set, - S-CCPCH ID, - BMC Schedule Level 1 information (N,K) The SS waits for about 10 s to make sure, that the UE is configured to receive CBS data
3	←		BMC CBS Message	Activated CBS message with CB Data 1 message content as described by the manufacturer. This message shall be repeated "CPREP" times, Parameter: - Message_ID, - Serial-No, - Data coding scheme, - CB-Data 1,
4				After having received the BMC CBS message the UE shall indicate the reception of CB Data 1 in a clear way.

Specific Message Contents

SYSTEM INFORMATION TYPE 5 and 6

The contents of SYSTEM INFORMATION TYPE 5 and 6 Information Element in this test case are identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] with the following exceptions:

Information Element	Value/remark
CHOICE mode	(see RRC default test settings)
- CTCH allocation period	N
- CTCH frame offset	K
Secondary CCPCH system	1
- Secondary CCPCH information	(see RRC default test settings)
- TFCS	1
- FACH/PCH information	(see RRC default test settings)
- TFS	TRUE
- CTCH indicator	(see RRC default test settings)

BMC CBS Message

Information Element	Value/remark
Message Type	1 (CBS message)
Message ID	Bitstring (16) CB message ID, it shall fit to the stored Message ID in the SIM inserted in the UE (source and type) [see TS 23.041] according to the transmitted CB-Data 1 content.
Serial Number	[see TS 23.041]
- Geographic Scope Indicator (2 bit)	11 (Normal Cell wide)
- Message Code (10 bit)	in accordance with the Message ID
- Update Number (4 bit)	for a new message: 0000, incremented by one for each repetition
Data Coding Scheme	Bitstring (16) ID of the alphabet/coding and the applied language [see TS 23.041]
CB Data	Octetstring, [see IXIT value: CB-Data 1]

7.4.2.2.5 Test requirements

The UE shall store and decode a received activated CBS message.

7.4.2.3 UE in RRC Connected mode, state URA_PCH

7.4.2.3.1 Definition and applicability

Applicable only for a UE supporting Cell Broadcast Services (CBS) as a type of Broadcast/Multicast Services.

It shall be possible to indicate the reception of certain CBS message contents carried with certain activated CB message types in a clear way on UE side.

7.4.2.3.2 Conformance requirement

A UE supporting Cell Broadcast Service (CBS) shall be capable to receive BMC messages (...) in CELL_PCH and URA_PCH RRC-state of Connected mode.

Reference(s)

TS 25.324 clause 9.1.

7.4.2.3.3 Test purpose

To verify, that a BMC configuration for a UE is able to receive activated CBS messages when in RRC Connected mode, state URA_PCH.

7.4.2.3.4 Method of test

Initial conditions

UE is in Connected mode state URA_PCH; BMC entity is established

SS: 1 cell.

NOTE: The CB message ID stored on the SIM shall be known for this test (parameter for CBS PDU's). The CBS data type shall be allocated and activated in the UE.

Related ICS/IXIT Statement(s)

ICS:

Support of BMC – Yes/No

Support of PS – Yes/No

CBS message support - YES/No.

IXIT: CBS-Data 1: Octetstring of N (where N≥1 and less than 1246).

NOTE: For CB-Data 1 IXIT, the manufacturer shall define CBS data as Octetstring together with the CB message ID used for transmitting this CB data, which is indicated by the UE after reception in a clear way according to the capabilities stored on the SIM. Furthermore, the manufacturer shall describe the indication on UE side (e.g. certain CBS traffic information)

Test procedure

a) The UE in RRC URA_PCH is triggered to wait for the next system information. The UE is activated to receive CBS messages.

b) The UE and the SS have configured their RLC, MAC and PHYs layers with all CB related system information, broadcasted by SS.

c) The SS sends the CBS message containing an activated CBS message type according to CB-Data 1 to the UE, this shall be repeated for "CPREP" times (indicated by parameter "repetition period").

d) The UE indicates in an unambiguous way, that this message was received, by certain clear indications (e.g. a unique part of the CB data contents).

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		SYSTEM INFORMATION	Transmit this message as described below on the BCCH, in addition to the regular BCCH transmissions (see RRC test description). Included are CB related system information parameter of the CBS: - CTCH ID, - FACH ID and associated format set, - S-CCPCH ID, - BMC Schedule Level 1 information (N,K)
2				The SS waits for about 10 s to make sure, that the UE is configured to receive CBS data
3	←		BMC CBS Message	Activated CBS message with CB Data 1 message content as described by the manufacturer. This message shall be repeated "CPREP" times, Parameter: - Message_ID, - Serial-No, - Data coding scheme, - CB-Data 1,
4				After having received the BMC CBS message the UE shall indicate the reception of CB Data 1 in a clear way.

Specific Message Contents

SYSTEM INFORMATION TYPE 5 and 6

The contents of SYSTEM INFORMATION TYPE 5 and 6 Information Element in this test case are identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] with the following exceptions:

Information Element	Value/remark
CHOICE mode	(see RRC default test settings)
- CTCH allocation period	N
- CTCH frame offset	K
Secondary CCPCH system	1
- Secondary CCPCH information	(see RRC default test settings)
- TFCS	1
- FACH/PCH information	(see RRC default test settings)
- TFS	TRUE
- CTCH indicator	(see RRC default test settings)

BMC CBS Message

Information Element	Value/remark
Message Type	1 (CBS message)
Message ID	Bitstring (16) CB message ID, it shall fit to the stored Message ID in the SIM inserted in the UE (source and type) [see TS 23.041] according to the transmitted CB-Data 1 content.
Serial Number	[see TS 23.041]
- Geographic Scope Indicator (2 bit)	11 (Normal Cell wide)
- Message Code (10 bit)	in accordance with the Message ID
- Update Number (4 bit)	for a new message: 0000, incremented by one for each repetition
Data Coding Scheme	Bitstring (16) ID of the alphabet/coding and the applied language [see TS 23.041]
CB Data	Octetstring, [see IXIT value: CB-Data 1]

7.4.2.3.5 Test requirements

The UE shall store and decode a received activated CBS message.

7.4.2.4 UE in RRC Idle mode (ANSI-41 CB data)

7.4.2.4.1 Definition and applicability

Applicable only for a UE supporting Cell Broadcast Services (CBS) for ANSI-41 CB data as a type of Broadcast/Multicast Services.

It shall be possible to indicate the reception of a certain CBS41 message content carried with certain activated CB41 message types in a clear way on UE side.

7.4.2.4.2 Conformance requirement

A UE supporting Cell Broadcast Services shall be capable to receive BMC messages in RRC Idle mode. (…)BMC messages are identified: (…), CBS41 Message

Reference(s)

TS 25.324 clause 9.1.

7.4.2.4.3 Test purpose

To verify, that a BMC configuration supporting ANSI-41 CB Data is able to receive activated CBS41 messages when in RRC Idle mode.

7.4.2.4.4 Method of test

Initial conditions

UE is in RRC Idle mode; BMC entity is established.

SS: 1 cell,

NOTE: The CB message ID stored on the SIM shall be known for this test (parameter for CBS41 PDU's). The CBS41 data type shall be allocated and activated in the UE.

Related ICS/IXIT Statement(s)

ICS:

Support of BMC – Yes/No

Support of PS – Yes/No

CBS41 message support - YES/No.

IXIT: CB41-Data 1: Octetstring of N (where N≥1 and less than 1246).

NOTE: For CB41-Data 1 IXIT, the manufacturer shall define CBS data as Octetstring together with the CB message ID used for transmitting this CB41 data, which is indicated by the UE after reception in a clear way according to the capabilities stored on the SIM. Furthermore, the manufacturer shall describe the indication on UE side (e.g. certain CBS41 traffic information)

Test procedure

a) The UE in RRC Idle mode is triggered to wait for the next system information. The UE is activated to receive expected CBS41 messages as described by the manufacturer.

b) The UE and the SS have configured their RLC, MAC and PHYs layers with all CB related system information, broadcasted by SS.

c) The SS sends the CBS41 message containing an activated CBS41 message type according to CB41-Data 1 to the UE; this shall be repeated for "CPREP" times (indicated by parameter "repetition period").

d) The UE indicates in an unambiguous way, that this message was received, by certain clear indications (e.g. a unique part of the CB41 data contents).

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		SYSTEM INFORMATION	Transmit this message as described below on the BCCH, in addition to the regular BCCH transmissions (see RRC test description). Included are CB related system information parameter of the CBS: - CTCH ID, - FACH ID and associated format set, - S-CCPCH ID, - BMC Schedule Level 1 information (N,K) In addition, the MIB and SIB 16 are sent as described below to setup the ANSI-41 parameters
2				The SS waits for about 10 s to make sure, that the UE is configured to receive CB41 data
3	←		BMC CBS41 Message	Activated CBS message with CB41 Data 1 message content as described by the manufacturer. This message shall be repeated "CPREP" times, Parameter: - Message_type, - Broadcast Address - CB41-Data 1
4				After having received the BMC CBS message the UE shall indicate the reception of CB41 Data 1 in a clear way.

Specific Message Contents

MASTER INFORMATION BLOCK (MIB)

The contents of MASTER INFORMATION BLOCK Information Element in this test case are identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] with the following exceptions:

Information Element	Value/remark
ANSI-41 Core Network information	Present

SYSTEM INFORMATION TYPE 5 AND 6

The contents of SYSTEM INFORMATION TYPE 5 AND 6 Information Element in this test case are identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] with the following exceptions:

Information Element	Value/remark
CHOICE mode	(see RRC default test settings)
- CTCH allocation period	N
- CTCH frame offset	K
Secondary CCPCH system	1
- Secondary CCPCH information	(see RRC default test settings)
- TFCS	1
- FACH/PCH information	(see RRC default test settings)
- TFS	TRUE
- CTCH indicator	(see RRC default test settings)

SYSTEM INFORMATION TYPE 13

The contents of SYSTEM INFORMATION TYPE 13 Information Element in this test case are identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] with the following exceptions:

Information Element	Value/remark
CHOICE CN Type	ANSI-41
- CN domain specific NAS information	
- NAS (ANSI-41) system information	T.B.D

BMC CBS41 Message

Information Element	Value/remark
Message Type	3 (CBS41 Message)
Broadcast Address	Bitstring (40) Address Information of higher layer
CB Data41	Octetstring, [see IXIT value: CB41-Data 1] (ANSI-41)

7.4.2.4.5 Test requirements

The UE shall store and decode a received activated CBS41 message.

7.4.2.5 UE in RRC Connected mode, state CELL_PCH (ANSI-41 CB data)

7.4.2.5.1 Definition and applicability

Applicable only for a UE supporting Cell Broadcast Services (CBS) for ANSI-41 CB data as a type of Broadcast/Multicast Services.

It shall be possible to indicate the reception of certain CBS41 message contents carried with certain activated CB41 message types in a clear way on UE side.

7.4.2.5.2 Conformance requirement

A UE supporting Cell Broadcast Service (CBS) shall be capable to receive BMC messages (...) in CELL_PCH RRC-state of Connected mode. (…)BMC messages are identified: (…), CBS41 Message.

Reference(s)

TS 25.324 clause 9.1.

7.4.2.5.3 Test purpose

To verify, that a BMC configuration supporting ANSI-41 CB Data is able to receive activated CBS41 messages when in RRC Connected mode, state CELL_PCH.

7.4.2.5.4 Method of test

Initial conditions

UE is in Connected mode state CELL_PCH; BMC entity is established.

SS: 1 cell,

NOTE: The CB41 message ID stored on the SIM shall be known for this test (parameter for CBS41 PDU's). The CBS41 data type shall be allocated and activated in the UE.

Related ICS/IXIT Statement(s)

ICS:

Support of BMC – Yes/No

Support of PS – Yes/No

CBS41 message support - YES/No.

IXIT: CBS41-Data 1: Octetstring of N (where N≥1 and less than 1246).

NOTE: For CB41-Data 1 IXIT, the manufacturer shall define CBS data as Octetstring together with the CB message ID used for transmitting this CB41 data, which is indicated by the UE after reception in a clear way according to the capabilities stored on the SIM. Furthermore, the manufacturer shall describe the indication on UE side

Test procedure

a) The UE in RRC CELL_PCH is triggered to wait for the next system information. The UE is activated to receive expected CBS41 messages as described by the manufacturer.

b) The UE and the SS have configured their RLC, MAC and PHYs layers with all CB41 related system information, broadcasted by SS.

c) The SS sends the CBS41 message containing an activated CBS41 message type according to CB41-Data 1 to the UE; this shall be repeated for "CPREP" times (indicated by parameter "repetition period").

d) The UE indicates in an unambiguous way, that this message was received, by certain clear indications (e.g. a unique part of the CB41 data contents).

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1	←		SYSTEM INFORMATION	Transmit this message as described below on the BCCH, in addition to the regular BCCH transmissions (see RRC test description). Included are CB related system information parameter of the CBS: - CTCH ID, - FACH ID and associated format set, - S-CCPCH ID, - BMC Schedule Level 1 information (N,K) In addition, the MIB and SIB 13 are sent as described below for setup the ANSI-41 parameters
2				The SS waits for about 10 s to make sure, that the UE is configured to receive CB41 data
3	←		BMC CBS41 Message	Activated CBS message with CB41 Data 1 message content as described by the manufacturer. This message shall be repeated "CPREP" times, Parameter: - Message_type, - Broadcast Address - CB41-Data 1
4				After having received the BMC CBS message the UE shall indicate the reception of CB41 Data 1 in a clear way.

Specific Message Contents

MASTER INFORMATION BLOCK (MIB)

The contents of MASTER INFORMATION BLOCK Information Element in this test case are identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] with the following exceptions:

Information Element	Value/remark
ANSI-41 Core Network information	Present

SYSTEM INFORMATION TYPE 5 and 6

The contents of SYSTEM INFORMATION TYPE 5 and 6 Information Element in this test case are identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] with the following exceptions:

Information Element	Value/remark
CHOICE mode	(see RRC default test settings)
- CTCH allocation period	N
- CTCH frame offset	K
Secondary CCPCH system	1
- Secondary CCPCH information	(see RRC default test settings)
- TFCS	1
- FACH/PCH information	(see RRC default test settings)
- TFS	TRUE
- CTCH indicator	(see RRC default test settings)

SYSTEM INFORMATION TYPE 13

The contents of SYSTEM INFORMATION TYPE 13 Information Element in this test case are identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] with the following exceptions:

Information Element	Value/remark
CHOICE CN Type	ANSI-41
- CN domain specific NAS information	
- NAS (ANSI-41) system information	T.B.D

BMC CBS41 Message

Information Element	Value/remark
Message Type	3 (CBS41 Message)
Broadcast Address	Bitstring (40) Address Information of higher layer
CB Data41	Octetstring, [see IXIT value: CB41-Data 1] (ANSI-41)

7.4.2.5.5 Test requirements

The UE shall store and decode a received activated CBS41 message.

7.4.2.6 UE in RRC Connected mode, state URA_PCH (ANSI-41 CB data)

7.4.2.6.1 Definition and applicability

Applicable only for a UE supporting Cell Broadcast Services (CBS) for ANSI-41 CB data as a type of Broadcast/Multicast Services.

It shall be possible to indicate the reception of a certain CBS41 message content carried with certain activated CB41 message types in a clear way on UE side.

7.4.2.6.2 Conformance requirement

A UE supporting Cell Broadcast Service (CBS) shall be capable to receive BMC messages (...) in URA_PCH RRC-state of Connected mode. (…)BMC messages are identified: (…), CBS41 Message.

Reference(s)

TS 25.324 clause 9.1.

7.4.2.6.3 Test purpose

To verify, that a BMC configuration supporting ANSI-41 CB Data is able to receive activated CBS41 messages when in RRC Connected mode, state URA_PCH.

7.4.2.3.4 Method of test

Initial conditions

UE is in Connected mode state URA_PCH; BMC entity is established.

SS: 1 cell,

NOTE: The CB41 message ID stored on the SIM shall be known for this test (parameter for CBS41 PDU's). The CBS41 data type shall be allocated and activated in the UE.

Related ICS/IXIT Statement(s)

ICS:

Support of BMC – Yes/No

Support of PS – Yes/No

CBS41 message support - YES/No.

IXIT: CBS41-Data 1: Octetstring of N (where N≥1 and less than 1246).

NOTE: For CB41-Data 1 IXIT, the manufacturer shall define CBS data as Octetstring together with the CB message ID used for transmitting this CB41 data, which is indicated by the UE after reception in a clear way according to the capabilities stored on the SIM. Furthermore, the manufacturer shall describe the indication on UE side (e.g. certain CBS41 traffic information).

Test procedure

a) The UE in RRC URA_PCH is triggered to wait for the next system information. The UE is activated to receive expected CBS41 messages as described by the manufacturer.

b) The UE and the SS have configured their RLC, MAC and PHYs layers with all CB related system information, broadcasted by SS.

c) The SS sends the CBS41 message containing an activated CBS41 message type according to CB41-Data 1 to the UE, this shall be repeated for "CPREP" times (indicated by parameter "repetition period").

d) The UE indicates in an unambiguous way, that this message was received, by certain clear indications (e.g. a unique part of the CB41 data contents).

Expected sequence

Step	Direction UE	SS	Message	Comments
1	←		SYSTEM INFORMATION	Transmit this message as described below on the BCCH, in addition to the regular BCCH transmissions (see RRC test description). Included are CB related system information parameter of the CBS: - CTCH ID, - FACH ID and associated format set, - S-CCPCH ID, - BMC Schedule Level 1 information (N,K) In addition, the MIB and SIB 13 are sent as described below for setup the ANSI-41 parameters
2				The SS waits for about 10 s to make sure, that the UE is configured to receive CB41 data
3	←		BMC CBS41 Message	Activated CBS message with CB41 Data 1 message content as described by the manufacturer. This message shall be repeated "CPREP" times, Parameter: - Message_type, - Broadcast Address - CB41-Data 1
4				After having received the BMC CBS message the UE shall indicate the reception of CB41 Data 1 in a clear way.

Specific Message Contents

MASTER INFORMATION BLOCK (MIB)

The contents of MASTER INFORMATION BLOCK Information Element in this test case are identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] with the following exceptions:

Information Element	Value/remark
ANSI-41 Core Network information	Present

SYSTEM INFORMATION TYPE 5 and 6

The contents of SYSTEM INFORMATION TYPE 5 and 6 Information Element in this test case are identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] with the following exceptions:

Information Element	Value/remark
CHOICE mode	(see RRC default test settings)
- CTCH allocation period	N
- CTCH frame offset	K
Secondary CCPCH system	1
- Secondary CCPCH information	(see RRC default test settings)
- TFCS	1
- FACH/PCH information	(see RRC default test settings)
- TFS	TRUE
- CTCH indicator	(see RRC default test settings)

SYSTEM INFORMATION TYPE 13

The contents of SYSTEM INFORMATION TYPE 13 Information Element in this test case are identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] with the following exceptions:

Information Element	Value/remark
CHOICE CN Type - CN domain specific NAS information - NAS (ANSI-41) system information	ANSI-41 T.B.D

BMC CBS41 Message

Information Element	Value/remark
Message Type Broadcast Address CB Data41	3 (CBS41 Message) Bitstring (40) Address Information of higher layer Octetstring, [see IXIT value: CB41-Data 1] (ANSI-41)

7.4.2.6.5 Test requirements

The UE shall store and decode a received activated CBS41 message.

7.4.3 BMC message reception procedure

7.4.3.1 Reception of certain CBS message types

7.4.3.1.1 Definition and applicability

Applicable only for a UE supporting Cell Broadcast Services (CBS) as type of Broadcast/Multicast Services.

It shall be possible to indicate the reception of two different CBS message contents carried with different activated CB message types in a clear way on UE side.

It shall be possible to activate/deactivate the CBS message types used to receive CB Data 1 or 2.

7.4.3.1.2 Conformance requirement

A UE supporting Cell Broadcast Service (CBS) shall be capable to receive BMC messages in RRC Idle mode.

The BMC entity on UE side evaluates received BMC Schedule Messages and takes decisions which BMC messages are received.

If not otherwise requested by upper layers, only those CB messages received in BMC CBS Messages should be delivered to upper layers for which the Serial Number associated with the CB message has changed. This implies that the BMC has to store the last received Serial Number of each CB message activated by upper layers.

Reference(s)

TS 25.324 clause 9.1.

TS 25.324 clause 9.4.

7.4.3.1.3 Test purpose

1. To verify, that a UE supporting CBS ignores a deactivated CBS message type which has been broadcasted by SS.

2. To verify, that a UE only stores Serial Numbers of a newly transmitted CBS messages. This shall be verified by indication of a received CBS message with changed Serial Number as indication for the storage of Serial Numbers.

7.4.3.1.4 Method of test

Initial conditions

UE is in RRC Idle mode.

SS: 1 cell,

NOTE: The CB message ID stored on the SIM shall be known for this test (as parameter for the CBS message PDU). The CBS data type shall be allocated and in the UE. It shall be possible to activate/deactivate such CBS data type.

Related ICS/IXIT Statement(s)

ICS:

Support of BMC – Yes/No

Support of PS – Yes/No

CBS message support - YES/No.

IXIT:

- CBS-Data 1: Octetstring of N (where N≥1 and less than 1246), with used CB message ID for CB-Data 1.
- CBS-Data 2: Octetstring of N (where N≥1 and less than 1246), with used CB message ID for CB-Data 2 (CB message ID for CB-Data 1 shall be different to CB message ID for CB-Data 2).

NOTE: For CBS data IXIT's, the manufacturer shall define CBS data as Octetstring as described in the IXIT, which is indicated by the UE after reception in a clear way according to the capabilities stored on the SIM. The manufacturer shall describe the indication on UE side for both CBS data types (e.g. certain CBS broadcast information shown in the display of the UE).

Test procedure

a) The UE in RRC Idle mode is triggered to wait for the next system information. The UE is activated to receive CBS data 1, CBS data 2) are deactivated.

b) The UE and the SS have configured their RLC, MAC and PHYs layers with all CB related system information, broadcasted by SS.

c) The SS sends the first BMC CBS schedule message to predict the next CBS messages to the UE.

d) The SS sends the CBS message containing CB-Data 1 to the UE, together with the CBS schedule message to predict the next CBS messages (repetition of CB Data 1, and the next CBS schedule message).

e) The UE indicates on an unambiguous way, that this CB-Data 1 has been received by the UE (e.g. a unique part of the CBS data contents shown on the display).

f) The SS sends the repeated CB Data 1, and the next CBS schedule message to predict the next CBS messages to the UE. (CBS schedule message predicts the first repetition of CB Data).

g) The UE indicates on an unambiguous way, that CB-Data 2 has been received by the UE (e.g. a unique part of the CBS data contents shown in the display).

h) The UE deactivates the CB Message type ID used for CB-Data 1.

i) The SS sends the CB Data 2 (as deactivated CB Data type) to the UE.

j) The UE ignores the newly received CB-Data 2, i.e. there is no indication for this CB Data 2 as described in step e).

Expected sequence

Step	Direction UE	SS	Message	Comments
1	←		SYSTEM INFORMATION	Transmit these messages as described below on the BCCH, in addition to the regular BCCH transmissions. Included are all CB related system information parameter of the CBS: - CTCH ID, - FACH ID and associated format set, - S-CCPCH ID, - BMC Schedule Level 1 information (N,K)
2				The SS waits for about 10 s to make sure, that the UE is configured to receive the CBS Data message
3	←		BMC CBS Schedule	Inband CBS schedule message with BMC schedule information Level 2 (DRX) to predict the next CB data block (CB Data 1 –new-, CBS Schedule message)
4	←		BMC CBS Message	Activated CBS message with certain CB data content (CBS data 1 as described by the manufacturer). This message is sent the first time. Parameter: - Message_ID, - Serial-No, - Data coding scheme, - CB-Data 1 (new)
5				After having received the BMC CB-Data 1 the UE shall indicate the reception in a clear way.
6	←		BMC CBS Schedule	Inband CBS schedule message with BMC schedule information Level 2 (DRX) to predict the next CB data block (CB Data 1 –rep.1-, CBS Schedule message)
7	←		BMC CBS Message	Activated CBS message with certain CB data content (CBS data 1 as described by the manufacturer). This message is repeated. Parameter: - Message_ID, - Serial-No, - Data coding scheme, - CB-Data 1 (old)
8				The UE deactivates "CB message type ID" used for CB-Data 1
9	←		BMC CBS Schedule	Inband CBS schedule message with BMC schedule information Level 2 (DRX) to predict the next CB data block (CB Data 2 –new-).
10	←		BMC CBS Message	Deactivated CBS message with certain CB data content (CBS data 2 as described by the manufacturer). This message is sent the first time. Parameter: - Message_ID, - Serial-No, - Data coding scheme, - CB-Data 2 (new)
11				After having received the BMC CBS message (CB-Data 2) the UE shall ignore the newly received CBS data 1 message, i.e. there is no indication as described by the manufacturer.

Specific Message Contents

SYSTEM INFORMATION TYPE 5 and 6

The contents of SYSTEM INFORMATION TYPE 5 and 6 Information Element in this test case are identical to those of the default contents of layer 3 messages for RRC tests [TS 34.123-1] with the following exceptions:

Information Element	Value/remark
CHOICE mode	(see RRC default test settings)
- CTCH allocation period	N
- CTCH frame offset	K
Secondary CCPCH system	1
- Secondary CCPCH information	(see RRC default test settings)
- TFCS	1
- FACH/PCH information	(see RRC default test settings)
- TFS	TRUE
- CTCH indicator	(see RRC default test settings)

BMC CBS Message (Step 4 and 7)

Information Element	Value/remark
Message Type	1 (CBS message)
Message ID	Bitstring (16) CB message ID, it shall fit to the stored Message ID in the SIM inserted in the UE (source and type) [see TS 23.041]
Serial Number	[see TS 23.041]
- Geographic Scope Indicator (2 bit)	11 (Normal Cell wide)
- Message Code (10 bit)	according with the Message ID
- Update Number (4 bit)	for a new message: 0000, incremented by one for each repetition
Data Coding Scheme	Bitstring (16) ID of the alphabet/coding and the applied language [see TS 23.041]
CB Data	Octetstring, [see IXIT value: CB-Data 1]

BMC CBS Message (Step 10)

Information Element	Value/remark
Message Type	1 (CBS message)
Message ID	Bitstring (16) CB message ID, it shall fit to the stored Message ID in the SIM inserted in the UE (source and type) [see TS 23.041]
Serial Number	[see TS 23.041]
- Geographic Scope Indicator (2 bit)	11 (Normal Cell wide)
- Message Code (10 bit)	according with the Message ID
- Update Number (4 bit)	for a new message: 0000, incremented by one for each repetition
Data Coding Scheme	Bitstring (16) ID of the alphabet/coding and the applied language [see TS 23.041]
CB Data	Octetstring, [see IXIT value: CB-Data 2]

BMC Schedule Message (Step 3, 6 and Step 9)

The parameters for BMC Schedule Message (inband schedule message) in Step 5 are inserted for CB-Data 2 and in Step 8 for CB-Data 1.

Information Element	Value/remark
Message Type	2 (Schedule message)
Offset to begin CTCH BS index	calculated offset value of the BS (Integer: 0...255) as recommended in TR 25.925
Length of CBS Schedule Period	Number of consecutive CTCH BS of the next CBS Schedule Period, (Integer: 1...255) as recommended in TR 25.925
New Message Bitmap	Bitmap (N*8), N = Length of CBS Schedule Period as recommended in TR 25.925
Message Description - Message Description Type	1 for new message (see TS 25.324, Table 11.9-3) 5 for old message (see TS 25.324, Table 11.9-3)
- Message ID	CB message ID used for the next CB data
- Offset to CTCH (BS index of first transmission)	for Message description type 1 or 5: CB message ID IE included (see TS 23.041)

7.4.3.1.5 Test requirements

After having received the CB-Data 1 message (step 4), the UE shall store the Serial Number of this message and indicate the reception of the CBS message as described by the manufacturer.

After CB-Data 2 message was newly broadcasted (step 10), the UE shall not indicate the reception for the deactivated CBS message (CB-Data 1).