27 Testing of the SIM/ME interface

The following sequence of tests confirms:

a) the correct interpretation of data read from the SIM (Subscriber Identification Module) by the ME;

b) the correct writing of data to the SIM by the ME;

c) the initiation of appropriate procedures by the ME;

d) low level protocols;

e) electrical characteristics;

f) physical characteristics.

NOTE 0: Throughout clause 27:

the term PCS 1 900 indicates GSM 710, GSM 750, T-GSM 810, GSM 850 and PCS 1 900 bands, which use 3-digit MNC

the term GSM indicates all other bands, which use 2-digit MNC.

A SIM simulator will be required as part of the SS. Alternatively, to perform the logical tests, SIMs programmed with specific data may be used. The SIM data is not defined within the initial conditions of the tests unless it differs from the default values defined below.

Definition of default values for SIM/ME interface testing

A SIM containing the following default values is used for all tests of this subclause unless otherwise stated.

For each data item, the logical default values and the coding within the elementary files (EF) of the SIM follow.

NOTE 1: Bx represents Byte x of the coding.

NOTE 2: Unless otherwise defined, the coding values are hexadecimal.

EF_{IMSI} (IMSI)

Logically: 246813579

Coding:

B1	B2	B3	B4	B5	B6	B7	B8	B9
05	29	64	18	53	97	FF	FF	FF

EF_{LOCI} (Location Information)

Logically: LAI-MCC: 246

LAI-MNC: 81 or 813 (see Note 0)

LAI-LAC: 0001

TMSI: "FF .. FF"

Coding:

Coding:	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
2-digit MNC	FF	FF	FF	FF	42	F6	18	00	01	FF	00
3-digit MNC	FF	FF	FF	FF	42	36	18	00	01	FF	00

EF_{Kc} (Ciphering Key Kc)

Logically: Key Kc: xx

Sequence No: 1

Coding:	B1	B2	B3	B4	B5	B6	B7	B8	B9
	xx	xx	xx	xx	xx	xx	xx	xx	01

EF_{ACC} (Access Control Class)

Logically: One and only one access class from 0 - 9, e.g. class 7 for which the coding is "00 80".

EF_{FPLMN} (Forbidden PLMNs)

Logically:

		PLMN1	PLMN2	PLMN3	PLMN4
MCC		234	234	234	234
MNC	2-digit	02	03	04	05
	3-digit	023	034	045	056

Coding:

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
2-digit MNC	32	F4	20	32	F4	30	32	F4	40	32	F4	50
3-digit MNC	32	34	20	32	44	30	32	54	40	32	64	50

EF_{SST} (SIM Service Table)

Logically: CHV1 disable function allocated and activated.

Abbreviated dialling numbers allocated and activated.

PLMN selector allocated and activated.

Fixed dialling numbers not activated.

Coding:

	B1	B2	B3	B4
Value (binary)	xx0x1111	0011xxxx	xxxxxxxx	0000xxxx

The coding of EF_{SST} shall conform with the capabilities of the SIM used.

EF_{ADN} (Abbreviated Dialling Number)

Logically:

At least 10 records, each non-empty record unique.

Record 1:	Length of alpha identifier:	32 characters
	Alpha identifier:	"ABCDEFGHIJKLMNOPQRSTUVWXYZABCDEF"
	Length of BCD number:	"03"
	TON and NPI:	Telephony and Unknown
	Dialled number:	123
	CCI:	None
	Ext1:	None

Coding:	B1	B2	B3	...	B32	B33	B34	B35	B36	B37	B38	B39	...	B46
Record 1:	41	42	43	...	46	03	81	21	F3	FF	FF	FF	...	FF

EF_{Phase}

Logically: Phase 2

Coding: "02"

$EF_{PLMNsel}$ (PLMN Selector)

Logically:

		PLMN1	PLMN2	PLMN3	PLMN4	PLMN5	PLMN6	PLMN7	PLMN8
MCC		234	234	234	234	234	234	246	246
MNC	2-digit	01	02	03	04	05	06	81	82
	3-digit	012	023	034	045	056	067	813	824

Coding:

	B1	B2	B3	B4	B5	B6	B7	B8	B0	B10	B11	B12
2-digit MNC	32	F4	10	32	F4	20	32	F4	30	32	F4	40
3-digit MNC	32	24	10	32	34	20	32	44	30	32	54	40
	B13	**B14**	**B15**	**B16**	**B17**	**B18**	**B19**	**B20**	**B21**	**B22**	**B23**	**B24**
2-digit MNC	32	F4	50	32	F4	60	42	F6	18	42	F6	28
3-digit MNC	32	64	50	32	74	60	42	36	18	42	46	28

CHV1 (PIN)

Logically: 2468

Coding:

B1	B2	B3	B4	B5	B6	B7	B8
32	34	36	38	FF	FF	FF	FF

CHV2 (PIN2)

Logically: 3579

Coding:

B1	B2	B3	B4	B5	B6	B7	B8
33	35	37	39	FF	FF	FF	FF

Unblock CHV1 (PUK)

Logically: 13243546

Coding:

B1	B2	B3	B4	B5	B6	B7	B8
31	33	32	34	33	35	34	36

Unblock CHV2 (PUK2)

Logically: 08978675

Coding:

B1	B2	B3	B4	B5	B6	B7	B8
30	38	39	37	38	36	37	35

Definition of FDN SIM

Some test cases require a different configuration than the one described above. For that purpose a default FDN SIM is defined. In general the values of the FDN SIM are identical to the default SIM, with the following exceptions.

EF_{SST} (SIM Service Table)

Logically: CHV1 disable function allocated and activated.

Abbreviated dialling numbers allocated and activated.

PLMN selector allocated and activated.

Fixed dialling numbers allocated and activated.

Advice of Charge allocated and activated.

Coding:

	B1	B2	B3	B4
Value (binary)	xx111111	0011xx11	xxxxxxxx	0000xxxx

The coding of EF_{SST} shall conform with the capabilities of the SIM used.

EF_{FDN} (Fixed Dialling Numbers)

Logically:

Record 1: Length of alpha identifier: 6 characters

Alpha identifier: "FDN111"

Length of BCD number: "06"

TON and NPI: Telephony and International

Dialled number: +1357924680

CCI: None

Ext1: None

Coding:

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
For record 1:	46	44	4E	31	31	31	06	91	31	75
	B11	**B12**	**B13**	**B14**	**B15**	**B16**	**B17**	**B18**	**B19**	**B20**
For record 1:	29	64	08	FF	FF	FF	FF	FF	FF	FF

Logically:

Record 2: Length of alpha identifier: 6 characters

Alpha identifier: "FDN222"

Length of BCD number: "04"

TON and NPI: Telephony and Unknown

Dialled number: 24680

CCI: None

Ext1: None

Coding:

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
For record 2	46	44	4E	32	32	32	04	81	42	86
	B11	**B12**	**B13**	**B14**	**B15**	**B16**	**B17**	**B18**	**B19**	**B20**
For record 2	F0	FF	FF	FF	FF	FF	FF	FF	FF	FF

Logically:

Record 3: Length of alpha identifier: 6 characters

Alpha identifier: "FDN333"

Length of BCD number: "0B"

TON and NPI: Telephony and International

Dialled number: +12345678901234567890

CCI: None

Ext1: None

Coding:

For record 3	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
	46	44	4E	33	33	33	0B	91	21	43
For record 3	**B11**	**B12**	**B13**	**B14**	**B15**	**B16**	**B17**	**B18**	**B19**	**B20**
	65	87	09	21	43	65	87	09	FF	FF

27.1 MS identification by short IMSI

27.1.1 MS identification by short IMSI - Normal case

27.1.1.1 Definition

The IMSI is used for unique identification of the MS by a GSM network. The IMSI is stored in the SIM and read during the SIM/ME initialization procedure.

27.1.1.2 Conformance requirement

On the receipt of an IMMEDIATE ASSIGNMENT message the MS shall send PAGING RESPONSE containing the IMSI of the SIM.

3GPP TS 11.11, subclauses 11.2.1 and 11.4.2, 3GPP TS 04.08 / 3GPP TS 24.008, subclause 10.5.1.4.

27.1.1.3 Test purpose

1) To verify that the ME uses the IMSI of the SIM.

2) To verify that the ME can handle an IMSI of less than the maximum length.

27.1.1.4 Method of test

27.1.1.4.1 Initial conditions

The SS transmits on the BCCH, with the following network parameters:

Attach/detach: disabled.

LAI-MCC: 246

LAI-MNC 81 or 813 (see Note 0)

LAI-LAC: 0001

Access control: unrestricted.

The default SIM is installed into the ME and the MS is powered on.

27.1.1.4.2 Procedure

a) The SS sends PAGING REQUEST to the MS using the IMSI stored in the SIM.

b) After receipt of a CHANNEL REQUEST from the MS, the SS sends IMMEDIATE ASSIGNMENT to the MS.

c) After receipt of a PAGING RESPONSE from the MS, the SS sends CHANNEL RELEASE to the MS.

27.1.1.5 Test requirement

After step b) the MS shall send PAGING RESPONSE to the SS containing the IMSI stored in the SIM.

27.1.2 MS identification by short IMSI, Phase 1 DCS SIM

27.1.2.1 Definition

Different from Phase 2, the IMSI in a Phase 1 DCS SIM is stored in a directory $DF_{DCS1800}$ with the specific identifier "7F 21". To ensure backwards compatibility, if selection of the phase 2 identifier "7F 20" fails, the MS shall select "7F 21". Otherwise access to the IMSI and other data is impossible with a Phase 1 DCS SIM

-27.1.2.2 Conformance requirement

If selection of DFGSM by the identifier "7F 20" fails, the ME shall select $DF_{DCS1800}$ with "7F 21".

3GPP TS 11.11, subclause 10.4.

27.1.2.3 Test purpose

To verify that the ME uses the identifier "7F 21" to select $DF_{DCS1800}$ in a Phase 1 DCS SIM.

27.1.2.4 Method of test

27.1.2.4.1 Initial conditions

The SS transmits on the BCCH, with the following network parameters:

Attach/detach: disabled.

LAI (MCC/MNC/LAC): 246/81/0001.

Access control: unrestricted.

A phase 1 DCS SIM (identifier of $DF_{DCS1800}$ is "7F 21", DF_{GSM} not existing) with default values is installed into the ME and the MS is powered on.

27.1.2.4.2 Procedure

a) The SS sends PAGING REQUEST to the MS using the IMSI stored in the SIM.

b) After receipt of a CHANNEL REQUEST from the MS, the SS sends IMMEDIATE ASSIGNMENT to the MS.

c) After receipt of a PAGING RESPONSE from the MS, the SS sends CHANNEL RELEASE to the MS.

27.1.2.5 Test requirement

After step b) the MS shall send PAGING RESPONSE to the SS containing the IMSI stored in the SIM.

27.2 MS identification by short TMSI

27.2.1 Definition

The TMSI is temporarily used for identification of the MS by a GSM network. It will have been previously assigned by the network. The TMSI is stored in the SIM by the ME and read during the SIM/ME initialization procedure.

27.2.2 Conformance requirement

On the receipt of an IMMEDIATE ASSIGNMENT message the MS shall send PAGING RESPONSE containing the TMSI stored in the SIM.

3GPP TS 11.11, subclauses 11.2.1 and 11.4.5, 3GPP TS 04.08 / 3GPP TS 24.008, subclause 10.5.1.4.

27.2.3 Test purpose

1) To verify that the ME uses the TMSI stored in the SIM.

2) To verify that the ME can handle a TMSI of less than maximum length.

27.2.4 Method of test

27.2.4.1 Initial conditions

The SS transmits on the BCCH, with the following network parameters:

Attach/detach: disabled.

LAI-MCC: 246

LAI-MNC 81 or 813 (see Note 0)

LAI-LAC: 0001

Access control: unrestricted.

The default SIM is used with the following exception.

EF_{LOCI} (Location Information)

Logically: LAI-MCC: 246

LAI-MNC: 81 or 813 (See Note 0)

LAI-LAC: 0001

TMSI: "2143"

Coding:

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
2-digit MNC	00	00	21	43	42	F6	18	00	01	FF	00
3-digit MNC	00	00	21	43	42	36	18	00	01	FF	00

The SIM is installed into the ME and the MS is powered on.

27.2.4.2 Procedure

a) The SS sends PAGING REQUEST to the MS using the TMSI stored in the SIM.

b) After receipt of a CHANNEL REQUEST from the MS, the SS sends IMMEDIATE ASSIGNMENT to the MS.

c) After receipt of a PAGING RESPONSE from the MS, the SS sends CHANNEL RELEASE to the MS.

27.2.5 Test requirement

After step b) the MS shall send PAGING RESPONSE to the SS containing the TMSI stored in the SIM.

27.3 MS identification by long TMSI

27.3.1 Definition

The TMSI is temporarily used for identification of the MS by a GSM network. It will have been previously assigned by the network. The TMSI is stored in the SIM by the ME and read during the SIM/ME initialization procedure.

27.3.2 Conformance requirement

On the receipt of an IMMEDIATE ASSIGNMENT message the MS shall send PAGING RESPONSE containing the correct TMSI stored in the SIM.

3GPP TS 11.11, subclauses 11.2.1 and 11.4.5, 3GPP TS 04.08 / 3GPP TS 24.008, subclause 10.5.1.4.

27.3.3 Test purpose

1) To verify that the ME uses the TMSI stored in the SIM.

2) To verify that the ME can handle a TMSI of maximum length.

3) To verify that the ME does not respond to page requests containing a previous TMSI.

27.3.4 Method of test

27.3.4.1 Initial conditions

Prior to this test, the ME shall have been operated with a SIM containing TMSI "2143". This will be achieved by executing the previous test (27.2) prior to this test. Only under this condition will test be verified.

The SS transmits on the BCCH, with the following network parameters:

Attach/detach: disabled.

LAI-MCC: 246

LAI-MNC 81 or 813 (see Note 0)

LAI-LAC: 0001

Access control: unrestricted.

The default SIM is used with the following exception:

EF_{LOCI} (Location Information)

Logically: LAI-MCC: 246

LAI-MNC: 81 or 813 (See Note 0)

LAI-LAC: 0001

TMSI: "21430000"

Coding:

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
2-digit MNC	21	43	00	00	42	F6	18	00	01	FF	00
3-digit MNC	21	43	00	00	42	36	18	00	01	FF	00

Bands using 2-digit MNC end

The SIM is installed into the ME and the MS is powered on.

27.3.4.2 Procedure

a) The SS sends PAGING REQUEST to the MS using the TMSI "2143".

b) The SS sends PAGING REQUEST to the MS using the TMSI stored in the SIM.

c) After receipt of a CHANNEL REQUEST from the MS, the SS sends IMMEDIATE ASSIGNMENT to the MS.

d) After receipt of a PAGING RESPONSE from the MS, the SS sends CHANNEL RELEASE to the MS.

27.3.5 Test requirement

1) After step a) the MS shall not respond to the PAGING REQUEST.

2) After step c) the MS shall send PAGING RESPONSE to the SS containing the TMSI stored in the SIM.

27.4 MS identification by long IMSI, TMSI updating and cipher key sequence number assignment

27.4.1 Definition

The IMSI and TMSI are used for identification of the MS by a GSM network. They are read from the SIM during the SIM/ME initialization procedure. Within the authentication procedure the network sends a cipher key sequence number to the MS. In addition the network may allocate a new TMSI to the MS. Cipher key sequence number and TMSI are stored in the SIM after call termination and/or at GSM session termination.

Test purpose 2) will only be verified if this test sequentially follows the previous test (27.3).

27.4.2 Conformance requirement

1. On the receipt of an IMMEDIATE ASSIGNMENT message the MS shall send PAGING RESPONSE containing the correct IMSI stored in the SIM.

   3GPP TS 11.11, subclauses 11.2.1 and 11.4.2, 3GPP TS 04.08 / 3GPP TS 24.008, subclause 10.5.1.4.

2. After call termination the SIM shall contain the cipher key sequence number and TMSI received by the MS during the authentication and TMSI reallocation procedures.

   3GPP TS 11.11, subclauses 11.2.2, 11.4.5 and 11.4.6, 3GPP TS 02.17, subclause 6.1.

27.4.3 Test purpose

1) To verify that the ME uses the IMSI stored in the SIM.

2) To verify that the ME does not respond to page requests containing a previous IMSI.

3) To verify that the ME can handle an IMSI of maximum length.

4) To verify that the ME correctly updates the cipher key sequence number at call termination.

5) To verify that the ME correctly updates the TMSI at call termination.

27.4.4 Method of test

27.4.4.1 Initial conditions

Prior to this test, the ME shall have been operated with a SIM containing IMSI "246813579". This will be achieved by executing the previous test (27.3) prior to this test. Only under this condition will this test be verified.

The SS transmits on the BCCH, with the following network parameters:

Attach/detach:	disabled.
LAI-MCC:	246
LAI-MNC	81 or 813 (see Note 0)
LAI-LAC:	0001
Access control:	unrestricted.

The default SIM is used with the following exception:

EF_{IMSI} (IMSI)

Logically: 246811111111111 (2-digit MNC) or 246813111111111 (3-digit MNC) (see Note 0)

Coding:

	B1	B2	B3	B4	B5	B6	B7	B8	B9
2-digit MNC	08	29	64	18	11	11	11	11	11
3-digit MNC	08	29	64	18	13	11	11	11	11

The SIM is installed into the ME and the MS is powered on.

27.4.4.2 Procedure

a) The SS sends PAGING REQUEST to the MS using the IMSI "246813579".

b) The SS sends PAGING REQUEST to the MS using the IMSI stored in the SIM.

c) After receipt of a CHANNEL REQUEST from the MS, the SS sends IMMEDIATE ASSIGNMENT to the MS.

d) After receipt of a PAGING RESPONSE from the MS, the SS sends AUTHENTICATION REQUEST to the MS containing cipher key sequence number set to binary 010.

e) After receipt of AUTHENTICATION RESPONSE from the MS, the SS sends TMSI REALLOCATION to the MS containing TMSI "32547698".

f) Within 5 s after receipt of TMSI REALLOCATION COMPLETE from the MS, the SS sends CHANNEL RELEASE to the MS.

g) To allow examination of the values in the SIM after call termination the MS shall not be soft powered down. If the test is performed with a SIM simulator, the simulation is stopped. If the test is performed with a SIM, the SIM is removed without soft powering down the MS. If this is not possible, the power supply of the ME is removed and then the SIM removed.

27.4.5 Test requirement

1) After step a) the MS shall not respond to the PAGING REQUEST.

2) After step c) the MS shall send PAGING RESPONSE to the SS containing the IMSI stored in the SIM.

3) After step e) the MS shall send TMSI REALLOCATION COMPLETE to the SS.

4) After step g) the SIM shall contain the following values.

EF_{LOCI} (Location Information)

Logically: LAI-MCC: 246

LAI-MNC: 81 or 813 (See Note 0)

TMSI: "32547698"

Coding:

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
2-digit MNC	32	54	76	98	42	F6	18	xx	xx	xx	xx
3-digit MNC	32	54	76	98	42	36	18	xx	xx	xx	xx

EF_{Kc} (Ciphering Key Kc)

Logically: Key Kc: xx (result of the authentication algorithm)

Sequence No: 2

Coding:

B1	B2	B3	B4	B5	B6	B7	B8	B9
xx	xx	xx	xx	xx	xx	xx	xx	02

27.5 Forbidden PLMNs, location updating and undefined cipher key

27.5.1 Definition

A list of forbidden PLMNs stored in the SIM and providing storage for up to 4 entries is managed by the MS. In automatic PLMN selection mode the MS controls location updating attempts to appropriate networks with respect to this list of forbidden PLMNs. As a result of a location update reject with the cause "PLMN not allowed" the MS stores the PLMN which rejected the update request in the SIM.

After a location update, which is not followed by an authentication procedure, the cipher key sequence number indicates that the cipher key is undefined.

27.5.2 Conformance requirement

1. In automatic PLMN selection mode the MS shall only attempt a LOCATION UPDATE if it receives a BCCH containing a LAI that is not indicated in the EF_{FPLMN} in the SIM.

   3GPP TS 02.11, subclause 2.3, 3GPP TS 11.11, subclauses 11.2.1 and 11.4.8.

2. After receipt of a LOCATION UPDATE REJECT message with the cause "PLMN not allowed" the ME shall update the EF_{FPLMN} in the SIM.

   3GPP TS 02.11, subclause 2.3, 3GPP TS 11.11, subclauses 11.2.1 and 11.4.8.

3. After call termination the SIM shall contain the correct cipher key sequence number.

   3GPP TS 11.11, subclauses 11.2.2, 11.4.5 and 11.4.6, 3GPP TS 02.17, subclause 6.1.

4. After call termination the SIM shall contain the correct TMSI and location information received by the MS.

   3GPP TS 11.11, subclauses 11.2.2, 11.4.5 and 11.4.6, 3GPP TS 02.17, subclause 6.1.

27.5.3 Test purpose

1) To verify that in automatic PLMN selection mode the MS does not attempt to access PLMNs stored in EF_{FPLMN} on the SIM.

2) To verify that the EF_{FPLMN} is correctly updated by the ME after receipt of a LOCATION UPDATE REJECT message with cause "PLMN not allowed".

3) To verify that the EF_{Kc} has been correctly updated by the ME.

4) To verify that the EF_{LOCI} has been correctly updated by the ME.

27.5.4 Method of test

27.5.4.1 Initial conditions

The SS transmits on the BCCH, with the following network parameters:

Attach/detach: disabled.

LAI-MCC: 234

LAI-MNC 02 or 023 (see Note 0)

LAI-LAC: 0001

Access control: unrestricted.

The default SIM is used with the following exception:

EF_{IMSI} (IMSI)

Logically: 246811111111111 (2-digit MNC) or 246813111111111 (3-digit MNC)

Coding:

	B1	B2	B3	B4	B5	B6	B7	B8	B9
2-digit MNC	08	29	64	18	11	11	11	11	11
3-digit MNC	08	29	64	18	13	11	11	11	11

EF_{LOCI} (Location Information)

Logically: LAI-MCC: 234

LAI-MNC: 01 or 012 (See Note 0)

LAI-LAC: 0000

TMSI: "32547698"

Coding:

B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
32	54	76	98	32	F4	10	00	00	FF	00

The SIM is installed into the ME and the MS is set to automatic PLMN selection mode.

EF_{Kc} (Ciphering Key Kc)

Logically: Key Kc: undefined

Sequence No: 2

Coding:

B1	B2	B3	B4	B5	B6	B7	B8	B9
xx	xx	xx	xx	xx	xx	xx	xx	02

27.5.4.2 Procedure

a) The MS is powered on.

b) The SS stops all RF output on the BCCH for a long enough period of time to cause a cell reselection procedure in the MS. The BCCH is changed to contain:

LAI (MCC/MNC): 234/03 or 234/034 (see Note 0).

The SS then resumes RF output on the BCCH.

c) The SS stops all RF output on the BCCH for a long enough period of time to cause a cell reselection procedure in the MS. The BCCH is changed to contain:

LAI (MCC/MNC): 234/04 or 234/045 (see Note 0).

The SS then resumes RF output on the BCCH.

d) The SS stops all RF output on the BCCH for a long enough period of time to cause a cell reselection procedure in the MS. The BCCH is changed to contain:

LAI (MCC/MNC): 234/05 or 234/056 (see Note 0).

The SS then resumes RF output on the BCCH.

e) The SS stops all RF output on the BCCH for a long enough period of time to cause a cell reselection procedure in the MS. The BCCH is changed to contain:

LAI (MCC/MNC): 234/01 or 234/012 (see Note 0).

The SS then resumes RF output on the BCCH.

f) After receipt of a CHANNEL REQUEST from the MS, the SS sends IMMEDIATE ASSIGNMENT to the MS.

g) After receipt of a LOCATION UPDATE REQUEST from the MS, the SS sends LOCATION UPDATE REJECT to the MS with cause "PLMN Not Allowed", followed by CHANNEL RELEASE.

The SS stops all RF output on the BCCH for a long enough period of time to cause a cell reselection procedure in the MS. The BCCH is changed to contain:

LAI (MCC/MNC): 234/06 or 234/067 (see Note 0).

The SS then resumes RF output on the BCCH.

h) After receipt of a CHANNEL REQUEST from the MS, the SS sends IMMEDIATE ASSIGNMENT to the MS.

i) After receipt of a LOCATION UPDATE REQUEST from the MS, the SS sends LOCATION UPDATE ACCEPT with:

LAI-MCC: 234

LAI-MNC 06 or 067 (see Note 0)

TMSI: "43658709".

to the MS.

j) After receipt of a TMSI REALLOCATION COMPLETE from the MS, the SS sends CHANNEL RELEASE to the MS.

k) The MS is soft powered down.

27.5.5 Test requirement

1) After each of the steps a) to d) the MS shall not attempt a LOCATION UPDATE.

2) After step f) the MS shall send LOCATION UPDATE REQUEST to the SS.

3) After step h) the MS shall send LOCATION UPDATE REQUEST to the SS.

4) After step i) the MS shall respond with TMSI REALLOCATION COMPLETE.

5) After step k) the SIM shall contain the following values:

EF_{LOCI} (Location Information)

Logically: LAI-MCC: 234

LAI-MNC: 06 or 067 (See Note 0)

TMSI: "43658709"

Coding:

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
2-digit MNC	43	65	87	09	32	F4	60	xx	xx	xx	00
3-digit MNC	43	65	87	09	32	74	60	xx	xx	xx	00

EF_{Kc} (Ciphering Key Kc)

Logically: Key Kc: xx

Sequence No: 7

Coding:

B1	B2	B3	B4	B5	B6	B7	B8	B9
xx	xx	xx	xx	xx	xx	xx	xx	07

EF_{FPLMN} (Forbidden PLMNs)

Logically:

		PLMN1	PLMN2	PLMN3	PLMN4
MCC		234	234	234	234
MNC	2-digit	03	04	05	01
	3-digit	034	045	056	012

Coding:

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
2-digit MNC	32	F4	30	32	F4	40	32	F4	50	32	F4	10
3-digit MNC	32	44	30	32	54	40	32	64	50	32	24	10

27.6 MS updating forbidden PLMNs

27.6.1 Definition

A list of forbidden PLMNs stored in the SIM provides storage for up to 4 entries, and is managed by the MS. In automatic PLMN selection mode the MS controls location updating attempts to appropriate networks with respect to this list of forbidden PLMNs. As a result of a location update reject with the cause "PLMN not allowed" the MS stores the PLMN which rejected the update request in the SIM.

27.6.2 Conformance requirement

After the receipt of a LOCATION UPDATE REJECT message with the cause "PLMN not allowed" the MS shall update the EF_{FPLMN} in the SIM.

3GPP TS 02.11, subclause 3.2.2.4.

27.6.3 Test purpose

To verify that the MS correctly updates the EF_{FPLMN}, i.e. fill up existing gaps in the elementary file before overwriting any existing entries.

27.6.4 Method of test

27.6.4.1 Initial conditions

The SS transmits on the BCCH, with the following network parameters:

Attach/detach: disabled.

LAI-MCC: 234

LAI-MNC 03 or 034 (see Note 0)

LAI-LAC: 0001

Access control: unrestricted.

The default SIM is used with the following exception:

Bands using 2-digit MNC (see Note 0) begin

EF_{FPLMN} (Forbidden PLMNs)

Logically:

		PLMN1	PLMN2	PLMN3	PLMN4
MCC		234	EMPTY	234	234
MNC	2-digit	02		04	05
	3-digit	023		045	056

Coding:

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
2-digit MNC	32	F4	20	FF	FF	FF	32	F4	40	32	F4	50
3-digit MNC	32	34	20	FF	FF	FF	32	54	40	32	64	50

The SIM is installed into the ME and the MS is set to automatic PLMN selection mode.

27.6.4.2 Procedure

a) The MS is powered on.

b) After receipt of a CHANNEL REQUEST from the MS, the SS sends IMMEDIATE ASSIGNMENT to the MS.

c) After receipt of a LOCATION UPDATE REQUEST from the MS, the SS sends LOCATION UPDATE REJECT to the MS with the cause "PLMN not allowed", followed by CHANNEL RELEASE.

d) The MS is soft powered down.

27.6.5 Test requirement

1) After step b) the MS shall send LOCATION UPDATE REQUEST to the SS.

2) After step d) the SIM shall contain:

EF_{FPLMN} (Forbidden PLMNs)

Logically:

			PLMN1	PLMN2	PLMN3	PLMN4
MCC			234	234	234	234
MNC (See Note 0)	2-digit	Either	02	03	04	05
		Or	02	04	05	03
	3-digit	Either	023	034	045	056
		Or	023	045	056	023

Coding:

		B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
2-digit MNC	Either	32	F4	20	32	F4	30	32	F4	40	32	F4	50
	Or	32	F4	20	32	F4	40	32	F4	50	32	F4	30
3-digit MNC	Either	32	34	20	32	44	30	32	54	40	32	64	50
	Or	32	34	20	32	54	40	32	64	50	32	44	30

27.7 MS deleting forbidden PLMNs

27.7.1 Definition

In manual PLMN selection mode the MS allows location update attempts to all available PLMNs, including forbidden PLMNs (as indicated by the forbidden PLMN list on the SIM). As a result of a successful location update procedure onto a PLMN which is in the forbidden PLMN list, the forbidden PLMN list is automatically updated by the MS.

27.7.2 Conformance requirement

1. In manual PLMN selection mode the MS shall be able to perform a LOCATION UPDATE attempt to a PLMN which is in the forbidden PLMN list.

   3GPP TS 02.11, subclause 3.2.2.2.

2. After receipt of LOCATION UPDATE ACCEPT the MS shall delete the forbidden PLMN from the forbidden PLMN list.

   3GPP TS 02.11, subclause 3.2.2.4.

27.7.3 Test purpose

1) To verify that in automatic PLMN selection mode the MS does not attempt to access PLMNs stored in EF_{FPLMN} on the SIM.

2) To verify that the MS is able to perform a LOCATION UPDATE on a forbidden PLMN in manual PLMN selection mode.

3) To verify that the MS after a successful LOCATION UPDATE deletes the PLMN in the EF_{FPLMN} on the SIM.

27.7.4 Method of test

27.7.4.1 Initial conditions

The SS transmits on the BCCH, with the following network parameters:

Attach/detach: disabled.

LAI-MCC: 234

LAI-MNC 01 or 012 (see Note 0)

LAI-LAC: 0001

Access control: unrestricted.

The default SIM is used with the following exception:

EF_{FPLMN} (Forbidden PLMNs)

Logically: PLMN1: empty

PLMN2: empty

PLMN3: MCC: 234

MNC: 01 or 012 (See Note 0)

PLMN4: empty

Coding:

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
2-digit MNC	FF	FF	FF	FF	FF	FF	32	F4	10	FF	FF	FF
3-digit MNC	FF	FF	FF	FF	FF	FF	32	24	10	FF	FF	FF

The SIM is installed into the ME and the MS is set to automatic PLMN selection mode.

27.7.4.2 Procedure

a) The MS is powered on.

b) PLMN with MCC/MNC of 234/01 or 234/012 (see Note 0) is manually selected.

c) After receipt of a CHANNEL REQUEST from the MS, the SS sends IMMEDIATE ASSIGNMENT to the MS.

d) After receipt of a LOCATION UPDATE REQUEST from the MS, the SS sends LOCATION UPDATE ACCEPT with:

LAI-MCC: 234

LAI-MNC 01 or 012 (see Note 0)

TMSI: "12345678".

to the MS.

e) After receipt of TMSI REALLOCATION COMPLETE from the MS, the SS sends CHANNEL RELEASE.

f) The MS is soft powered down.

27.7.5 Test requirement

1) After step a) the MS shall not attempt a LOCATION UPDATE.

2) After step c) the MS shall send LOCATION UPDATE REQUEST to the SS.

3) After step d) the MS shall respond with TMSI REALLOCATION COMPLETE.

4) After step f) the SIM shall contain the following values:

EF_{LOCI} (Location Information)

Logically: LAI-MCC: 234

LAI-MNC: 01 or 012 (See Note 0)

TMSI: "12345678"

Coding:

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
2-digit MNC	12	34	56	78	32	F4	10	xx	xx	xx	00
3-digit MNC	12	34	56	78	32	24	10	xx	xx	xx	00

EF_{FPLMN} (Forbidden PLMNs)

Logically: PLMN1: empty

PLMN2: empty

PLMN3: empty

PLMN4: empty

Coding:

B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF

27.8 MS updating the PLMN selector list

27.8.1 Definition

The PLMN selector list gives in priority order the preferred PLMNs on which the MS shall register. The list is stored on the SIM in the $EF_{PLMNsel}$. Update and deletion of PLMNs may be performed by the subscriber.

27.8.2 Conformance requirement

The MS shall correctly replace the selected PLMN in the PLMN selector list.

3GPP TS 11.11, subclause 11.5.5.

27.8.3 Test purpose

To verify that the MS correctly updates the $EF_{PLMNsel}$.

27.8.4 Method of test

27.8.4.1 Initial conditions

No SS is required for this test.

The default SIM is used.

The SIM is installed into the ME and the MS is powered on.

27.8.4.2 Procedure

a) The user shall initiate an MMI dependent procedure to change the second PLMN in the PLMN selector list to MCC/MNC of 567/01 or 567/018 (see Note 0).

b) The MS is soft powered down.

27.8.5 Test requirement

After step b) the SIM shall contain the following values:

$EF_{PLMNsel}$ (PLMN Selector)

Logically:

PLMN	1st	2nd	3rd	4th	5th	6th	7th	8th
MCC	234	567	234	234	234	234	246	246
2-digit MNC	01	01	03	04	05	06	81	82
3-digit MNC	012	018	034	045	056	067	813	824

Coding:

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
2-digit MNC	32	F4	10	65	F7	10	32	F4	30	32	F4	40
3-digit MNC	32	24	10	65	87	10	32	44	30	32	54	40
	B13	**B14**	**B15**	**B16**	**B17**	**B18**	**B19**	**B20**	**B21**	**B22**	**B23**	**B24**
2-digit MNC	32	F4	50	32	F4	60	42	F6	18	42	F6	28
3-digit MNC	32	64	50	32	74	60	42	36	18	42	46	28

27.9 MS recognizing the priority order of the PLMN selector list

27.9.1 Definition

The PLMN selector list gives in priority order the preferred PLMNs on which the MS shall register. The list is stored on the SIM in the $EF_{PLMNsel}$. Update and deletion of PLMNs may be performed by the subscriber by the use of the PIN.

27.9.2 Conformance requirement

When registering onto a VPLMN the MS shall take into account the priority order of the PLMNs in the preferred list on the SIM.

3GPP TS 02.11, subclause 3.2.2.2.

27.9.3 Test purpose

To verify that the PLMN with the higher priority (defined by its position in $EF_{PLMNsel}$) takes precedence over the PLMN with the lower priority when the MS performs a network selection.

27.9.4 Method of test

27.9.4.1 Initial conditions

The SS transmits on two BCCHs, with the following network parameters:

	Attach / Detach	LAI				Access Control
		MCC	MNC (2-digit)	MNC (3-digit)	LAC	
BCCH 1	disabled	234	33	334	0001	unrestricted
BCCH 2	disabled	234	34	345	0001	unrestricted

The default SIM is used with the following exception:

$EF_{PLMNsel}$ (PLMN Selector)

Logically: MCC: 234

MNC:

PLMN	1st	2nd	…	…	32nd	33rd	34th
2-digit MNC	01	02	…	…	32	34	33
3-digit MNC	012	023	…	…	323	345	334

Coding:

	B1	B2	B3	B4	B5	B6	…	…	…
2-digit MNC	32	F4	10	32	F4	20	…	…	…
3-digit MNC	32	24	10	32	34	20	…	…	…
	B94	**B95**	**B96**	**B97**	**B98**	**B99**	**B100**	**B101**	**B102**
2-digit MNC	32	F4	23	32	F4	43	32	F4	33
3-digit MNC	32	34	23	32	54	43	32	44	33

The SIM is installed into the ME and the MS is set to automatic PLMN selection mode.

27.9.4.2 Procedure

a) The MS is powered on.

b) After receipt of a CHANNEL REQUEST from the MS, the SS sends IMMEDIATE ASSIGNMENT to the MS.

c) After receipt of a LOCATION UPDATE REQUEST from the MS, the SS sends LOCATION UPDATE ACCEPT with:

LAI-MCC: 234

LAI-MNC 34 or 345 (see Note 0)

TMSI: "34567890".

to the MS

d) After receipt of a TMSI REALLOCATION COMPLETE from the MS, the SS sends CHANNEL RELEASE to the MS.

e) The MS is soft powered down.

27.9.5 Test requirement

1) After step b) the MS shall send LOCATION UPDATE REQUEST containing an MCC/MNC of 234/34 or 234/345 (see Note 0) to the SS.

2) After step c) the MS shall respond with TMSI REALLOCATION COMPLETE.

3) After step e) the SIM shall contain the following values:

EF_{LOCI} (Location Information)

Logically: LAI-MCC: 234

LAI-MNC: 34 or 345 (See Note 0)

TMSI: "34567890"

Coding:	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
2-digit MNC	34	56	78	90	32	F4	43	xx	xx	xx	00
3-digit MNC	34	56	78	90	32	54	43	xx	xx	xx	00

27.10 MS access control management

27.10.1 Definition

Access Control allows restriction of call access attempts. All mobile stations are assigned to a "low order class", and optionally (for priority uses) also to one or more "high order classes".

A "high order class" is only valid in the HPLMN or HPLMN country. Otherwise, the "low order class" is used.

The classes are programmed on the SIM. The network controls which classes at any time may be barred.

In addition, there is a separate mechanism for control of network access for emergency call attempts.

27.10.2 Conformance requirement

1. The ME shall read the access control value as part of the SIM/ME initialization procedure, and subsequently adopt this value.

   3GPP TS 11.11, subclause 11.2.1.

2. If the MS is a member of at least one access class which corresponds to the permitted classes as signalled over the air interface, and the access class is applicable in the serving network, the MS may make call attempts. Otherwise call access attempts are not allowed.

   If access class 10 is barred, MS of classes 0 - 9 and ME without SIMs shall not make emergency call attempts.

   MS of classes 11 - 15 are not allowed to make emergency call attempts if access class 10 and the relevant access class(es) between 11 and 15 are barred. Otherwise, emergency call attempts are allowed irrespective of the conditions of access class 10.

   All options are shown in figure 27-1 and are referenced to the tests.

   3GPP TS 02.11, subclauses 4.3 and 4.4.

3. For PCS 1 900: The test requirements 1 and 2 above are also tested for emergency call number 911.

27.10.3 Test purpose

1) To verify that the ME reads the access control value as part of the SIM/ME initialization procedure, and subsequently adopts this value.

2) To verify that the MS controls its network access in accordance with its access control class and the conditions imposed by the serving network.

3) For PCS 1 900: To verify the requirements in 1 and 2 above by using the emergency call number 911.

The tests verify ME performance for the following:

Tests (a) and (b) No SIM in ME.

Tests (c) to (e) MS with access class 0 to 9.

Test (f) MS with access class 11 and 15 not in HPLMN; and

MS with access class 12,13 and 14 not in HPLMN country.

Test (g) and (h) MS with access class 11 and 15 in HPLMN; and

MS with access class 12,13 and 14 in HPLMN country.

Each of the above are tested against all relevant combinations of access control and emergency call bits signalled by the network, as shown in table 27-1.

27.10.4 Method of test

27.10.4.1 Initial conditions

The SS transmits on the BCCH, with the following network parameters:

Attach/detach: disabled.

LAI (MCC/MNC/LAC): see table 27-1.

Access control: see table 27-1.

RACH: see table 27-1.

A SIM is installed in the ME containing IMSI and access control values as given in table 27-1 and the MS is powered on.

NOTE: Depending on the initial value of the EF_{LOCI}, the MS may perform a location update. This will be accepted by the SS.

Coding details

SIM IMSI: Data Field 6F 07

	Value 246813579	Value 2468135x9
byte 1	05H	05H
byte 2	29H	29H
byte 3	64H	64H
byte 4	18H	18H
byte 5	53H	53H
byte 6	97H	9xH
byte 7	FFH	FFH
byte 8	FFH	FFH
byte 9	FFH	FFH

Access class: Data field 6F 78

See 3GPP TS 11.11.

NETWORK (SS)

RACH: As defined in 3GPP TS 04.08 / 3GPP TS 44.018 subclause 10.5.2.29.

octet 1 01111000

octet 2 00001000

octet 3 }

octet 4 } as table 27-1

Specific PICS Statements

Speech supported for Full rate version 1 (TSPC_AddInfo_Full_rate_version_1)

27.10.4.2 Procedure

a) Using the MMI or EMMI a normal call set-up is attempted.

b) Using the MMI or EMMI an emergency call set-up is attempted. (Step 'b') is applicable if MS supports speech (TSPC_AddInfo_Full_rate_version_1)

c) The test is repeated for each set of values in table 27-1.

27.10.5 Test requirement

After steps a) and b) the MS shall access the network, or shall make no access attempt, in accordance with table 27-1.

NOTE: For type approval, to limit testing, in tests (c, (d) and (e) it is only necessary that one of the access classes is tested.

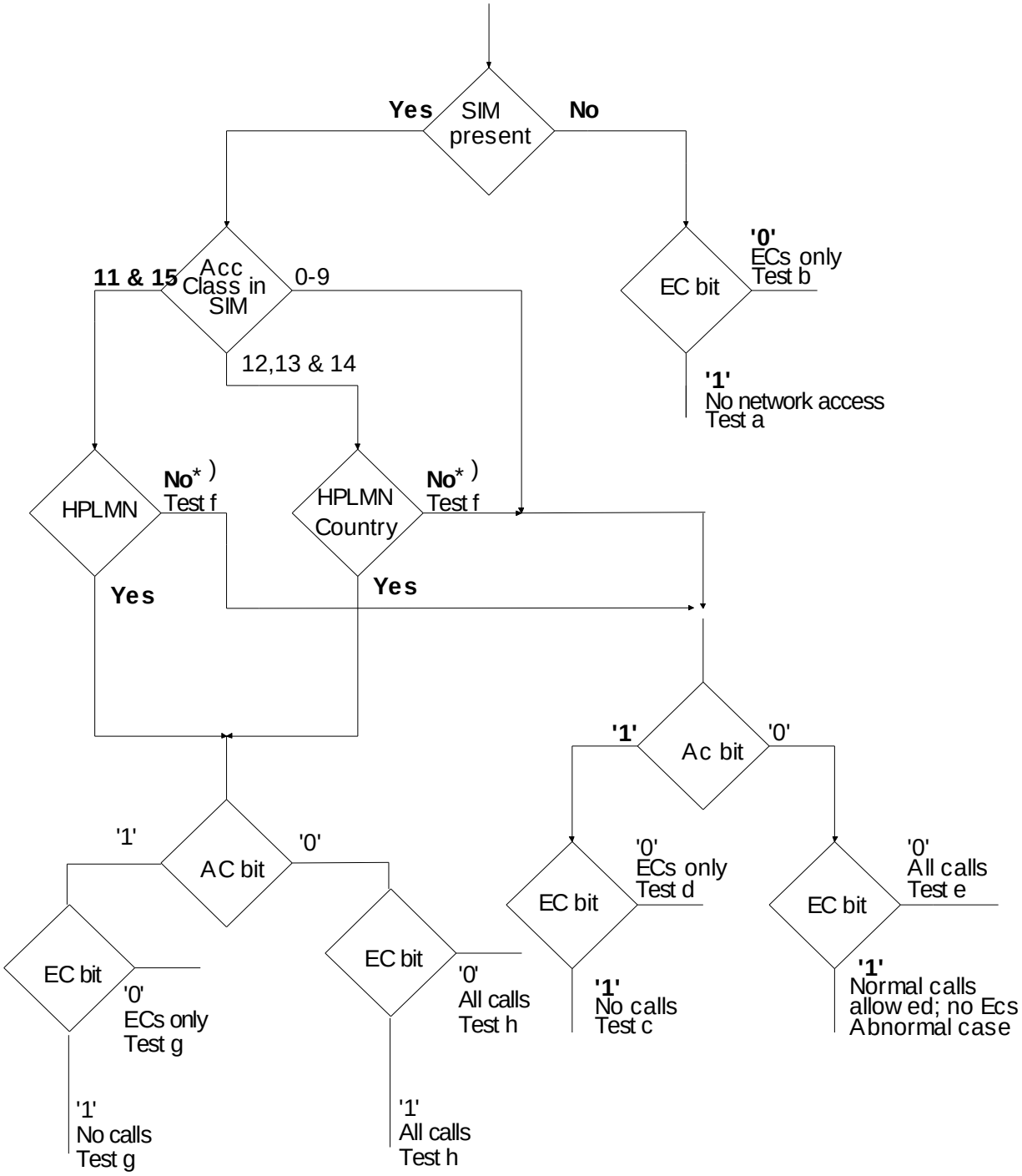
Table 27-1

	IMSI	Access class	RACH octet 3 octet 4	BCCH/LAI MCC MNC (see Note 0)	Normal calls	Emergency calls
TEST (a)						
	No SIM in ME		00000100 00000000	234 01 or 012	No	No
TEST (b)						
	No SIM in ME		00000000 00000000	234 01 or 012	No	Yes
TEST (c)						
	246813579	0	00000100 00000001	246 81 or 813	No	No
	246813579	1	00000100 00000010	246 81 or 813	No	No
	246813579	2	00000100 00000100	246 81 or 813	No	No
	246813579	3	00000100 00001000	246 81 or 813	No	No
	246813579	4	00000100 00010000	246 81 or 813	No	No
	246813579	5	00000100 00100000	246 81 or 813	No	No
	246813579	6	00000100 01000000	246 81 or 813	No	No
	246813579	7	00000100 10000000	246 81 or 813	No	No
	246813579	8	00000101 00000000	246 81 or 813	No	No
	246813579	9	00000110 00000000	246 81 or 813	No	No
TEST (d)						
	246813579	0	00000000 00000001	246 81 or 813	No	Yes
	246813579	1	00000000 00000010	246 81 or 813	No	Yes
	246813579	2	00000000 00000100	246 81 or 813	No	Yes
	246813579	3	00000000 00001000	246 81 or 813	No	Yes
	246813579	4	00000000 00010000	246 81 or 813	No	Yes
	246813579	5	00000000 00100000	246 81 or 813	No	Yes

	IMSI	Access class	RACH octet 3 octet 4	BCCH/LAI MCC MNC (see Note 0)	Normal calls	Emergency calls
	246813579	6	00000000 01000000	246 81 or 813	No	Yes
	246813579	7	00000000 10000000	246 81 or 813	No	Yes
	246813579	8	00000001 00000000	246 81 or 813	No	Yes
	246813579	9	00000010 00000000	246 81 or 813	No	Yes
TEST (e)						
	246813579	0	11111011 11111110	246 81 or 813	Yes	Yes
	246813579	1	11111011 11111101	246 81 or 813	Yes	Yes
	246813579	2	11111011 11111011	246 81 or 813	Yes	Yes
	246813579	3	11111011 11110111	246 81 or 813	Yes	Yes
	246813579	4	11111011 11101111	246 81 or 813	Yes	Yes
	246813579	5	11111011 11011111	246 81 or 813	Yes	Yes
	246813579	6	11111011 10111111	246 81 or 813	Yes	Yes
	246813579	7	11111011 01111111	246 81 or 813	Yes	Yes
	246813579	8	11111010 11111111	246 81 or 813	Yes	Yes
	246813579	9	11111001 11111111	246 81 or 813	Yes	Yes
TEST (f)						
	2468135 x 9	11 & x	00000111 11111111	246 82 or 824	No	No
	2468135 x 9	11 & x	00000011 11111111	246 82 or 824	No	Yes
	2468135 x 9 Set "x" to an arbitrary value in the range 0 to 9	11 & x	00000000 00000000	246 82 or 824	Yes	Yes
	2468135 x 9	12 & x	00000111 11111111	234 01 or 012	No	No
	2468135 x 9	12 & x	00000011 11111111	234 01 or 012	No	Yes
	2468135 x 9 Set "x" to an arbitrary value in the range0 to 9	12 & x	00000000 00000000	234 01 or 012	Yes	Yes
	2468135 x 9	13 & x	00000111 11111111	234 01 or 012	No	No
	2468135 x 9	13 & x	00000011 11111111	234 01 or 012	No	Yes
	2468135 x 9 Set "x" to an arbitrary value in the range0 to 9	13 & x	00000000 00000000	234 01 or 012	Yes	Yes
	2468135 x 9	14 & x	00000111 11111111	234 01 or 012	No	No
	2468135 x 9	14 & x	00000011 11111111	234 01 or 012	No	Yes
	2468135 x 9 Set "x" to an arbitrary value in the range0 to 9	14 & x	00000000 00000000	234 01 or 012	Yes	Yes
	2468135 x 9	15 & x	00000111 11111111	246 82 or 824	No	No

	IMSI	Access class	RACH octet 3 octet 4	BCCH/LAI MCC MNC (see Note 0)	Normal calls	Emergency calls
	2468135 x 9	15 & x	00000011 11111111	246 82 or 824	No	Yes
	2468135 x 9	15 & x	00000000 00000000	246 82 or 824	Yes	Yes
	Set "x" to an arbitrary value in the range0 to 9					
TEST (g)						
	246813579	11 & x	00001111 11111111	246 81 or 813	No	No
	246813579	11 & x	00001011 11111111	246 81 or 813	No	Yes
	246813579	12 & x	00010111 11111111	246 82 or 824	No	No
	246813579	12 & x	00010011 11111111	246 82 or 824	No	Yes
	246813579	13 & x	00100111 11111111	246 82 or 824	No	No
	246813579	13 & x	00100011 11111111	246 82 or 824	No	Yes
	246813579	14 & x	01000111 11111111	246 82 or 824	No	No
	246813579	14 & x	01000011 11111111	246 82 or 824	No	Yes
	246813579	15 & x	10000111 11111111	246 81 or 813	No	No
	246813579	15 & x	10000011 11111111	246 81 or 813	No	Yes
	Set "x" to an arbitrary value in the range 0 to 9					
TEST (h)						
	246813579	11 & x	11110011 11111111	246 81 or 813	Yes	Yes
	246813579	12 & x	11101011 11111111	246 82 or 824	Yes	Yes
	246813579	13 & x	11011011 11111111	246 82 or 824	Yes	Yes
	246813579	14 & x	10111011 11111111	246 82 or 824	Yes	Yes
	246813579	15 & x	01111011 11111111	246 81 or 813	Yes	Yes
	246813579	11 & x	11110111 11111111	246 81 or 813	Yes	Yes
	246813579	12 & x	11101111 11111111	246 82 or 824	Yes	Yes
	246813579	13 & x	11011111 11111111	246 82 or 824	Yes	Yes
	246813579	14 & x	10111111 11111111	246 82 or 824	Yes	Yes
	246813579	15 & x	01111111 11111111	246 81 or 813	Yes	Yes
	Set "x" to an arbitrary value in the range 0 to 9					

ACCESS CONTROL



ECs = Emergency Calls

Access Class in SIM - See GSM 11.11 Data Field 6F 78

EC bit = bit3 of octet 3 of RACH Control Parameters - See GSM 04.08 Para 10.5.2.29

AC bit = See bytes 3 & 4 of RACHControl Parameters

*) Mobile adopts Access Class 0-9, based on IMSI. See GSM 02.11

27.11 Exchange protocol tests

27.11.1 Character transmission

27.11.1.1 Bit/character duration during the transmission from the ME to the SIM

27.11.1.1.1 Definition

Data is transmitted serially across the SIM/ME interface. A character comprises:

- the start bit;
- eight data bits;
- the parity bit.

27.11.1.1.2 Conformance requirement

The bit/character duration and the delay between two consecutive characters (between start leading edges) sent by the ME shall be in the range specified.

3GPP TS 11.11, subclause 5.9.

27.11.1.1.3 Test purpose

To verify the timing during the transmission from the ME to the SIM.

27.11.1.1.4 Method of test

27.11.1.1.4.1 Initial conditions

The ME is connected to the SIM simulator, and powered on.

27.11.1.1.4.2 Procedure

A number of characters are transmitted from the ME to the SIM simulator. The SIM simulator shall measure the bit/character duration and the delay between two consecutive characters for all characters transmitted by the ME.

27.11.1.1.5 Test requirement

The timing shall be in the range specified.

27.11.1.2 Bit/character duration during the transmission from the SIM simulator to the ME

27.11.1.2.1 Definition

Data is transmitted serially across the SIM/ME interface. A character comprises:

- the start bit;
- eight data bits;
- the parity bit.

27.11.1.2.2 Conformance requirement

Responses with maximum and minimum bit/character duration times shall be accepted by the ME.

3GPP TS 11.11, subclause 5.9.

27.11.1.2.3 Test purpose

To verify the acceptance of maximum and minimum bit/character duration during the transmission from the SIM to the ME.

27.11.1.2.4 Method of test

27.11.1.2.4.1 Initial conditions

The ME is connected to the SIM simulator, and powered on.

27.11.1.2.4.2 Procedure

The SIM simulator shall send responses with the maximum and minimum bit/character durations specified in 3GPP TS 11.11.

27.11.1.2.5 Test requirement

The ME shall accept the response and act accordingly.

27.11.1.3 Inter-character delay

27.11.1.3.1 Definition

The inter-character delay is defined as the time between the start edge of a character and the start edge of the previous character. It is given by:

- the length of a character plus an extra guard time of N etu during transmission from the ME to the SIM. N is indicated in ATR character TC1;
- the work waiting time during transmission from the SIM to the ME.

27.11.1.3.2 Conformance requirement

1) If TC1 is 0 or 255 the ME shall work with the SIM.
2) If TC1 is not 0 or 255 the ME shall repeat the reset at least 2 times before it rejects the SIM.
3) The ME shall accept characters sent by the SIM with the work waiting time within the specified range.

3GPP TS 11.11, clause 5.9.

27.11.1.3.3 Test purpose

1) To verify the correct evaluation of the character TC1 indicated in the ATR.
2) To verify that the ME accepts the minimum and maximum work waiting time during the transmission from the SIM to the ME.

27.11.1.3.4 Method of test

27.11.1.3.4.1 Initial conditions

The ME is connected to the SIM simulator, and powered on.

27.11.1.3.4.2 Procedure

a) Upon reception of a reset the SIM simulator transmits the ATR as follows:

a.1) N = 0.

character name	content	meaning
TS	3B	direct convention
T0	40	TA1, TB1, TD1 not transmitted, TC1 transmitted, no historical characters
TC1	00	N = 0

a.2) N = 255.

character name	content	meaning
TS	3B	direct convention
T0	40	TA1, TB1, TD1 not transmitted, TC1 transmitted, no historical characters
TC1	FF	N = 255

a.3) N = Value other than 0 and 255.

character name	content	meaning
TS	3B	direct convention
T0	40	TA1, TB1, TD1 not transmitted, TC1 transmitted, no historical characters
TC1	00 < XX < FF	0 < N < 255

b) The SIM simulator transmits with a work-waiting-time of 12 etu.

c) The SIM simulator transmits with a work-waiting-time of 9 600 etu.

27.11.1.3.5 Test requirement

In steps a.1) and a.2) the ME shall work with the SIM simulator.

In step a.3) the ME shall repeat the reset at least 2 times and then reject the SIM simulator.

In steps b) and c) the ME shall work with the SIM simulator.

27.11.1.4 Error handling during the transmission from the ME to the SIM

27.11.1.4.1 Definition

Error checking is done for each character transmitted by making use of the parity bit. If the SIM detects a parity error, an error signal is sent to the ME, and the ME retransmits that character.

27.11.1.4.2 Conformance requirement

Subsequent to Answer to Reset and the protocol type selection, the error detection and character repetition procedure specified in GSM 11.11 is mandatory for transmission on the basis of T = 0. On receipt of an error signal, the ME shall repeat the previously transmitted character.

3GPP TS 11.11, subclause 5.10.

27.11.1.4.3 Test purpose

To verify the error handling during the transmission from the ME to the SIM.

27.11.1.4.4 Method of test

27.11.1.4.4.1 Initial conditions

The ME is connected to the SIM simulator, and powered on.

27.11.1.4.4.2 Procedure

The SIM simulator shall transmit an error signal in response to a received character in accordance with ISO 7816-3, subclause 6.3.3.

27.11.1.4.5 Test requirement

The ME shall repeat the character in accordance with ISO 7816-3, subclause 6.3.3.

27.11.1.5 Error handling during transmission from the SIM to the ME

27.11.1.5.1 Definition

Error checking is done for each character transmitted by making use of the parity bit. If the ME detects a parity error, an error signal is sent to the SIM, and the SIM retransmits that character.

27.11.1.5.2 Conformance requirement

Subsequent to Answer to Reset and the protocol type selection, the error detection and character repetition procedure specified in GSM 11.11 is mandatory for transmission on the basis of T = 0. On receipt of a response with a parity error, the ME shall send an error signal and expect the previously transmitted character to be repeated.

3GPP TS 11.11, subclause 5.10.

27.11.1.5.3 Test purpose

To verify the error handling during the transmission from the SIM to the ME.

27.11.1.5.4 Method of test

27.11.1.5.4.1 Initial conditions

The ME is connected to the SIM simulator, and powered on.

27.11.1.5.4.2 Procedure

The SIM simulator shall send a response with a parity error and check that the ME performs error handling in accordance with ISO/IEC 7816-3, subclause 6.3.3.

27.11.1.5.5 Test requirement

The ME shall send an error signal in accordance with ISO/IEC 7816-3, subclause 6.3.3, and expect a repetition of the character. The ME shall correctly evaluate the character when repeated by the SIM simulator.

27.11.2 Answer to reset (RST)

27.11.2.1 Void

27.11.2.2 Acceptance of SIMs with active low RST

27.11.2.2.1 Definition

Active low RST is one possible implementation of reset, and MEs must be able to accept SIMs with active low reset.

27.11.2.2.2 Conformance requirement

The ME shall accept a SIM with active low reset by putting the RST contact to state H. The signal timing shall be in accordance with the specification.

3GPP TS 11.11, clause 5.

ISO/IEC 7816-3, subclause 5.3.2.

27.11.2.2.3 Test purpose

To verify that the ME accepts a SIM with active low reset. The timing of the RST signal shall be in accordance with the specification.

27.11.2.2.4 Method of test

27.11.2.2.4.1 Initial conditions

The SIM simulator is configured for active low reset. The ME is connected to the SIM simulator and powered on.

27.11.2.2.4.2 Procedure

The SIM simulator measures the timing of the RST signal.

27.11.2.2.5 Test requirement

The ME shall accept the SIM simulator with active low reset. The RST signal shall be put to state H after a minimum of (400/fi)s.

27.11.2.3 Characters of the answer to reset

27.11.2.3.1 Definition

When the SIM is reset, it sends up to 33 characters to the ME, containing information which must be interpreted by the ME to ascertain the transmission protocol to be used.

27.11.2.3.2 Conformance requirement

1. The ME shall adopt the data encoding convention and initial etu time defined in the initial character TS of the ATR.

   3GPP TS 11.11, subclause 5.8.

2. The ME shall be able to receive interface characters for other transmission protocols than T = 0, historical characters and a check byte, even if only T = 0 is used by the ME.

   3GPP TS 11.11, subclause 5.8.1.

27.11.2.3.3 Test purpose

1. To verify that the ME adopts the appropriate data encoding convention and initial elementary time unit (etu) defined in the initial character TS of the Answer to Reset.

2. To verify that the ME accepts interface characters for transmission protocols other than T=0, historical characters and the check byte.

27.11.2.3.4 Method of test

27.11.2.3.4.1 Initial conditions

The ME is connected to the SIM (or SIM simulator).

27.11.2.3.4.2 Procedure

a) The ME is powered on

b) The SIM (or SIM simulator) sends an ATR as follows:

character name	content	meaning
TS	3B	direct convention
T0	9F	TB1, TC1 not transmitted, TA1, TD1 transmitted, 15 historical characters
TA1	11	default values F = 372, D = 1
TD1	80	TA2, TB2, TC2 not transmitted, TD2 transmitted, protocol T=0 offered
TD2	01	TA2, TB2, TC2, TD2 not transmitted, protocol T=1 offered
Ti	53 49 4D 20 53 55 42 47 52 4F 55 50 20 39 35	historical characters
TCK	4F	check byte

c) The ME is made to send further commands to the SIM (or SIM simulator) (e.g. by entering the PIN).

d) The ME is switched off and on. This time the SIM (or SIM simulator) sends an ATR as follows:

character name	content	meaning
TS	3F	inverse convention
T0	9F	TB1, TC1 not transmitted, TA1, TD1 transmitted, 15 historical characters
TA1	11	default values F = 372, D = 1
TD1	80	TA2, TB2, TC2 not transmitted, TD2 transmitted, protocol T=0 offered
TD2	01	TA2, TB2, TC2, TD2 not transmitted, protocol T=1 offered
Ti	53 49 4D 20 53 55 42 47 52 4F 55 50 20 39 35	historical characters
TCK	4F	check byte

e) The ME is made to send further commands to the SIM (e.g. by entering the PIN).

27.11.2.3.5 Test requirement

1. After step b), the ME shall work with the SIM (or SIM simulator).

2. After step d), the ME shall work with the SIM (or SIM simulator).

27.11.2.4 PPS procedure

27.11.2.4.1 Definition

The PPS procedure is required to select the standard transmission protocol if the SIM does not use this as a default.

27.11.2.4.2 Conformance requirement

If the ME receives an Answer to Reset where TA1 is not equal to "11", it shall initiate the PPS procedure as defined in 3GPP TS 11.11.

3GPP TS 11.11, subclause 5.8.2.

27.11.2.4.3 Test purpose

To verify that ME uses the PPS procedure as specified in 3GPP TS 11.11.

27.11.2.4.4 Method of test

27.11.2.4.4.1 Initial conditions

The ME is connected to the SIM (or SIM simulator).

27.11.2.4.4.2 Procedure

a) The ME is powered on.

b) The SIM (or the SIM simulator) sends an ATR as follows:

character name	content	meaning
TS	3B	direct convention
T0	10	TB1, TC1, TD1 not transmitted, TA1 transmitted, no historical characters
TA1	77	invalid values for F and D

27.11.2.4.5 Test requirement

After step b), the ME shall send to the SIM (or the SIM simulator) "FF00FF".

27.11.2.5 Reset repetition

27.11.2.5.1 Definition

If transmission errors result in the ATR being unintelligible to the ME, the ME performs the reset again. The minimum number of reset attempts is three.

27.11.2.5.2 Conformance requirement

Following receipt of a wrong ATR, the ME shall perform a reset. The ME shall not reject the SIM until at least three consecutive wrong ATRs are received.

3GPP TS 11.11, subclause 5.10.

27.11.2.5.3 Test purpose

To verify that the ME repeats the reset procedure on receipt of a wrong ATR, and does not reject the SIM unless at least three consecutive wrong ATRs are received.

27.11.2.5.4 Method of test

27.11.2.5.4.1 Initial conditions

The ME is connected to the SIM simulator.

27.11.2.5.4.2 Procedure

a) The ME is powered on.

b) The SIM simulator sends a non understandable answer to reset to the ME. (e.g. a wrong TS byte), at each reset initiated by the ME.

27.11.2.5.5 Test requirement

After step b), the ME shall repeat the reset at least two times.

27.11.2.6 Speed Enhancement

27.11.2.6.1 Definition

MEs that support speed enhancement use a specific PPS sequence to indicate the use of different transmission parameters F and D. If this PPS fails, the ME retries with standard parameters.

27.11.2.6.2 Conformance requirement

1. If speed enhancement is implemented in the ME, it is mandatory to support F=512 and D=8 (in addition to the default values F=372 and D=1).

2. If the SIM does not answer the PPS request within the initial waiting time the ME shall reset the SIM. After two failed PPS attempts using F=512 and D=8 or values indicated in TA1, (no PPS response from the SIM) the ME shall initiate PPS procedure using default values.

3. If this also fails (no PPS response from the SIM) the ME may proceed using default values without requesting PPS.

3GPP TS 11.11, subclause 5.8.3.

27.11.2.6.3 Test purpose

1. To verify that the ME supports the transmission parameters F=512 and D=8.

2. To verify that the ME resets the SIM if the SIM does not answer the PPS request within the initial waiting time and initiates a PPS procedure using default values F=372 and D=1 after the second failed PPS attempt.

3. To verify that if the ME proceeds it uses the default values without requesting PPS.

27.11.2.6.4 Method of test

27.11.2.6.4.1 Initial conditions

The ME is connected to the SIM simulator.

27.11.2.6.4.2 Procedure

Part 1:

a) The ME is powered on.

b) The SIM simulator sends an ATR as follows:

character name	content	meaning
TS	3B	direct convention
T0	10	TB1, TC1, TD1 not transmitted, TA1 transmitted, no historical characters
TA1	94	F=512, D=8

c) After receipt of the PTS Request, the SIM simulator answers with the PTS Response "FF 10 94 7B" using a work waiting time of 9600 etu (initial waiting time).

d) The ME and SIM simulator transmits with enhanced speed (F=512, D=8).

Part 2:

e) The ME is switched off and on. The SIM simulator sends an ATR as in step b).

f) After receipt of the PPS Request, the SIM simulator does not answer within the initial waiting time.

g) After being reset by the ME the SIM simulator sends an ATR as in step b)

h) After receipt of the PPS Request, the SIM simulator does not answer within the initial waiting time

i) After being reset by the ME the SIM simulator sends an ATR as in step b)

j) After receipt of the PPS Request using default values "FF 00 FF", the SIM simulator answers with the PPS Response "FF 00 FF" using a work waiting time of 9600 etu (initial waiting time).

k) The SIM simulator sends with normal speed (F=372, D=1),

Part 3:

l) The ME is switched off and on. The SIM simulator sends an ATR as in step b).

m) After receipt of the PPS Request, the SIM simulator does not answer within the initial waiting time.

n) After being reset by the ME the SIM simulator sends an ATR as in step b)

o) After receipt of the PPS Request, the SIM simulator does not answer within the initial waiting time

p) After being reset by the ME the SIM simulator sends an ATR as in step b)

q) After receipt of the PPS Request using default values "FF 00 FF", the SIM simulator does not answer within the initial waiting time

r) The ME may reset the SIM

s) After being reset by the ME the SIM simulator sends an ATR as in step b)

t) If the ME reset the SIM in step p) it shall not send a PPS request

u) The SIM simulator sends with normal speed (F=372, D=1),

Note: Part 3 is optional for ME27.11.2.6.5 Test requirement

After step b) the ME shall send to the SIM simulator the PPS Request "FF 10 94 7B".

After step c) the ME shall work with the SIM simulator.

After step e) the ME shall send to the SIM simulator the PPS Request "FF 10 94 7B" .

After step f) the ME shall reset the SIM after the initial waiting time has expired.

After step g) the ME shall send to the SIM simulator the PPS Request "FF 10 94 7B".

After step h) the ME shall reset the SIM after the initial waiting time has expired.

After step i) the ME shall send to the SIM simulator the PPS Request "FF 00 FF".

After step m) the ME may reset the SIM after the initial waiting time has expired.

After step t) the ME shall not send a PPS request to the SIM simulator but continue to work with the SIM using default values (F=372, D=1).

27.11.3 Command processing, procedure bytes

27.11.3.1 Definition

The procedure bytes ACK, NULL, and SW1 are sent from the SIM to the ME, and give the ME an acknowledgement for the previous instruction, information concerning transfer of data and the card status at the end of the command.

27.11.3.2 Conformance requirement

On the basis of protocol T = 0, the ME shall correctly use the different modes of data transmission defined in ISO/IEC 7816-3, subclause 8.2.2.

3GPP TS 11.11, clause 5

ISO/IEC 7816: 1990, subclause 8.2.2.

27.11.3.3 Test purpose

To verify that the ME uses correctly the different modes of data transmission.

27.11.3.4 Method of test

27.11.3.4.1 Initial conditions

The ME is connected to the SIM simulator and powered on.

27.11.3.4.2 Procedure

a) The ME is made to initiate a VERIFY CHV command.

b) The SIM simulator answers the first 3 bytes with ACK=INS complemented.

c) The SIM simulator answers the next data byte with NULL (NULL="60").

d) The SIM simulator then sends ACK=INS. This byte is sent when the elapsed time since step b) is greater than the work waiting time.

e) The SIM simulator answers the transmission of the rest of the data with NULL.

f) The SIM simulator then sends SW1 and SW2, indicating correct execution of the command ("90" and "00" for SW1 and SW2 respectively). These bytes are sent when the elapsed time since step d) is greater than the work waiting time.

27.11.3.5 Test requirement

The command shall be executed correctly.

27.12 Evaluation of directory characteristics

27.12.1 Operating speed in authentication procedure

27.12.1.1 Definition

Authentication is performed by a GSM network on the SIM, by sending a random number to the SIM. The SIM then performs a calculation on the random number, and sends the result to the network for verification.

27.12.1.2 Conformance requirement

If bit b2 of the file characteristics is set to 1, then the ME shall provide a clock frequency of at least 13/4 MHz to enable the SIM to run the authentication process in the required time.

3GPP TS 11.11, subclause 5.4.

27.12.1.3 Test purpose

To verify that the authentication procedure is done with a frequency of at least 13/4 MHz if the bit b2 of the file characteristics (byte 1 of the directory characteristics) is set to 1.

27.12.1.4 Method of test

27.12.1.4.1 Initial conditions

System simulator:

1 cell, default parameters.

Mobile Equipment:

Connected to a SIM-simulator with bit b2 of the file characteristics set to 1.

ME is powered on.

27.12.1.4.2 Procedure

An authentication is made in the same way as in test [26.7.2. Authentication]. The MS is paged. After the MS has responded with a PAGING RESPONSE message to the SS, the SS initiates an authentication procedure, sending the MS the value RAND. During authentication, the SIM simulator checks the frequency of the clock supplied by the ME. Following the AUTHENTICATION RESPONSE from the MS, the SS sends CHANNEL RELEASE.

27.12.1.5 Test requirement

The frequency of the clock shall be at least 13/4 MHz during the authentication procedure.

27.12.2 Clock stop

27.12.2.1 Definition

The ME may switch off the clock signal to the SIM, but only if the SIM indicates that it supports this feature.

27.12.2.2 Conformance requirement

1. The ME shall not stop the clock, unless the requirements indicated in byte 1 of the file characteristics are met.

   3GPP TS 11.11, subclauses 5.6 and 9.2.1.

2. The ME shall wait at least 1 860 clock cycles after having received the last character including the minimum guard time (2 etu) of the response before switching off the clock. The ME shall wait at least 744 clock cycles before it sends the first command after having restarted the clock.

   3GPP TS 11.11, subclause 5.6.

27.12.2.3 Test purpose

1. To verify that the clock is only switched off if requirements are met as indicated in the file characteristics (byte 1 of the directory characteristics).

2. To verify that the timing of the clock switching is as specified.

27.12.2.4 Method of test

27.12.2.4 Method of test

Specific PICS statements:

- 5V only SIM/ME interface (TSPC_AddInfo_5V)

PIXIT statements:

-

27.12.2.4.1 Initial conditions

The ME is connected to a SIM simulator. CHV 1 is enabled.

27.12.2.4.2 Procedure

a) A SIM simulator is used with bits set as follows:

Bit b1	Bit b3	Bit b4
0	0	0

b) The ME is powered on. When the ME is in mode PIN check, 10 s shall elapse before the PIN is entered.

c) The ME is powered off, and a SIM simulator is used with bits set as follows:

Bit b1	Bit b3	Bit b4
0	1	0

d) The ME is powered on. When the ME is in mode PIN check, 10 s shall elapse before the PIN is entered.

e) The ME is powered off, and a SIM simulator is used with bits set as follows:

Bit b1	Bit b3	Bit b4
0	0	1

f) The ME is powered on. When the ME is in mode PIN check, 10 s shall elapse before the PIN is entered.

g) The ME is powered off, and a SIM simulator is used with bits set as follows:

Bit b1	Bit b3	Bit b4
1	0	0

h) The ME is powered on. When the ME is in mode PIN check, 10 s shall elapse before the PIN is entered.

27.12.2.5 Test requirement

1. During step b), the ME shall not switch off the clock. This applies only to MEs supporting 5V SIM interface (see PICS).
2. During step d), the ME shall not switch off the clock, unless at high level.
3. During step f), the ME shall not switch off the clock, unless at low level.
4. During steps d), f) and h), the ME shall not switch off the clock until at least 1 860 clock cycles after having received the last character of the response including the minimum guard time (2 etu).
5. During steps d), f) and h), the ME shall wait at least 744 clock cycles before it sends the first command after having restarted the clock.

27.13 Mechanical tests

27.13.1 Contact pressure

27.13.1.1 Definition

The contacts of the card reader must exert a force to maintain a good electrical contact, but the force must not be excessive and damage the SIM.

27.13.1.2 Conformance requirement

A contact force may not be greater than 0,5 N per contact.

3GPP TS 11.11, subclause 4.3.4.

27.13.1.3 Test purpose

To verify that the contact pressure of each contacting element is not greater than 0,5 N when each of the following types of card is used:

i) Unembossed.

ii) Embossed on the contact side.

iii) Embossed on the opposite side to the contacts.

NOTE: Only type i) applies to the plug-in SIM.

27.13.1.4 Method of test

27.13.1.4.1 Initial conditions

The ME manufacturers shall provide a separate card reader (mechanical components) to make the measurement possible.

27.13.1.4.2 Procedure

The pressure of each contacting element is measured.

27.13.1.5 Test requirement

The contact pressure of each contacting element shall be not greater than 0,5 N.

27.13.2 Shape of contacts for IC card SIM card reader

27.13.2.1 Definition

The shape of the contacts is important to maintain a good electrical contact, but must not damage the SIM.

27.13.2.2 Conformance requirement

The radius of curvature of the contacting elements shall be greater than or equal to 0,8 mm in the contact area of both axes.

3GPP TS 11.11, subclause 4.3.4.

27.13.2.3 Test purpose

To verify that the radius of curvature of the contacting elements is greater than or equal to 0,8 mm in the contact area on both axes.

27.13.2.4 Method of test

27.13.2.4.1 Initial conditions

The ME manufacturers shall provide a separate card reader (mechanical components) to make the measurement possible.

27.13.2.4.2 Procedure

The radius of curvature of the contacting elements is measured on both axes.

27.13.2.5 Test requirement

The radius of curvature of the contacting elements shall be greater than or equal to 0,8 mm in the contact area on both axes.

27.14 Secret code usage

27.14.1 Entry of PIN

27.14.1.1 Definition

The PIN is a number used to authenticate the user to the SIM for security. Entry of the correct PIN allows PIN-protected data to be accessed over the SIM-ME interface.

27.14.1.2 Conformance requirement

Following insertion of the SIM and switching on the MS, the ME shall check the state of the PIN. If the PIN is enabled, the ME asks the user for PIN verification.

The VERIFY CHV function verifies the PIN presented by the ME to the SIM.

Reference:

3GPP TS 02.30, subclause 4.6.1; 3GPP TS 11.11, subclauses 8.9, 9.2.9 and 11.3.1.

27.14.1.3 Test purpose

1. To verify that the PIN verification procedure is performed by the ME correctly.
2. To verify that the GSM basic public MMI string is supported.

27.14.1.4 Method of test

27.14.1.4.1 Initial conditions

The ME is connected to a SIM or SIM-simulator with the PIN enabled, and powered off.

The default SIM is used.

27.14.1.4.2 Procedure

a) The ME is powered on.

b) When the MS is in mode "PIN check" enter "2468#".

27.14.1.5 Test requirement

1) The ME shall send a VERIFY CHV command to the SIM, with CHV number = "01".

2) The MS shall give an indication "OK", following a successful execution of the command.

27.14.2 Change of PIN

27.14.2.1 Definition

The PIN may be changed by the user, by entering the old and new PINs. The length of the PIN is between 4 and 8 digits.

27.14.2.2 Conformance requirement

The ME shall support the change of PIN procedure as defined in 3GPP TS 02.30 and 3GPP TS 11.11.

Reference:

3GPP TS 02.30, subclause 4.6.2; 3GPP TS 11.11, subclauses 8.10, 9.2.10 and 11.3.2.

27.14.2.3 Test purpose

1. To verify that the PIN substitution procedure is performed correctly by the ME.

2. To verify that the GSM basic public MMI string is supported.

27.14.2.4 Method of test

27.14.2.4.1 Initial conditions

The ME is connected to a SIM or SIM-simulator with the PIN enabled.

The default SIM is used.

The ME is powered-on, with the correct PIN entered.

Specific PICS Statements:

- support of basic public MMI strings to change/unblock PIN (TSPC_PIN_MMI_Strings)

27.14.2.4.2 Procedure

a) When the public basic MMI strings to change/unblock PIN are supported enter "**04*2468*01234567*01234567#", else initiate an equivalent MMI dependent procedure to change the PIN from '2468' to '01234567'.

b) The MS is switched off and on.

c) When the MS is in mode "PIN-check", the sequence "01234567#" is entered.

d) The MS is switched off and on.

e) When the MS is in mode "PIN check" enter "2468#".

27.14.2.5 Test requirement

1) After step a), the ME shall send a CHANGE CHV command to the SIM, with CHV number set to "01".

2) Following the successful execution of the command, the MS shall give an indication that the new PIN is accepted.

3) After step c), the MS shall give an indication "OK".

4) After step e), the MS shall give an indication that the entered PIN is not accepted.

27.14.3 Disabling the PIN

27.14.3.1 Definition

Entry of the PIN may be disabled by the user, depending on the service table of the SIM. It is the responsibility of the ME to check the SIM service table.

27.14.3.2 Conformance requirement

Disabling PIN is achieved through the DISABLE CHV command. If the PIN disable function in the SIM service table is not allocated or activated, then the ME shall not attempt to disable the PIN.

Reference:

3GPP TS 11.11, subclauses 8.11, 9.2.11, 10.2.7, 11 and 11.3.3.

27.14.3.3 Test purpose

To verify that the ME does not attempt to disable the PIN.

27.14.3.4 Method of test

27.14.3.4.1 Initial conditions

The ME is connected to the SIM simulator.

Elementary files in the SIM simulator shall be default, with the exception of:

EF_{SST} (SIM Service Table)

Logically: CHV1 disable function not activated.

Abbreviated dialling numbers allocated and activated.

PLMN selector allocated and activated.

Fixed dialling numbers not activated.

Coding:

	B1	B2	B3	B4
Value (binary)	xx0x110x	0011xxxx	xxxxxxxx	0000xxxx

The coding of EF_{SST} shall conform with the capabilities of the SIM simulator.

The ME is powered on and a correct PIN entered.

27.14.3.4.2 Procedure

Using the ME's MMI procedure, an attempt is made to disable the PIN.

27.14.3.5 Test requirement

The ME shall not send a DISABLE CHV command across the SIM/ME interface.

27.14.4 PUK entry

27.14.4.1 Definition

After three consecutive wrong entries of the PIN, the PIN becomes blocked. The PUK is used to unblock the PIN. This function may be performed whether or not the PIN is blocked.

27.14.4.2 Conformance requirement

The ME shall support the procedure to unblock PIN using PUK, as defined in 3GPP TS 02.30 and 3GPP TS 11.11.

Reference:

3GPP TS 02.30, subclause 4.6.3; 3GPP TS 11.11, subclauses 8.13, 9.2.13 and 11.3.5.

27.14.4.3 Test purpose

1. To verify that the CHV unblocking procedure is performed correctly.
2. To verify that the GSM basic public MMI string is supported.

27.14.4.4 Method of test

27.14.4.4.1 Initial conditions

The ME is connected to the SIM simulator.

The default SIM is used.

Specific PICS Statements:

- support of basic public MMI strings to change/unblock PIN (TSPC_PIN_MMI_Strings)

27.14.4.4.2 Procedure

Step ‘a’ up to and including step ‘e’ are applicable if MS supports basic public MMI strings to change/unblock PIN (TSPC_PIN_MMI_Strings).

a) The ME is powered on.

b) Enter "**05*13243546*1234*1234#"

c) The ME is powered off and on.

d) Enter the new PIN: "1234".

e) The ME is powered off.

f) The ME is powered on.

g) Enter a wrong PIN three times.

h) When the public basic MMI strings to change/unblock PIN are supported enter "**05*13243546*1357*1357#", else initiate an equivalent MMI dependent procedure to unblock the PIN with unblock code '13243546' and a new PIN '1357'.

i) The ME is powered off and on.

j) Enter the new PIN: "1357".

27.14.4.5 Test requirements

Test reqirement 1 and Test requirement 2 are not applicable for an ME that does not support basic public MMI strings to change/unblock PIN (TSPC_PIN_MMI_Strings)..

1. After step b), the ME shall send an UNBLOCK CHV command to the SIM, with CHV number = "00".
2. After step d), the ME shall indicate that the PIN has been accepted.
3. After step g), the ME shall indicate that the PIN has been blocked.
4. After step h), the ME shall send an UNBLOCK CHV command to the SIM, with CHV number = "00".
5. After step j), the ME shall indicate that the PIN has been accepted.

27.14.5 Entry of PIN2

27.14.5.1 Definition

PIN2 is a number used to authenticate the user to the SIM for security. Entry of the correct PIN2 allows PIN2-protected data to be accessed over the SIM-ME interface.

27.14.5.2 Conformance requirement

Where entry of PIN2 is necessary for security access, the ME shall indicate that PIN2 is to be entered.

The VERIFY CHV function verifies the PIN presented by the ME to the SIM.

Reference:

3GPP TS 02.30, subclause 4.6.1; 3GPP TS 11.11, subclauses 8.9, 9.2.9 and 11.3.1.

27.14.5.3 Test purpose

To verify that entry of PIN2 is processed by the ME correctly.

27.14.5.4 Method of test

27.14.5.4.1 Initial conditions

The ME is connected to a SIM or SIM-simulator and powered on, with the correct PIN entered.

A default FDN SIM is used.

27.14.5.4.2 Procedure

a) A feature is accessed which requires the entry of PIN2, e.g. resetting ACM for Advice of Charge, or changing a Fixed Dialling Number.

b) The MMI is used to enter PIN2: "3579".

27.14.5.5 Test requirement

1) After step b), the ME shall send a VERIFY CHV command to the SIM, with CHV number = "02".

2) Following the successful execution of the command, the MS shall give an indication that PIN2 was accepted.

27.14.6 Change of PIN2

27.14.6.1 Definition

The PIN2 may be changed by the user, by entering the old and new PIN2s. The length of the PIN is between 4 and 8 digits.

27.14.6.2 Conformance requirement

The ME shall support the change of PIN2 procedure as defined in 3GPP TS 02.30 and 3GPP TS 11.11.

Reference:

3GPP TS 02.30, subclause 4.6.2; 3GPP TS 11.11, subclauses 8.10, 9.2.10 and 11.3.2.

27.14.6.3 Test purpose

1. To verify that PIN2 substitution procedure is performed correctly by the ME.

2. To verify that the GSM basic public MMI string is supported.

27.14.6.4 Method of test

27.14.6.4.1 Initial conditions

The ME is connected to a SIM or SIM-simulator.

The default FDN SIM is used, with PIN enabled.

The ME is powered on, with the correct PIN entered.

Specific PICS Statements:

- support of basic public MMI strings to change/unblock PIN (TSPC_PIN_MMI_Strings)

27.14.6.4.2 Procedure

a) When the public basic MMI strings to change/unblock PIN are supported enter "**042*3579*12345678*12345678#", else initiate an equivalent MMI dependent procedure to change the PIN2 from '3579' to '12345678'.

b) The MS is switched off and on, and PIN entered: "2468".

c) When the public basic MMI strings to change/unblock PIN are supported enter "**042*3579*12345678*12345678#", else initiate an equivalent MMI dependent procedure to change the PIN2 from '3579' to '12345678'.

d) When the public basic MMI strings to change/unblock PIN are supported enter "**042*12345678*3579*3579#", else initiate an equivalent MMI dependent procedure to change the PIN2 from '12345678' to '3579'.

27.14.6.5 Test requirement

1) After step a), the ME shall send a CHANGE CHV command to the SIM, with CHV number set to "02".

2) Following the successful execution of the command, the MS shall give an indication that the new PIN2 is accepted.

3) After step c), the MS shall give an indication that the new PIN2 is not accepted.

4) After step d), the MS shall give an indication that the new PIN2 is accepted.

27.14.7 PUK2 entry

27.14.7.1 Definition

After three consecutive wrong entries of PIN2, it becomes blocked. PUK2 is used to unblock PIN2. This function may be performed whether or not PIN2 is blocked.

27.14.7.2 Conformance requirement

The ME shall support the procedure to unblock PIN2 using PUK2, as defined in 3GPP TS 02.30 and 3GPP TS 11.11.

Reference:

3GPP TS 02.30, subclause 4.6.3; 3GPP TS 11.11, subclauses 8.13, 9.2.13 and 11.3.5.

27.14.7.3 Test purpose

1. To verify that the PUK2 unblock procedure is performed correctly by the ME.

2. To verify that the GSM basic public MMI string is supported.

27.14.7.4 Method of test

27.14.7.4.1 Initial conditions

The ME is connected to the SIM simulator.

The default FDN SIM is used, with PIN enabled.

Specific PICS Statements:

- support of basic public MMI strings to change/unblock PIN (TSPC_PIN_MMI_Strings)

27.14.7.4.2 Procedure

Step ‘a’ up to and including step ‘c’ are applicable if MS supports basic public MMI strings to change/unblock PIN (TSPC_PIN_MMI_Strings).

a) The ME is powered on and a correct PIN entered.

b) Enter "**052*08978675*1234*1234#".

c) The MS is powered off.

d) The MS is powered on, and a correct PIN entered.

e) A feature is selected requiring the entry of PIN2.

f) A wrong PIN2 is entered three times.

g) When the public basic MMI strings to change/unblock PIN are supported enter "**052*08978675*3579*3579#", else initiate an equivalent MMI dependent procedure to unblock the PIN2 with unblock code '08978675' and a new PIN2 '3579'.

h) A feature is selected requiring the entry of PIN2, and the new PIN2 "3579" is entered.

27.14.7.5 Test requirements

Test reqirement 1 is not applicable for an ME that does not support basic public MMI strings to change/unblock PIN (TSPC_PIN_MMI_Strings)..

1. After step b), the ME shall send an UNBLOCK CHV command to the SIM, with CHV number = "02".
2. After step f), the ME shall indicate that PIN2 has been blocked.
3. After step g), the ME shall send an UNBLOCK CHV command to the SIM, with CHV number = "02".
4. After step h), the ME shall indicate that PIN2 has been accepted.

27.15 Abbreviated Dialling Numbers (ADN)

27.15.1 Definition

Abbreviated Dialling Numbers contain subscriber number and supplementary service control strings. They may also contain alpha identifiers.

27.15.2 Conformance requirement

The ME shall be able to manage the storage and retrieval of ADNs from the SIM, and set up calls to these numbers.

Reference:

3GPP TS 02.07, subclause B.3.1; 3GPP TS 02.30 subclause 4.6.4; 3GPP TS 11.11, subclause 11.5.1.

27.15.3 Test purpose

To verify that the ME manages the storage and retrieval of ADNs from the SIM.

27.15.4 Method of Test

27.15.4.1 Initial conditions

Coding of elementary files in the SIM shall be as default, with the addition of:

EF_{ADN} (Abbreviated Dialling Number)

Logically:

At least 101 records, each record unique. Example of record 1 below

Record 1:		Length of alpha identifier: 32 characters
	Alpha identifier:	"ABCDEFGHIJKLMNOPQRSTUVWXYZABCDEF"
	Length of BCD number:	"03"
	TON and NPI:	Telephony and Unknown
	Dialled number:	123
	CCI:	None
	Ext1:	None

Coding:

For record 1:	B1	B2	B3	...	B32	B33	B34	B35	B36	B37	B38	B39	...	B46
	41	42	43	...	46	03	81	21	F3	FF	FF	FF	...	FF

The ME is installed with the default SIM or SIM simulator, and switched on.

The code "+123456789012345" is stored as abbreviated dialling entry number 7 on the SIM.

The code "00112233" is stored as abbreviated dialling entry number 6 on the SIM.

The code "**21*44556677#" is stored as abbreviated dialling entry number 101 on the SIM.

27.15.4.2 Procedure

a) Retrieve data from SIM entry number 7 using the procedure N(N)(N)#.

b) Retrieve data from SIM entry number 6 using the procedure N(N)(N)#.

c) Retrieve data from SIM entry number 101 using the procedure N(N)(N)#.

d) Retrieve data from SIM entry number 1 using the procedure N(N)(N)#.

27.15.5 Test requirements

1) After step a), the number "+123456789012345" shall be displayed.

2) After step b), the number "00112233" shall be displayed.

3) After step c), the number "**21*44556677#" (or an equivalent representation) shall be displayed.

4) After step d), the number “123” shall be displayed.

27.16 MMI reaction to SIM status encoding

27.16.1 Definition

The SIM gives status information in response to instructions, as two-byte codes. Some of these codes give valuable information to the user, and appropriate indication by the ME is mandatory.

27.16.2 Conformance requirement

It is mandatory to give the user an appropriate indication when any of the codes given below appear.

Reference:

3GPP TS 02.30, subclause 4.6.5.

27.16.3 Test purpose

To verify that the ME gives an appropriate indication to the user in response to status information return codes from the SIM.

27.16.4 Method of test

27.16.4.1 Initial conditions

The ME is connected to the SIM simulator. All elementary files are coded as default.

The ME is powered on.

27.16.4.2 Procedure.

The SIM simulator is used to send the following error codes as reaction on an instruction from the ME:

- 9240 Memory Problem;
- 9804 Access security policy not fulfilled or secret code rejected;
- 9840 Secret code locked;
- 6FXX Technical problem with no diagnostic given as reaction on an instruction from the ME.

27.16.5 Test requirement

For each error code, the ME shall give an appropriate MMI indication.

27.17 Electrical tests

General test purpose

Testing of electrical characteristics of the SIM/ME interface.

Whilst non-conformance in this area would be unlikely to cause difficulties to other users or the network (type approval criteria), significant deviations from the specifications (3GPP TS 11.11 and ISO 7816) may damage the SIM. If an attempt is then made to use the SIM in a different ME, then its failure may reflect badly on both that ME and the network.

This subclause lists the electrical tests to be performed.

They include:

i) tests during activation and deactivation phases; and

ii) tests to be performed on each contact in both static and dynamic states: e.g. voltages, currents and signal characteristics.

However, due to the likely difficulty of accessing the terminals of the SIM/ME interface for the purposes of measurements, the ME manufacturer shall provide a test interface in accordance with subclause 36.5 for the purpose of conformance testing.

General measurement conventions

For the 5V interface operation mode, the measurement conventions are specified in ISO/IEC 7816-3 subclause 4.2.1.

For the 3Vand 1,8V interface operation mode these conditions apply in an analogous way.

27.17.1 Test of the power transition phases

27.17.1.1 Phase preceding ME power on

27.17.1.1.1 Definition

When the mobile equipment is switched off, the contacts of the SIM/ME interface remain in an inactive state in order to prevent any damage to the SIM.

27.17.1.1.2 Conformance requirement

The residual voltage across the contacts of the SIM/ME interface (C1, C2, C3, C6, C7) shall not exceed ± 0,4 Volts referenced to GND.

Reference:

3GPP TS 11.11, subclause 4.3.3.

27.17.1.1.3 Test purpose

To verify that the residual voltage across the contacts of the SIM/ME interface (C1, C2, C3, C6, C7) is not greater than ± 0,4 Volts referenced to GND.

27.17.1.1.4 Method of test

27.17.1.1.4.1 Initial condition

The ME is connected to a SIM Simulator.

The contact C1 (Vcc) of the SIM/ME interface is loaded with an impedance of 10 kOhm.

The other contacts (C2, C3, C6, C7) are loaded with an impedance of 50 kOhm.

27.17.1.1.4.2 Procedure

The residual voltage on each contact is measured.

27.17.1.1.5 Test requirement

The residual voltage on each contact shall not exceed ±0,4 Volts referenced to GND.

27.17.1.2 Phase during SIM power on

27.17.1.2.1 Definition

When the mobile station is switched on or when the SIM/ME interface is being activated after 3V/5V or 1,8V/3V switching, the contacts shall be activated in a defined sequence in order to prevent any damage to the SIM.

The timing of this sequence is not defined, a measurement resolution better than or equivalent to 100 ns is assumed.

An ME supporting both 5V and 3V interface operation mode may switch from 3V to 5V after it has read the SIM type identification in the SIM status information by deactivating the SIM and activating it at the new supply voltage.

An ME supporting both 3V and 1,8V interface operation mode may switch from 1,8V to 3V after it has read the SIM type identification in the SIM status information by deactivating the SIM and activating it at the new supply voltage.

27.17.1.2.2 Conformance requirement

a) When the MS is soft powered on, the contacts of the SIM/ME interface shall be activated in the following order:

   1. VCC at state H and stable;
   2. CLK stable;
   3. RST at state L for at least 400 clock cycles after the clock signal is applied to CLK;
   4. I/O at state Z within 200 clock cycles after the clock signal is applied to CLK.

   When Vpp is connected to Vcc, as allowed by 3GPP TS 11.11 (subclauses 4.3.2 and 5.3), then Vpp is activated together with Vcc, at the time of Vcc (step 1 in the sequence above).

b) When the MS is soft powered on, the contacts of the SIM/ME interface shall be activated in the following order:

   1. VCC at state H and stable;
   2. CLK stable;
   3. RST at state L for at least 400 clock cycles after the clock signal is applied to CLK;
   4. I/O at state Z within 200 clock cycles after the clock signal is applied to CLK.

c.1) When the MS is soft powered on, the contacts of the SIM/ME interface shall be activated to 3V mode in the following order:

1. VCC at state H and stable;
2. CLK stable;
3. RST at state L for at least 400 clock cycles after the clock signal is applied to CLK;
4. I/O at state Z within 200 clock cycles after the clock signal is applied to CLK.

c.2) When the SIM/ME interface is being activated after the 3V/5V switching the contacts shall be activated to 5V mode in the order given in c.1).

d) When the MS is soft powered on, the contacts of the SIM/ME interface shall be activated in the following order:

1. VCC at state H and stable;
2. CLK stable;
3. RST at state L for at least 400 clock cycles after the clock signal is applied to CLK;4. I/O at state Z within 200 clock cycles after the clock signal is applied to CLK.

e.1) When the MS is soft powered on, the contacts of the SIM/ME interface shall be activated to 1.81,8V mode in the following order:

1. VCC at state H and stable;
2. CLK stable;
3. RST at state L for at least 400 clock cycles after the clock signal is applied to CLK;4. I/O at state Z within 200 clock cycles after the clock signal is applied to CLK.

e.2) When the SIM/ME interface is being activated after the 1.81,8V/3V switching the contacts shall be activated to 3V mode in the order given in ce.1).

Reference:

a): 3GPP TS 11.11, subclause 4.3.2.

b), c.1), c.2): 3GPP TS 11.12, subclause 4.4 and subclause 4.5.

d), e.1), e.2): 3GPP TS 11.18, subclause 4.4 and subclause 4.5.

27.17.1.2.3 Test purpose

To verify that the contacts of the SIM/ME interface are activated in the correct order, as described in the conformance requirement.

27.17.1.2.4 Method of test

27.17.1.2.4.1 Initial condition

The ME is connected to a SIM Simulator.

27.17.1.2.4.2 Procedure

To test the requirements a), b), c.1), d) and e.1) the MS is soft powered on.

To test the requirement c.2) and e.2), the ME is caused to switch the voltage on the SIM/ME interface.

The verification of each activation procedure starts with the first contact leaving the inactive state. The SIM/ME interface is monitored until it is fully activated.

27.17.1.2.5 Test requirement

The contacts of the SIM/ME interface shall be activated in the correct order, as described in the conformance requirement.

27.17.1.3 Phase during ME power off with clock stop forbidden

27.17.1.3.1 Definition

When the mobile station is soft powered off, the contacts shall be deactivated in a defined sequence in order to prevent any damage to the SIM.

The timing of this sequence is not defined, a measurement resolution better than or equivalent to 100 ns is assumed.

NOTE 1: If during MS operation the SIM is physically removed it is impractical to ensure correct sequencing of deactivation and the possible damage to the SIM cannot be safeguarded by a type approval test. Furthermore, in this situation the integrity of SIM data is not guaranteed (see 3GPP TS 02.17).

NOTE 2: Since 3V technology SIMs and 1,8V technology SIMs shall not indicate that clock stop is forbidden, this test applies only to MEs with a 5V interface and MEs with a 3V/5V interface when powered down from 5V mode.

27.17.1.3.2 Conformance requirement

a) When the ME is soft powered down, the contacts of the SIM/ME interface shall be deactivated in the following order:

   1. RST at low state;
   2. Clock stopped at low state;
   3. Vpp inactive (only if Vpp is provided independent of Vcc, see 3GPP TS 11.11 subclause 5.3);
   4. I/O at state A;
   5. Vcc inactive.

b) When Vpp is connected to Vcc, as allowed by 3GPP TS 11.11 (subclause 5.3), then Vpp is deactivated together with Vcc, at the time of Vcc (step 5 in the sequence above).

c) When the ME is soft powered down from 5V mode, the contacts of the SIM/ME interface shall be deactivated in the following order:

   1. RST at low state;
   2. Clock stopped at low state;
   3. I/O at status A;
   4. Vcc inactive.

Reference:

a) 3GPP TS 11.11, subclause 4.3.2.

c) 3GPP TS 11.12, subclause 4.5.

27.17.1.3.3 Test purpose

To verify that the contacts of the SIM/ME interface become deactivated in the correct order, as given in the conformance requirement.

27.17.1.3.4 Method of test

27.17.1.3.4.1 Initial condition

The ME is connected to a SIM Simulator.

The file characteristics of the directories (byte 14 of STATUS information) shall indicate a 5V SIM with clock stop forbidden.

27.17.1.3.4.2 Procedure

The MS is soft powered off.

The SIM/ME interface is monitored until it is fully deactivated.

27.17.1.3.5 Test requirement

The contacts of the SIM/ME interface shall be deactivated in the correct order, as given in the conformance requirement.

27.17.1.4 Phase during ME power off with clock stop allowed

27.17.1.4.1 Definition

When the mobile station is soft powered off or when the SIM/ME interface is being deactivated for 3V/5V or 1,8V/3V switching, the contacts shall be deactivated in a defined sequence in order to prevent any damage to the SIM.

The timing of this sequence is not defined, a measurement resolution better than or equivalent to 100 ns is assumed.

NOTE: If during MS operation the SIM is physically removed it is impractical to ensure correct sequencing of deactivation and the possible damage to the SIM cannot be safeguarded by a type approval test. Furthermore, in this situation the integrity of the SIM data is not guaranteed (see 3GPP TS 02.17).

27.17.1.4.2 Conformance requirement

a) Depending on the state of the clock at the time of deactivation, the contacts of the SIM/ME shall be deactivated in one of two ways.

If the clock is running, the contacts of the SIM/ME interface shall be deactivated in the following order:

1. RST at low level;
2. Clock stopped at low level;
3. Vpp inactive (only if Vpp is provided independent of Vcc, see 3GPP TS 11.11 subclause 5.3);
4. I/O at status A;
5. Vcc inactive.

When Vpp is connected to Vcc, as allowed by 3GPP TS 11.11 (subclause 5.3), then Vpp is deactivated together with Vcc, at the time of Vcc (step 5 in the sequence above).

If the clock is stopped and is not restarted, the ME is allowed to deactivate all the contacts in any order, provided that all signals reach low level before Vcc leaves high level.

b) Depending on the state of the clock at the time of deactivation, the contacts of the SIM/ME shall be deactivated in one of two ways.

If the clock is running, the contacts of the SIM/ME interface shall be deactivated in the following order:

1. RST at low level;
2. Clock stopped at low level;
3. I/O at status A;
4. Vcc inactive.

If the clock is stopped and is not restarted, the ME is allowed to deactivate all the contacts in any order, provided that all signals reach low level before Vcc leaves high level.

c.1) Depending on the state of the clock at the time of deactivation, the contacts of the SIM/ME interface shall be deactivated in one of two ways.

If the clock is running, the contacts of the SIM/ME interface shall be deactivated in the following order:

1. RST at low level;
2. Clock stopped at low level;
3. I/O at status A;
4. Vcc inactive.

If the clock is stopped and is not restarted, the ME is allowed to deactivate all the contacts in any order, provided that all signals reach low level before Vcc leaves high level.

c.2) When the SIM/ME interface is deactivated for 3V/5V switching, the contacts shall be deactivated as given in c.1).

d) Depending on the state of the clock at the time of deactivation, the contacts of the SIM/ME shall be deactivated in one of two ways.

If the clock is running, the contacts of the SIM/ME interface shall be deactivated in the following order:

1. RST at low level;
2. Clock stopped at low level;
3. I/O at status A;
4. Vcc inactive.

If the clock is stopped and is not restarted, the ME is allowed to deactivate all the contacts in any order, provided that all signals reach low level before Vcc leaves high level.

e.1) Depending on the state of the clock at the time of deactivation, the contacts of the SIM/ME interface shall be deactivated in one of two ways.

If the clock is running, the contacts of the SIM/ME interface shall be deactivated in the following order:

1. RST at low level;
2. Clock stopped at low level;
3. I/O at status A;
4. Vcc inactive.

If the clock is stopped and is not restarted, the ME is allowed to deactivate all the contacts in any order, provided that all signals reach low level before Vcc leaves high level.

e.2) When the SIM/ME interface is deactivated for 1,8V/3V switching, the contacts shall be deactivated as given in e.1).

Reference:

a): 3GPP TS 11.11, subclause 4.3.2.

b), c.1), c.2): 3GPP TS 11.12, subclause 4.5.

d), e.1), e.2): 3GPP TS 11.18, subclause 4.5.

27.17.1.4.3 Test purpose

To verify that, depending on the state of the clock (running or stopped), the contacts of the SIM/ME interface become deactivated in the correct order, as given in the conformance requirement.

27.17.1.4.4 Method of test

27.17.1.4.4.1 Initial condition

The ME is connected to a SIM Simulator.

The file characteristics of the directories (byte 14 of STATUS information) shall indicate that clock stop is allowed.

27.17.1.4.4.2 Procedure

To test the requirements a), b), c.1), d) and e.1), the MS is soft powered off.

To test the requirement c.2) and e.2), the ME is caused to switch the voltage on the SIM/ME interface.

The SIM/ME interface is monitored until it is fully deactivated.

27.17.1.4.5 Test requirement

The contacts of the SIM/ME interface shall be deactivated in the correct order, as given in the conformance requirements.

27.17.1.5 SIM Type Recognition and Voltage Switching

27.17.1.5.1 Reaction of 3V only MEs on SIM type recognition failure

27.17.1.5.1.1 Definition

When a 3V only ME detects a failure during the SIM type recognition procedure, the ME shall reject the SIM in order to prevent any damage to the SIM.

27.17.1.5.1.2 Conformance requirement

1) The procedure for deriving the identification bit (SIM type recognition procedure) shall be performed by the ME immediately after the ATR and before issuing any other command. The procedure shall consist of the two commands "SELECT GSM" and "STATUS/GET RESPONSE".

2) If a 3V only ME cannot complete the SIM type recognition procedure the ME shall deactivate the SIM/ME interface and reject the SIM immediately without issuing any further command.

   This procedure shall be finished within 5 s after the "STATUS/GET RESPONSE" command.

Reference:

3GPP TS 11.12 subclauses 4.3 and 4.5.

27.17.1.5.1.3 Test purpose

1) To verify that a 3V only ME correctly performs the SIM type recognition procedure.

2) To verify that a 3V only ME deactivates the SIM/ME interface and rejects the SIM in case that the SIM does not respond to the "STATUS/GET RESPONSE" command.

27.17.1.5.1.4 Method of test

27.17.1.5.1.4.1 Initial condition

The ME is connected to a SIM Simulator simulating a 3V technology SIM with nominal test conditions according to table 27.2-2. All elementary files are coded as default.

The ME is powered on.

27.17.1.5.1.4.2 Procedure

After sending the ATR the SIM simulator checks the presence of the commands "SELECT GSM" and "STATUS/GET RESPONSE" as the first and only commands of the GSM card session.

The SIM simulator does not respond to the "STATUS/GET RESPONSE" command.

The SIM/ME interface is monitored for at least 1 minute until the MS is switched off.

27.17.1.5.1.5 Test requirement

1) Immediately after the ATR only the two commands "SELECT GSM" and "STATUS/GET RESPONSE" shall be sent by the ME.

2) The 3V only ME shall deactivate the SIM/ME interface within 5 s and reject the SIM (i.e. not activate the SIM/ME interface within the test procedure).

27.17.1.5.2 Reaction of 3V only MEs on type recognition of 5V only SIMs

27.17.1.5.2.1 Definition

When a 3V only ME detects a 5V only SIM during the SIM type recognition procedure, the ME shall reject the SIM in order to prevent any damage to the SIM.

27.17.1.5.2.2 Conformance requirement

1) The procedure for deriving the identification bit (SIM type recognition procedure) shall be performed by the ME immediately after the ATR and before issuing any other command. The procedure shall consist of the two commands "SELECT GSM" and "STATUS/GET RESPONSE"

2) If a 3V only ME identifies a 5V only SIM during the SIM type recognition procedure the ME shall deactivate the SIM/ME interface and reject the SIM immediately without issuing any further command.

Reference:

3GPP TS 11.12 subclauses 4.3 and 4.5.

27.17.1.5.2.3 Test purpose

1) To verify that a 3V only ME correctly performs the SIM type recognition procedure.

2) To verify that a 3V only ME deactivates the SIM/ME interface and rejects the SIM if a 5V only SIM is applied.

27.17.1.5.2.4 Method of test

27.17.1.5.2.4.1 Initial condition

The ME is connected to a SIM Simulator simulating a 3V technology SIM (to ensure that the ME can perform the SIM type recognition procedure) with nominal test conditions according to table 27.2-2. All elementary files are coded as default. Bit 5 in byte 14 of the status information is set to "0" (i.e. 5V only SIM).

The ME is powered on.

27.17.1.5.2.4.2 Procedure

After sending the ATR the SIM simulator checks the presence of the commands "SELECT GSM" and "STATUS/GET RESPONSE" as the first and only commands of the GSM card session.

The SIM simulator responds to the "STATUS/GET RESPONSE" command with a status information indicating a 5V only SIM.

The SIM/ME interface is monitored for at least 1 minute until the MS is switched off.

27.17.1.5.2.5 Test requirement

1) Immediately after the ATR only the two command "SELECT GSM" and "STATUS/GET RESPONSE" shall be sent by the ME.

2) The 3V only ME shall deactivate the SIM/ME interface immediately after receipt of the status information from the SIM (but not later than 5 s after the "STATUS/GET RESPONSE command) and reject the SIM (i.e. not activate the SIM/ME interface again within the test procedure).

27.17.1.5.3 Reaction of 3V technology MEs on type recognition of 5V only SIMs

27.17.1.5.3.1 Definition

When a 3V technology ME detects a 5V only SIM during the SIM type recognition procedure, the ME shall switch to 5V operation.

27.17.1.5.3.2 Conformance requirement

1) A 3V technology ME shall initially activate the SIM at 3V (i.e. the first activation of a GSM card session.

2) The procedure for deriving the identification bit (SIM type recognition procedure) shall be performed by the ME immediately after the ATR procedure and before issuing any other command. The procedure shall consist of the two commands "SELECT GSM" and "STATUS/GET RESPONSE".

3) If a 3V technology ME identifies a 5V only SIM during the SIM type recognition procedure, the ME shall switch to 5V operation mode. Switching from 3V to 5V shall only be performed by deactivating the SIM and activating it with 5V supply voltage immediately after the SIM type recognition procedure without issuing any further command.

Reference:

3GPP TS 11.12 subclauses 4.3 and 4.4.

27.17.1.5.3.3 Test purpose

1) To verify that a 3V technology ME initially activates the SIM with 3V.

2) To verify that a 3V technology ME correctly performs the SIM type recognition procedure.

3) To verify that a 3V technology ME deactivates the SIM/ME interface immediately after the SIM type recognition procedure (in order to switch the supply voltage) without issuing any further command.

27.17.1.5.3.4 Method of test

27.17.1.5.3.4.1 Initial condition

The ME is connected to a SIM Simulator simulating a 5V only SIM with nominal test conditions according to table 27.2-1. All elementary files are coded as default. Bit 5 in byte 14 of the status information is set to "0" (i.e. 5V only SIM).

The ME is powered on.

27.17.1.5.3.4.2 Procedure

After sending the ATR the SIM simulator checks the presence of the commands "SELECT GSM" and "STATUS/GET RESPONSE" as the first and only commands of the GSM card session.

The SIM simulator responds to the "STATUS/GET RESPONSE" command with a status information indicating a 5V only SIM.

The SIM/ME interface is monitored for at least 1 minute until the MS is switched off.

27.17.1.5.3.5 Test requirement

1) The initial activation of the SIM/ME interface shall be performed with 3V supply voltage.

2) Immediately after the ATR the two commands "SELECT GSM" and "STATUS/GET RESPONSE" shall be sent by the ME before issuing further commands.

3) The 3V technology ME shall deactivate the SIM/ME interface immediately after receipt of the status information from the SIM.

27.17.1.5.4 Reaction of 3V technology MEs on type recognition of 3V technology SIMs

27.17.1.5.4.1 Definition

When a 3V technology ME detects a 3V technology SIM during the SIM type recognition procedure the ME may either switch to 5V operation or stay in 3V operation.

27.17.1.5.4.2 Conformance requirement

1) A 3V technology ME shall initially activate the SIM with a 3V (i.e. the first activation of a GSM card session).

2) The procedure for deriving the identification bit (SIM type recognition procedure) shall be performed by the ME immediately after the ATR and before issuing any other command. the procedure shall consist of the two commands "SELECT GSM" and "STATUS/GET RESPONSE".

3) If a 3V technology ME identifies a 3V technology SIM during the SIM type recognition the ME may switch to 5V operation. Switching from 3V to 5V shall only be performed by deactivating the SIM and activating it with 5V supply voltage immediately after the SIM type recognition procedure without issuing any further commands.

Reference:

3GPP TS 11.12, subclauses 4.3, 4.4 and 4.7.

27.17.1.5.4.3 Test purpose

1) To verify that a 3V technology ME initially activates the SIM with 3V.

2) To verify that a 3V technology ME correctly performs the SIM type recognition procedure.

3) To verify that a 3V technology ME deactivates the SIM/ME interface immediately after the recognition of a 3V technology SIM (in order to switch the supply voltage) or proceeds with the 3V operation during the whole GSM card session without switching to 5V supply voltage.

27.17.1.5.4.4 Method of test

27.17.1.5.4.4.1 Initial condition

The ME is connected to a SIM Simulator simulating a 3V technology SIM with nominal test conditions according to table 27.2-2. All elementary files are coded as default. Bit 5 in byte 14 of the status information is set to "1" (i.e. 3V technology SIM.)

The ME is powered on.

27.17.1.5.4.4.2 Procedure

After sending the ATR the SIM simulator checks the presence of commands "SELECT GSM" and "STATUS/GET RESPONSE" as the first and only commands of the GSM card session.

The SIM simulator responds to the "STATUS/GET RESPONSE" command with a status information indicating a 3V technology SIM.

The SIM/ME interface is monitored for at least 1 minute until the MS is switched off.

27.27.1.5.4.5 Test requirement

1) The initial activation of the SIM/ME interface shall be performed with 3V supply voltage.

2) Immediately after the ATR the two commands "SELECT GSM" and "STATUS/GET RESPONSE: shall be sent by the ME.

3) The ME shall react in one of the following ways:

   a) The ME deactivates the SIM/ME interface immediately after the receipt of the status information from the SIM.

   b) the ME proceeds with the GSM card session without switching to another supply voltage.

27.17.1.5.5 Reaction of 1,8V only MEs on SIM type recognition failure

27.17.1.5.5.1 Definition

When a 1,8V only ME detects a failure during the SIM type recognition procedure, the ME shall reject the SIM in order to prevent any damage to the SIM.

27.17.1.5.5.2 Conformance requirement

1) The procedure for deriving the identification bit (SIM type recognition procedure) shall be performed by the ME immediately after the ATR and before issuing any other command. The procedure shall consist of the two commands "SELECT GSM" and "STATUS/GET RESPONSE".

2) If a 1,8V only ME cannot complete the SIM type recognition procedure the ME shall deactivate the SIM/ME interface and reject the SIM immediately without issuing any further command.

   This procedure shall be finished within 5 s after the "STATUS/GET RESPONSE" command.

Reference:

3GPP TS 11.18 subclauses 4.3 and 4.5.

27.17.1.5.5.3 Test purpose

1) To verify that a 1,8V only ME correctly performs the SIM type recognition procedure.

2) To verify that a 1,8V only ME deactivates the SIM/ME interface and rejects the SIM in case that the SIM does not respond to the "STATUS/GET RESPONSE" command.

27.17.1.5.5.4 Method of test

27.17.1.5.5.4.1 Initial condition

The ME is connected to a SIM Simulator simulating a 1,8V technology SIM with nominal test conditions according to table 27.2-3. All elementary files are coded as default.

The ME is powered on.

27.17.1.5.5.4.2 Procedure

After sending the ATR the SIM simulator checks the presence of the commands "SELECT GSM" and "STATUS/GET RESPONSE" as the first and only commands of the GSM card session.

The SIM simulator does not respond to the "STATUS/GET RESPONSE" command.

The SIM/ME interface is monitored for at least 1 minute until the MS is switched off.

27.17.1.5.5.5 Test requirement

1) Immediately after the ATR only the two commands "SELECT GSM" and "STATUS/GET RESPONSE" shall be sent by the ME.

2) The 1,8V only ME shall deactivate the SIM/ME interface within 5 s and reject the SIM (i.e. not activate the SIM/ME interface within the test procedure).

27.17.1.5.6 Reaction of 1,8V only MEs on type recognition of 3V SIMs

27.17.1.5.6.1 Definition

When a 1,8V only ME detects a 3V technology SIM during the SIM type recognition procedure, the ME shall reject the SIM in order to prevent any damage to the SIM.

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27.17.1.5.6.2 Conformance requirement

1) The procedure for deriving the identification bit (SIM type recognition procedure) shall be performed by the ME immediately after the ATR and before issuing any other command. The procedure shall consist of the two commands "SELECT GSM" and "STATUS/GET RESPONSE"

2) If a 1,8V only ME identifies a 3V technology SIM during the SIM type recognition procedure the ME shall deactivate the SIM/ME interface and reject the SIM immediately without issuing any further command.

Reference:

3GPP TS 11.18 subclauses 4.3 and 4.5.

27.17.1.5.6.3 Test purpose

1) To verify that a 1,8V only ME correctly performs the SIM type recognition procedure.

2) To verify that a 1,8V only ME deactivates the SIM/ME interface and rejects the SIM if a 3V technology SIM is applied.

27.17.1.5.6.4 Method of test

27.17.1.5.6.4.1 Initial condition

The ME is connected to a SIM Simulator simulating a 1,8V technology SIM (to ensure that the ME can perform the SIM type recognition procedure) with nominal test conditions according to table 27.2-3. All elementary files are coded as default. Bits 6 and 5 in byte 14 of the status information are set to "01" (i.e. 3V technology SIM).

The ME is powered on.

27.17.1.5.6.4.2 Procedure

After sending the ATR the SIM simulator checks the presence of the commands "SELECT GSM" and "STATUS/GET RESPONSE" as the first and only commands of the GSM card session.

The SIM simulator responds to the "STATUS/GET RESPONSE" command with a status information indicating a 3V technology SIM.

The SIM/ME interface is monitored for at least 1 minute until the MS is switched off.

27.17.1.5.6.5 Test requirement

1) Immediately after the ATR only the two command "SELECT GSM" and "STATUS/GET RESPONSE" shall be sent by the ME.

2) The 1,8V only ME shall deactivate the SIM/ME interface immediately after receipt of the status information from the SIM (but not later than 5 s after the "STATUS/GET RESPONSE command) and reject the SIM (i.e. not activate the SIM/ME interface again within the test procedure).

27.17.1.5.7 Reaction of 1,8V technology MEs on type recognition of 3V technology SIMs

27.17.1.5.7.1 Definition

When a 1,8V technology ME detects a 3V technology SIM during the SIM type recognition procedure, the ME shall switch to 3V operation.

27.17.1.5.7.2 Conformance requirement

1) A 1,8V technology ME shall initially activate the SIM at 1,8V (i.e. the first activation of a GSM card session.

2) The procedure for deriving the identification bit (SIM type recognition procedure) shall be performed by the ME immediately after the ATR procedure and before issuing any other command. The procedure shall consist of the two commands "SELECT GSM" and "STATUS/GET RESPONSE".

3) If a 1,8V technology ME identifies a 3V technology SIM during the SIM type recognition procedure, the ME shall switch to 3V operation mode. Switching from 1,8V to 3V shall only be performed by deactivating the SIM

and activating it with 3V supply voltage immediately after the SIM type recognition procedure without issuing any further command.

Reference:

3GPP TS 11.18 subclauses 4.3 and 4.4.

27.17.1.5.7.3 Test purpose

1) To verify that a 1,8V technology ME initially activates the SIM with 1,8V.

2) To verify that a 1,8V technology ME correctly performs the SIM type recognition procedure.

3) To verify that a 1,8V technology ME deactivates the SIM/ME interface immediately after the SIM type recognition procedure (in order to switch the supply voltage) without issuing any further command.

27.17.1.5.7.4 Method of test

27.17.1.5.7.4.1 Initial condition

The ME is connected to a SIM Simulator simulating a 3V technology SIM with nominal test conditions according to table 27.2-2. All elementary files are coded as default. Bits 6 and 5 in byte 14 of the status information are set to "01" (i.e. 3V technology SIM).

The ME is powered on.

27.17.1.5.7.4.2 Procedure

After sending the ATR the SIM simulator checks the presence of the commands "SELECT GSM" and "STATUS/GET RESPONSE" as the first and only commands of the GSM card session.

The SIM simulator responds to the "STATUS/GET RESPONSE" command with a status information indicating a 3V technology SIM.

The SIM/ME interface is monitored for at least 1 minute until the MS is switched off.

27.17.1.5.7.5 Test requirement

1) The initial activation of the SIM/ME interface shall be performed with 1,8V supply voltage.

2) Immediately after the ATR the two commands "SELECT GSM" and "STATUS/GET RESPONSE" shall be sent by the ME before issuing further commands.

3) The 1,8V technology ME shall deactivate the SIM/ME interface immediately after receipt of the status information from the SIM.

27.17.1.5.8 Reaction of 1,8V technology MEs on type recognition of 1,8V technology SIMs

27.17.1.5.8.1 Definition

When a 1,8V technology ME detects a 1,8V technology SIM during the SIM type recognition procedure the ME may either switch to 3V operation or stay in 1,8V operation.

27.17.1.5.8.2 Conformance requirement

1) A 1,8V technology ME shall initially activate the SIM with a 1,8V (i.e. the first activation of a GSM card session).

2) The procedure for deriving the identification bit (SIM type recognition procedure) shall be performed by the ME immediately after the ATR and before issuing any other command. the procedure shall consist of the two commands "SELECT GSM" and "STATUS/GET RESPONSE".

3) If a 1,8V technology ME identifies a 1,8V technology SIM during the SIM type recognition the ME may switch to 3V operation. Switching from 1,8V to 3V shall only be performed by deactivating the SIM and activating it with 3V supply voltage immediately after the SIM type recognition procedure without issuing any further commands.

Reference:

3GPP TS 11.18, subclauses 4.3, 4.4 and 4.7.

27.17.1.5.8.3 Test purpose

1) To verify that a 1,8V technology ME initially activates the SIM with 1,8V.

2) To verify that a 1,8V technology ME correctly performs the SIM type recognition procedure.

3) To verify that a 1,8V technology ME deactivates the SIM/ME interface immediately after the recognition of a 1,8V technology SIM (in order to switch the supply voltage) or proceeds with the 1,8V operation during the whole GSM card session without switching to 3V supply voltage.

27.17.1.5.8.4 Method of test

27.17.1.5.8.4.1 Initial condition

The ME is connected to a SIM Simulator simulating a 1,8V technology SIM with nominal test conditions according to table 27.2-3. All elementary files are coded as default. Bits 6 and 5 in byte 14 of the status information are set to "11" (i.e. 1,8V technology SIM.)

The ME is powered on.

27.17.1.5.8.4.2 Procedure

After sending the ATR the SIM simulator checks the presence of commands "SELECT GSM" and "STATUS/GET RESPONSE" as the first and only commands of the GSM card session.

The SIM simulator responds to the "STATUS/GET RESPONSE" command with a status information indicating a 1,8V technology SIM.

The SIM/ME interface is monitored for at least 1 minute until the MS is switched off.

27.17.1.5.8.5 Test requirement

1) The initial activation of the SIM/ME interface shall be performed with 1,8V supply voltage.

2) Immediately after the ATR the two commands "SELECT GSM" and "STATUS/GET RESPONSE: shall be sent by the ME.

3) The ME shall react in one of the following ways:

   a) The ME deactivates the SIM/ME interface immediately after the receipt of the status information from the SIM.

b) the ME proceeds with the GSM card session without switching to another supply voltage.

27.17.2 Electrical tests on each ME contact

The following tables give the electrical conditions that must be applied by the SIM simulator to all contacts during a test if not stated otherwise.

Table 27.2-1: Nominal test conditions on 5V SIM/ME interface

Contacts	Low level	High level	Max. capacitive load
C1 (Vcc)	---	I = 10 mA	
C2 (RST)	I = -200 μA	I = +20 μA	30 pF
C3 (CLK)	I = -200 μA	I = +20 μA	30 pF
C5 (GND)	---	---	
C6 ((Vpp)	---	I = 0 mA	
C7 (I/O) ME input ME output	 V = 0 V I = -1 mA	 I = +20 μA I = +20 μA	30 pF

Table 27.2-2: Nominal test conditions on 3V SIM/ME interface

Contacts	Low level	High level	Max. capacitive load
C1 (Vcc)	---	I = 6 mA	
C2 (RST)	I = -200 μA	I = +200 μA	30 pF
C3 (CLK)	I = -20 μA	I = +20 μA	30 pF
C5 (GND)	---	---	
C6 ((Vpp)	---	---	
C7 (I/O) ME input ME output	 V = 0 V I = -1 mA	 I = +20 μA I = +20 μA	30 pF

Table 27.2-3: Nominal test conditions on 1,8V SIM/ME interface

Contacts	Low level	High level	Max. capacitive load
C1 (Vcc)	---	I = 4 mA	
C2 (RST)	I = -200 μA	I = +200 μA	30 pF
C3 (CLK)	I = -20 μA	I = +20 μA	30 pF
C5 (GND)	---	---	
C6 ((Vpp)	---	---	
C7 (I/O) ME input ME output	 V = 0 V I = -1 mA	 I = +20 μA I = +20 μA	30 pF

NOTE 1: Measurements of contacts voltage levels can be done at any time since the beginning of activation of the SIM and the end of deactivation of the SIM (ISO/IEC 7816-3 subclause 5.1).

NOTE 2: The reference point of all measurements is the contact C5 (Ground).

NOTE 3: Currents flowing into the SIM are considered positive.

27.17.2.1 Electrical tests on contact C1

C1 = Card power supply (Vcc).

27.17.2.1.1 Test 1

27.17.2.1.1.1 Definition

When the mobile station is activated, the supply voltage on the SIM/ME interface shall remain in the specified range in order to ensure correct operation and to prevent any damage to the SIM.

27.17.2.1.1.2 Conformance requirement

a) The voltage on contact C1 of the SIM/ME interface shall be 5V ± 10 % for Icc up to 10 mA.

b) The voltage on contact C1 of the SIM/ME interface shall be 3V ± 10 % for Icc up to 6 mA.

c.1) The voltage on contact C1 of the SIM/ME interface shall be 5V ± 10 % for Icc up to 10 mA when the interface is in 5V operation mode.

c.2) The voltage on contact C1 of the SIM/ME interface shall be 3V ± 10 % for Icc up to 6 mA when the interface is in 3V operation mode.

d) The voltage on contact C1 of the SIM/ME interface shall be 1,8V ± 10 % for Icc up to 4 mA.

e.1) The voltage on contact C1 of the SIM/ME interface shall be 3V ± 10 % for Icc up to 6 mA when the interface is in 3V operation mode.

e.2) The voltage on contact C1 of the SIM/ME interface shall be 1,8V ± 10 % for Icc up to 4 mA when the interface is in 1,8V operation mode.

Reference:

a), c.1): 3GPP TS 11.11, subclause 5.1.

b), c.2), e.1): 3GPP TS 11.12, clause 5.

d), e.2): 3GPP TS 11.18, clause 5.

27.17.2.1.1.3 Test purpose

To verify that the ME keeps the voltage on contact C1 of the SIM/ME interface within the ranges specified in the conformance requirements.

27.17.2.1.1.4 Method of test

Initial condition

The ME is connected to a SIM Simulator.

The MS is activated.

The remaining contacts of the SIM/ME interface are in nominal test conditions (see 3GPP TS 11.10 subclause 27.17.2).

Test Procedure

The voltage of contact C1 (Vcc) of the SIM/ME interface is measured.

27.17.2.1.1.5 Test requirement

The voltage on contact C1 of the SIM/ME interface shall be within the ranges specified in the conformance requirements.

27.17.2.1.2 Test 2

27.17.2.1.2.1 Definition

When the mobile station is activated, the supply voltage on the SIM/ME interface shall be able to counteract spikes in the current consumption of the SIM up to the limits given in the conformance requirement, ensuring that the supply voltage stays in the specified range.

27.17.2.1.2.2 Conformance requirement

a) The voltage on contact C1 of the SIM/ME interface shall be 5V ± 10 % for spikes in the current consumption with a maximum charge of 40 nAs with no more than 400 ns duration and an amplitude of at most 200 mA.

b) The voltage on contact C1 of the SIM/ME interface shall be 3V ± 10 % for spikes in the current consumption with a maximum charge of 12 nAs with no more than 400 ns duration and an amplitude of at most 60 mA.

c.1) The voltage on contact C1 of the SIM/ME interface shall be 5V ± 10 % for spikes in the current consumption with a maximum charge of 40 nAs with no more than 400 ns duration and an amplitude of at most 200 mA when the interface is in 5V operation mode.

c.2) The voltage on contact C1 of the SIM/ME interface shall be 3V ± 10 % for spikes in the current consumption with a maximum charge of 12 nAs with no more than 400 ns duration and an amplitude of at most 60 mA when the interface is in 3V operation mode.

d) The voltage on contact C1 of the SIM/ME interface shall be 1,8V ± 10 % for spikes in the current consumption with a maximum charge of 12 nAs with no more than 400 ns duration and an amplitude of at most 60 mA.

e.1) The voltage on contact C1 of the SIM/ME interface shall be 3V ± 10 % for spikes in the current consumption with a maximum charge of 12 nAs with no more than 400 ns duration and an amplitude of at most 60 mA when the interface is in 3V operation mode.

e.2) The voltage on contact C1 of the SIM/ME interface shall be 1,8V ± 10 % for spikes in the current consumption with a maximum charge of 12 nAs with no more than 400 ns duration and an amplitude of at most 60 mA when the interface is in 1,8V operation mode.

Reference:

a), c.1): 3GPP TS 11.11, subclause 5.2.

b), c.2), e.1): 3GPP TS 11.12, clause 5.

d), e.2): 3GPP TS 11.18, clause 5.

27.17.2.1.2.3 Test purpose

To verify that the ME keeps the voltage on contact C1 of the SIM/ME interface within the specified range for the conditions given in the conformance requirement.

27.17.2.1.2.4 Method of test

Initial condition

The ME is connected to a SIM Simulator.

The MS is activated.

The remaining contacts of the SIM/ME interface are held in nominal test condition (see 3GPP TS 11.10 subclause 27.17.2).

Procedure

To test the requirements a) and c-1), the voltage on contact C1 of the SIM/ME interface is monitored and the following current spikes are applied:

1) continuous spikes:

   current amplitude 20 mA

   current offset 0 mA

   Duration 100 ns

   Pause 100 ns

2) continuous spikes:

   current 20 mA

   current offset 0 mA

   Duration 400 ns

   Pause 400 ns

3) continuous spikes:

   current amplitude 15 mA

   current offset 5 mA

   (i.e. maximum amplitude = 5 mA + 15 mA = 20 mA

   Duration 150 ns

   Pause 300 ns

4) random spikes:

   current amplitude 200 mA

   current offset 0 mA

   Duration 200 ns

Pause between 0,1 ms and 500 ms, randomly varied

5) random spikes:

current amplitude 100 mA

current offset 0 mA

Duration 400 ns

Pause between 0,1 ms and 500 ms, randomly varied

6) random spikes

current amplitude 195 mA

current offset 5mA

(i.e. maximum amplitude = 5 mA + 195 mA = 200 mA

Duration 200 ns

Pause between 0,1 ms and 500 ms, randomly varied

To test the requirements b), c.2), d), e.1) and e.2) the voltage on contact C1 of the SIM/ME interface is monitored and the following current spikes are applied:

1) continuous spikes:

current amplitude 12 mA

current offset 0 mA

Duration 100 ns

Pause 100 ns

2) continuous spikes:

current 12 mA

current offset 0 mA

Duration 400 ns

Pause 400 ns

3) continuous spikes:

current amplitude 9 mA

current offset 3 mA

(i.e. maximum amplitude = 3 mA + 9 mA = 12 mA

Duration 150 ns

Pause 300 ns

4) random spikes:

current amplitude 60 mA

current offset 0 mA

Duration 200 ns

Pause between 0,1 ms and 500 ms, randomly varied

5) random spikes:

current amplitude 30 mA

current offset 0 mA

Duration 400 ns

Pause between 0,1 ms and 500 ms, randomly varied

6) random spikes

current amplitude 57 mA

current offset 3 mA

(i.e. maximum amplitude = 3 mA + 57 mA = 60 mA

Duration 200 ns

Pause between 0,1 ms and 500 ms, randomly varied

NOTE: The specified spike durations are measured at 50 % of the spike amplitude.

27.17.2.1.2.5 Test requirement

The voltage on contact C1 of the SIM/ME interface shall be within the ranges specified in the conformance requirements.

27.17.2.2 Electrical tests on contact C2

C2 = Reset (RST).

27.17.2.2.1 Definition

When the mobile station is activated, the voltage on contact C2 of the SIM/ME interface shall remain in the specified range in order to ensure correct operation and to prevent any damage to the SIM.

27.17.2.2.2 Conformance requirement

a) The voltage on contact C2 (RST) of the SIM/ME interface shall be between -0,3V and +0,6V for a current of -200 μA in low state and between 3,8V and Vcc + 0,3V for a current of +20 μA in high state.

b) The voltage on contact C2 (RST) of the SIM/ME interface shall be between -0,3V and +0,7V for a current of -200 μA in low state and between 2,15 V and Vcc + 0,3V for a current of +200 μA in high state.

c.1) The voltage on contact C2 (RST) of the SIM/ME interface shall be between -0,3V and +0,6V for a current of -200 μA in low state and between 3,8V and Vcc + 0,3V for a current of +20 μA in high state when the interface is in 5V operation mode.

c.2) The voltage on contact C2 (RST) of the SIM/ME interface shall be between -0,3V and +0,7V for a current of -200 μA in low state and between 2,15 V and Vcc + 0,3V for a current of +200 μA in high state when the interface is in 3V operation mode.

d) The voltage on contact C2 (RST) of the SIM/ME interface shall be between -0,3V and +0,47V for a current of -200 μA in low state and between 1,3 V and Vcc + 0,3V for a current of +200 μA in high state.

e.1) The voltage on contact C2 (RST) of the SIM/ME interface shall be between -0,3V and +0,7V for a current of -200 μA in low state and between 2,15 V and Vcc + 0,3V for a current of +200 μA in high state when the interface is in 3V operation mode.

e.2) The voltage on contact C2 (RST) of the SIM/ME interface shall be between -0,3V and +0,47V for a current of -200 μA in low state and between 1,3 V and Vcc + 0,3V for a current of +200 μA in high state when the interface is in 1,8V operation mode.

Reference:

a), c.1): 3GPP TS 11.11, clause 5.

b), c.2), e.1): 3GPP TS 11.12, clause 5.

d), e.2): 3GPP TS 11.18, clause 5.

27.17.2.2.3 Test purpose

To verify that the ME keeps the voltage on contact C2 (RST) of the SIM/ME interface within the specified range, as given in the conformance requirement.

27.17.2.2.4 Method of test

27.17.2.2.4.1 Initial condition

The ME is connected to a SIM Simulator.

The MS is activated.

The remaining contacts of the SIM/ME interface are held in nominal test conditions (see 3GPP TS 11.10 subclause 27.17.2).

27.17.2.2.4.2 Procedure

The voltage on contact C2 (RST) of the SIM/ME interface is measured.

27.17.2.2.5 Test requirement

The voltage on contact C2 (RST) of the SIM/ME interface shall be within the range specified in the conformance requirement.

27.17.2.3 Electrical tests on contact C3

C3 = Clock (CLK).

27.17.2.3.1 Definition

When the mobile station is activated, the voltage, the rise/fall time of the signal, the clock cycle ratio and the frequency on contact C3 of the SIM/ME interface shall remain in the specified range in order to ensure correct operation and to prevent any damage to the SIM.

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27.17.2.3.2 Conformance requirement

a.1) The voltage on contact C3 (CLK) of the SIM/ME interface shall be between -0,3V and +0,5V for a current of -200 μA in low state and between 3,15V and Vcc +0,3V for a current of +20 μA in high state.

a.2) The rise and the fall time of the clock signal shall not exceed 9 % of the clock period .

a.3) The cycle ratio of the clock signal shall be between 40 % and 60 % of the period, in steady state.

a.4) The frequency of the clock signal shall be between 1 MHz and 5 MHz.

b.1) The voltage on contact C3 (CLK) of the SIM/ME interface shall be between -0,3V and +0,6V for a current of -20 μA in low state and between 1,9V and Vcc +0,3V for a current of +20 μA in high state.

b.2) The rise and the fall time of the clock signal shall not exceed 50 ns.

b.3) The cycle ratio of the clock signal shall be between 40 % and 60 % of the period, in steady state.

b.4) The frequency of the clock signal shall be between 1 MHz and 4 MHz.

c.1) The voltage on contact C3 (CLK) of the SIM/ME interface shall be between -0,3V and +0,5V for a current of -200 μA in low state and between 3,15V and Vcc +0,3V for a current of +20 μA in high state when the interface is in 5V operation mode.

c.2) The rise and the fall time of the clock signal shall not exceed 9 % of the clock period when the interface is in 5V operation mode.

c.3) The cycle ratio of the clock signal shall be between 40 % and 60 % of the period, in steady state when the interface is in 5V operation mode.

c.4) The frequency of the clock signal shall be between 1 MHz and 5 MHz when the interface is in 5V operation mode.

c.5) The voltage on contact C3 (CLK) of the SIM/ME interface shall be between -0,3V and +0,6V for a current of -20 μA in low state and between 1,9V and Vcc +0,3V for a current of +20 μA in high state when the interface is in 3V operation mode.

c.6) The rise and the fall time of the clock signal shall not exceed 50 ns when the interface is in 3V operation mode.

c.7) The cycle ratio of the clock signal shall be between 40 % and 60 % of the period, in steady state when the interface is in 3V operation mode.

c.8) The frequency of the clock signal shall be between 1 MHz and 4 MHz when the interface is in 3V operation mode.

d.1) The voltage on contact C3 (CLK) of the SIM/ME interface shall be between -0,3V and +0,47V for a current of -20 μA in low state and between 1,21V and Vcc +0,3V for a current of +20 μA in high state.

d.2) The rise and the fall time of the clock signal shall not exceed 50 ns.

d.3) The cycle ratio of the clock signal shall be between 40 % and 60 % of the period, in steady state.

d.4) The frequency of the clock signal shall be between 1 MHz and 4 MHz.

e.1) The voltage on contact C3 (CLK) of the SIM/ME interface shall be between -0,3V and +0,47V for a current of -20 μA in low state and between 1,21V and Vcc +0,3V for a current of +20 μA in high state when the interface is in 1,8V operation mode.

e.2) The rise and the fall time of the clock signal shall not exceed 50 ns when the interface is in 1,8V operation mode.

e.3) The cycle ratio of the clock signal shall be between 40 % and 60 % of the period, in steady state when the interface is in 1,8V operation mode.

e.4) The frequency of the clock signal shall be between 1 MHz and 4 MHz when the interface is in 1,8V operation mode.

e.5) The voltage on contact C3 (CLK) of the SIM/ME interface shall be between -0,3V and +0,6V for a current of -20 μA in low state and between 1,9V and Vcc +0,3V for a current of +20 μA in high state when the interface is in 3V operation mode.

e.6) The rise and the fall time of the clock signal shall not exceed 50 ns when the interface is in 3V operation mode.

e.7) The cycle ratio of the clock signal shall be between 40 % and 60 % of the period, in steady state when the interface is in 3V operation mode.

e.8) The frequency of the clock signal shall be between 1 MHz and 4 MHz when the interface is in 3V operation mode.

Reference:

a), c.1,2,3,4) 3GPP TS 11.11, clause 5 and subclause 5.4.

b), c.5,6,7,8), e.1,2,3,4) 3GPP TS 11.12, subclause 4.2 and clause 5.

d), e.5,6,7,8) 3GPP TS 11.18, subclause 4.2 and clause 5.

27.17.2.3.3 Test purpose

To verify that the ME keeps the voltage, the rise and fall time, the cycle ratio and the frequency on contact C3 (CLK) of the SIM/ME interface within the ranges specified in the conformance requirements.

27.17.2.3.4 Method of test

27.17.2.3.4.1 Initial condition

The ME is connected to a SIM Simulator.

The MS is activated.

The remaining contacts of the SIM/ME interface are held in nominal test conditions (see 3GPP TS 11.10 subclause 27.17.2).

27.17.2.3.4.2 Procedure

The voltage, the rise/fall time, the clock cycle ratio and the frequency on contact C3 (CLK) of the SIM/ME interface are measured.

27.17.2.3.5 Test requirement

The voltage, the rise and fall time, the cycle ratio and the frequency on contact C3 (CLK) of the SIM/ME interface shall be within the ranges specified in the conformance requirements.

27.17.2.4 [Not used]

27.17.2.5 Electrical tests on contact C7

C7 = Input - output (I/O).

27.17.2.5.1 Definition

When the mobile station is activated, the ME shall keep the voltage, the current and the rise/fall time of the signal on contact C7 of the SIM/ME interface within the specified range in order to ensure correct operation and to prevent any damage to the SIM..

27.17.2.5.2 Conformance requirement

a.1) ME receiving state A (low state):

With an imposed voltage of 0V the current flowing out of the ME shall not exceed 1 mA.

a.2) ME transmitting state A (low state):

The voltage shall be between -0,3V and 0,4V when a current of 1 mA flowing into the ME is applied.

a.3) ME transmitting or receiving state Z (high state):

The voltage shall be between +3,8V and Vcc + 0,3V when a current of 20 µA flowing out of the ME is applied.

a.4) The rise time and the fall time of the I/O signal shall not exceed 1 µs.

b.1) ME receiving state A (low state):

With an imposed voltage of 0V the current flowing out of the ME shall not exceed 1 mA.

b.2) ME transmitting state A (low state):

The voltage shall be between -0,3V and 0,4V when a current of 1 mA flowing into the ME is applied.

b.3) ME transmitting or receiving state Z (high state):

The voltage shall be between 0,7* Vcc and Vcc + 0,3V when a current of 20 µA flowing out of the ME is applied.

b.4) The rise time and the fall time of the I/O signal shall not exceed 1 µs.

c.1) ME receiving state A (low state):

With an imposed voltage of 0V the current flowing out of the ME shall not exceed 1 mA when the ME is in 5V operation mode.

c.2) ME transmitting state A (low state):

The voltage shall be between -0,3V and 0,4V when a current of 1 mA flowing into the ME is applied when the ME is in 5V operation mode.

c.3) ME transmitting or receiving state Z (high state):

The voltage shall be between +3,8V and Vcc + 0,3V when a current of 20 µA flowing out of the ME is applied when the ME is in 5V operation mode.

c.4) The rise time and the fall time of the I/O signal shall not exceed 1 µs when the ME is in 5V operation mode.

c.5) ME receiving state A (low state):

With an imposed voltage of 0V the current flowing out of the ME shall not exceed 1 mA when the ME is in 3V operation mode.

c.6) ME transmitting state A (low state):

The voltage shall be between -0,3V and 0,4V when a current of 1 mA flowing into the ME is applied when the ME is in 3V operation mode.

c.7) ME transmitting or receiving state Z (high state):

The voltage shall be between 0,7* Vcc and Vcc + 0,3V when a current of 20 µA flowing out of the ME is applied when the ME is in 3V operation mode.

c.8) The rise time and the fall time of the I/O signal shall not exceed 1 µs when the ME is in 3V operation mode.

d.1) ME receiving state A (low state):

With an imposed voltage of 0V the current flowing out of the ME shall not exceed 1 mA.

d.2) ME transmitting state A (low state):

The voltage shall be between -0,3V and 0,3V when a current of 1 mA flowing into the ME is applied.

d.3) ME transmitting or receiving state Z (high state):

The voltage shall be between 0,7* Vcc and Vcc + 0,3V when a current of 20 µA flowing out of the ME is applied.

d.4) The rise time and the fall time of the I/O signal shall not exceed 1 µs.

e.1) ME receiving state A (low state):

With an imposed voltage of 0V the current flowing out of the ME shall not exceed 1 mA when the ME is in 3V operation mode.

e.2) ME transmitting state A (low state):

The voltage shall be between -0,3V and 0,4V when a current of 1 mA flowing into the ME is applied when the ME is in 3V operation mode.

e.3) ME transmitting or receiving state Z (high state):

The voltage shall be between 0,7* Vcc and Vcc + 0,3V when a current of 20 µA flowing out of the ME is applied when the ME is in 3V operation mode.

e.4) The rise time and the fall time of the I/O signal shall not exceed 1 µs when the ME is in 3V operation mode.

e.5) ME receiving state A (low state):

With an imposed voltage of 0V the current flowing out of the ME shall not exceed 1 mA when the ME is in 1,8V operation mode.

e.6) ME transmitting state A (low state):

The voltage shall be between -0,3V and 0,3V when a current of 1 mA flowing into the ME is applied when the ME is in 1,8V operation mode.

e.7) ME transmitting or receiving state Z (high state):

The voltage shall be between 0,7* Vcc and Vcc + 0,3V when a current of 20 µA flowing out of the ME is applied when the ME is in 1,8V operation mode.

e.8) The rise time and the fall time of the I/O signal shall not exceed 1 µs when the ME is in 3V operation mode.

Reference:

a), c.1,2,3,4) 3GPP TS 11.11, clause 5.

b), c-5,6,7,8), e.1,2,3,4) 3GPP TS 11.12, clause 5.

d), e-5,6,7,8) 3GPP TS 11.18, clause 5.

27.17.2.5.3 Test purpose

To verify that the ME keeps the voltage, the current and the rise and fall times of the signal on contact C7 (I/O) of the SIM/ME interface within the ranges specified in the conformance requirements.

27.17.2.5.4 Method of test

27.17.2.5.4.1 Initial condition

The ME is connected to a SIM Simulator.

The MS is activated.

The remaining contacts of the SIM/ME interface are held in nominal test conditions (see 3GPP TS 11.10 subclause 27.17.2).

27.17.2.5.4.2 Procedure

The voltage, the current and the rise/fall time on contact C7 (I/O) of the SIM/ME interface are measured.

27.17.2.5.5 Test requirement

The voltage, the current and the rise and fall times of the signal on contact C7 (I/O) of the SIM/ME interface shall be within the ranges specified in the conformance requirements.

27.18 Fixed Dialling Number (FDN)

27.18.1 ME and SIM with FDN activated

27.18.1.1 EF_{ADN} invalidated and not readable or updatable

27.18.1.1.1 Definition

Fixed Dialling Number (FDN) is a service defined for the SIM. An activated FDN service results in call restrictions for the MS. The call restrictions are controlled by the ME. To ascertain the type of SIM and state of FDN the MS runs the FDN capability request procedure during SIM/ME initialization.

27.18.1.1.2 Conformance requirement

1. Recognizing the state of the SIM (FDN enabled) the MS shall perform the SIM initialization procedure as specified.

2. The MS allows call set-up to a directory number as stored in EF_{FDN}.

3. The MS allows call set-up to a directory number as stored in EF_{FDN} and extended by digits in the end.
4. The MS does not allow call set-up to a directory number stored in EF_{FDN} but with missing digits at the end.
5. The MS does not allow call set-up to a directory number having no reference in EF_{FDN}.
6. The MS allows call set-up of an emergency call.
7. For PCS 1 900: To verify the requirement 6 above by using the emergency call number 911.

Reference:

3GPP TS 11.11, subclauses 9.3, 10.2.7, 10.3.2, 11.2.1 and 11.5.1, 3GPP TS 02.07, subclause 3.2.

27.18.1.1.3 Test purpose

1. To verify that the ME as a result of the state of the SIM rehabilitates EF_{IMSI} and EF_{LOCI} during SIM/ME initialization procedure.
2. To verify that the ME allows call set-up to a FDN number.
3. To verify that the ME allows call set-up to a FDN number extended by some digits in the end.
4. To verify that the ME rejects call set-up to a FDN number not completely corresponding to an entry in EF_{FDN} .
5. To verify that the ME rejects call set-up to number having no reference in EF_{FDN}.
6. To verify that the ME allows emergency call set-up.
7. For PCS 1 900: To verify the requirement 6 above by using the emergency call number 911.

Note: Test purpose 6 is not applicable for a MS not supporting speech (See Specific PICS Statements)

27.18.1.1.4 Method of test

27.18.1.1.4.1 Initial conditions

The SS transmits on the BCCH, with the following network parameters

Attach/detach:	disabled.
LAI-MCC:	246
LAI-MNC	81 or 813 (see Note 0)
LAI-LAC:	0001
LAI (MCC/MNC/LAC):	246/81/0001 or 246/813/0001 (see Note 0).
Access control:	unrestricted.

The default FDN-SIM with FDN service enabled and EF_{ADN} invalidated and neither readable nor updatable is installed into the ME.

Specific PICS Statements

Speech supported for Full rate version 1 (TSPC_AddInfo_Full_rate_version_1)

Speech supported for Half rate version 1 (TSPC_AddInfo_Half_rate_version_1)

Speech supported for Full rate version 2 (TSPC_AddInfo_Full_rate_version_2)

Speech supported for Full rate version 3 (TSPC_AddInfo_Full_rate_version_3)

Speech supported for Half rate version 3 (TSPC_AddInfo_Half_rate_version_3)

27.18.1.1.4.2 Procedure

a) The MS is powered on and PIN1 is entered.

b) Using the MMI a call set-up to the fixed dialling number 1 is attempted.

c) Using the MMI a call set-up to the fixed dialling number 2 extended by "123" in the end is attempted.

d) Using the MMI a call set-up to a number which is equal to the fixed dialling number 3 without the last digit is attempted, e.g. by recalling the fixed dialling number 3 and deleting the last digit (only in display).

e) Using the MMI a call set-up to the number "1234567" is attempted.

f) Using the MMI an emergency call set-up is attempted.

27.18.1.1.5 Test requirement

1) After step a) the MS is registered and in idle state.

2) After steps b) and c) the MS shall allow call set-up and send the requested number across the air interface.

3) After steps d) and e) the MS shall prevent call set-up.

4) After step f) the MS shall allow emergency call set-up and send the requested number across the air interface.

27.18.1.2 EF_{ADN} invalidated but readable and updatable

27.18.1.2.1 Definition

Fixed Dialling Number (FDN) is a service defined for the SIM. An activated FDN service results in call restrictions for the MS. The call restrictions are controlled by the ME.

27.18.1.2.2 Conformance requirement

The MS allows call set-up to a directory number as stored in EF_{FDN} and extended by digits added from an EF_{ADN}.

Reference:

3GPP TS 11.11, subclauses 9.3, 10.2.7, 10.3.2, 11.2.1 and 11.5.1, 3GPP TS 02.07, subclause 3.2.

27.18.1.2.3 Test purpose

To verify that the ME allows call set-up to a FDN number extended by digits from an EF_{ADN}.

27.18.1.2.4 Method of test

27.18.1.2.4.1 Initial conditions

The SS transmits on the BCCH, with the following network parameters

Attach/detach:	disabled.
LAI-MCC:	246
LAI-MNC	81 or 813 (see Note 0)
LAI-LAC:	0001
LAI (MCC/MNC/LAC):	246/81/0001 or 246/813/0001 (see Note 0).
Access control:	unrestricted.

The default FDN-SIM with FDN service enabled and EF_{ADN} invalidated but readable and updatable is installed into the ME.

27.18.1.2.4.2 Procedure

a) The MS is powered on and PIN1 is entered.

b) Using the MMI a call set-up to the fixed dialling number 1 extended by the abbreviated dialling number 1 in the end is attempted.

27.18.1.2.5 Test requirement

1) After step a) the MS is registered and in idle state.

2) After steps b) the MS shall allow call set-up and send the requested number across the air interface.

27.18.2 ME and SIM with FDN deactivated

27.18.2.1 Definition

Fixed Dialling Number (FDN) is a service defined for the SIM. An activated FDN service results in call restrictions for the MS. Only directory numbers which are stored in the EF_{FDN} may be dialled by the MS. The call restrictions are controlled by the ME. To ascertain the type of SIM and state of FDN the MS runs the FDN capability request procedure during SIM/ME initialization. Deactivation of the service by the subscriber is possible under the control of PIN2 and switches the SIM into a "normal", non restrictive SIM.

27.18.2.2 Conformance requirement

1. Recognizing the state of the SIM (FDN disabled) the MS correctly performs the SIM initialization procedure.
2. The MS allows call set-up to a directory number as stored in EF_{FDN}.
3. The MS allows call set-up to a directory number as stored in EF_{ADN}.
4. The MS allows call set-up to a directory number given in manually.

Reference:

3GPP TS 11.11, subclauses 10.2.7, 10.3.2, 11.2.1 and 11.5.1, 3GPP TS 02.07,subclause 3.2.

27.18.2.3 Test purpose

1. To verify that the ME as a result of the state of the SIM correctly performs the SIM/ME initialization procedure.
2. To verify that the ME allows call set-up to a FDN number.
3. To verify that the ME allows call set-up to a ADN number.
4. To verify that the ME allows call set-up to manually given number.

27.18.2.4 Method of test

27.18.2.4.1 Initial conditions

The SS transmits on the BCCH, with the following network parameters

Attach/detach:	disabled.
LAI-MCC:	246
LAI-MNC	81 or 813 (see Note 0)
LAI-LAC:	0001
LAI (MCC/MNC/LAC):	246/81/0001 or 246/813/0001 (see Note 0).
Access control:	unrestricted.

The default FDN SIM with FDN service disabled is installed into the ME and the MS is powered on.

27.18.2.4.2 Procedure

a) Using the MMI a call set-up to the fixed dialling number 1 is attempted.

b) Using the MMI a call set-up to the abbreviated dialling number 1 is attempted.

c) Using the MMI a call set-up to the number "1234567" is attempted.

27.18.2.5 Test requirement

After steps a), b) and c) the MS shall allow call set-up and send the requested number across the air interface.

27.18.3 Enabling, disabling and updating of FDN

27.18.3.1 Definition

FDN may be enabled and disabled by the subscriber under control of PIN2. Fixed dialling numbers are read with PIN and updated under control of PIN2.

27.18.3.2 Conformance requirement

1. Recognizing the state of the SIM (FDN enabled) the MS shall perform the SIM initialization procedure as specified.
2. The MS shall allow updating of EF_{FDN} by the use of PIN2.
3. The MS provides means to disable the FDN service by the use of PIN2.
4. The MS shall allow the use of EF_{ADN} after disabling of FDN.

Reference:

3GPP TS 11.11, subclauses 10.2.7, 10.3.2, 11.2.1 and 11.5.1, 3GPP TS 02.07, subclause 3.2.

27.18.3.3 Test purpose

1. To verify that the ME as a result of the state of the SIM rehabilitates EF_{IMSI} and EF_{LOCI} during SIM/ME initialization procedure.
2. To verify that the ME correctly performs the update of a number in EF_{FDN}.
3. To verify that the ME correctly disables FDN service.
4. To verify that the ME recognizes disabling of FDN and allows access to EF_{ADN}.

27.18.3.4 Method of test

27.18.3.4.1 Initial conditions

The SS transmits on the BCCH, with the following network parameters

Attach/detach:	disabled.
LAI-MCC:	246
LAI-MNC	81 or 813 (see Note 0)
LAI-LAC:	0001
LAI (MCC/MNC/LAC):	246/81/0001 or 246/813/0001 (see Note 0).
Access control:	unrestricted.

The default FDN SIM with FDN service enabled is installed into the ME and the MS is powered on.

27.18.3.4.2 Procedure

a) The MS is powered on and PIN 1 is entered.

b) Using the MMI the directory number "+876543210" is stored in EF_{FDN} as fixed dialling number 1 (The alpha identifier is not changed).

c) Using the MMI the FDN disabling procedure is performed. On request of the MS PIN2 is entered.

d) Using the MMI a call set-up to the abbreviated dialling number 1 is attempted.

e) The MS is soft-powered down.

27.18.3.5 Test requirement

1) After step a) the MS is registered and in idle state.

2) After step c) the MS shall indicate that the FDN disabling procedure has been successful.

3) After step d) the MS shall allow call set-up and send the requested number across the air interface.

4) After step e) the value of bit 1 of byte 12 in the response data of EF_{ADN} in the SIM shall be "1" and record 1 in EF_{FDN}, shall contain the following values:

B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
46	44	4E	31	31	31	06	91	78	56
B11	**B12**	**B13**	**B14**	**B15**	**B16**	**B17**	**B18**	**B19**	**B20**
34	12	F0	FF	FF	FF	FF	FF	FF	FF

27.19 Phase identification

27.19.1 Definition

The phase of the SIM is indicated in the Elementary File EF_{PHASE}. This allows the ME to identify the phase of the SIM and adapt its functionality accordingly.

27.19.2 Conformance requirement

The phase of the card shall be determined as part of the initialization procedure.

Reference:

3GPP TS 11.11, subclauses 10.2.16 and 11.2.1.

27.19.3 Test purpose

To verify that the ME requests the SIM phase as part of the initialization procedure.

27.19.4 Method of test

27.19.4.1 Initial conditions

The ME is connected to the SIM simulator, and powered off.

The default values are used.

27.19.4.2 Procedure

a) The mobile is powered on.

b) The SIM simulator monitors the SIM initialization procedure.

27.19.5 Test requirement

The ME shall request the phase of the SIM as part of the initialization procedure.

27.20 SIM presence detection

27.20.1 Definition

The presence of the SIM is an essential requirement for setting up and maintaining a call. The ME detects the presence of the SIM electronically.

27.20.2 Conformance requirement

To ensure that the SIM has not been removed during a card session, the ME shall send STATUS commands within all 30 second periods of inactivity on the SIM-ME interface during a call. Inactivity in this case is defined as starting at the

end of the last communication or the last issued STATUS command. If the ME detects that the SIM has been removed, a possibly ongoing call shall be terminated by the ME within 5 s at the latest after having detected the SIM removal.

Reference:

3GPP TS 11.11, subclause 11.2.8 and TS 102.221, subclause 14.5.2.

27.20.3 Test purpose

1. To verify that there are no periods of inactivity on the SIM-ME interface greater than 30 seconds during a call.
2. To verify that the ME terminates a call within 5 s at the latest after having received a wrong response to the STATUS command.

27.20.4 Method of test

27.20.4.1 Initial conditions

The ME is connected to the SIM-simulator.

All elementary files are coded as default.

27.20.4.2 Procedure

a) A call is set up using the generic call setup.

b) The SIM simulator monitors the periods of inactivity on the SIM-ME interface.

c) After 3 minutes, the call is cleared.

d) A call is set up using the generic call setup.

e) After one minute after the call was successfully set up, the SIM simulator responds to a STATUS command with the response data indicating a DF different from the current DF.

27.20.5 Test requirements

1. During step b), the time periods of inactivity shall not be longer than 30 s.
2. After step e), the ME shall terminate the call within 5 s at the latest after having received the wrong response to the STATUS command.

27.21 Advice of Charge (AoC)

27.21.1 AoC not supported by SIM

27.21.1.1 Definition

If the ME under test supports Advice of Charge Charging, it shall still look at the capability of the SIM, before responding to any AoCC information from the network.

27.21.1.2 Conformance requirement

1. An MS not supporting AoCC and in the outgoing call / U4 call delivered state, on receipt of a CONNECT message containing AoCC information shall acknowledge the CONNECT message but ignore and not acknowledge the AoCC information sent within the CONNECT.
2. An MS not supporting AoCC and in the outgoing call / U4 call delivered state, on receipt of a FACILITY message containing AoCC information shall ignore and not acknowledge the AoCC information sent within the FACILITY.
3. An MS not supporting AoCC and in the incoming call / U9 call confirmed state, on receipt of a FACILITY message containing AoCC information shall ignore and not acknowledge the AoCC information sent within the FACILITY.

4. An MS not supporting AoCC and in the U10 call active state, on receipt of a FACILITY message containing AoCC information, shall ignore and not acknowledge the AoCC information sent within the FACILITY.

References:

3GPP TS 03.86, subclauses 1.2, 1.3, 2.2, 2.3; 3GPP TS 04.86, clause 2.

27.21.1.3 Test purpose

1. To verify that an MS not supporting AoCC (where the ME does support AoCC but the SIM does not) and in the outgoing call / U4 call delivered state, on receipt of a CONNECT message containing AoCC information shall acknowledge the CONNECT message but ignore and not acknowledge the AoCC information sent within the CONNECT.

2. To verify that an MS not supporting AoCC (where the ME does support AoCC but the SIM does not) and in the outgoing call / U4 call delivered state, on receipt of a FACILITY message containing AoCC information shall ignore and not acknowledge the AoCC information sent within the FACILITY.

3. To verify that an MS not supporting AoCC (where the ME does support AoCC but the SIM does not) and in the incoming call / U9 call confirmed state, on receipt of a FACILITY message containing AoCC information shall ignore and not acknowledge the AoCC information sent within the FACILITY.

4. To verify that an MS not supporting AoCC (where the ME does support AoCC but the SIM does not) and in the U10 call active state, on receipt of a FACILITY message containing AoCC information, shall ignore and not acknowledge the AoCC information sent within the FACILITY.

27.21.1.4 Method of test

27.21.1.4.1 Initial conditions

The ME shall be installed with a SIM or SIM simulator, with all elementary files coded as for the default SIM, with the exception of:

EF_{SST} (SIM Service Table)

Logically: CHV1 disable function allocated and activated.

Abbreviated dialling numbers allocated and activated.

PLMN selector allocated and activated.

Fixed dialling numbers not activated.

AoC not activated.

Coding:

	B1	B2	B3	B4
Value (binary)	xx0x1111	0011xx0x	xxxxxxxx	0000xxxx

The coding of EF_{SST} shall conform with the capabilities of the SIM used.

The generic call set up procedures are followed up to and including the reception, or transmission of the ALERTING message by the MS.

27.21.1.4.2 Procedure

a) For an MO call in the U4 state the SS transmits CONNECT containing AoCC information.

b) For an MO call in the U4 state the SS transmits FACILITY containing AoCC information.

c) For an MTcall in the U9 state the SS transmits FACILITY containing AoCC information.

d) For an MO call in the U10 state the SS transmits FACILITY containing AoCC information.

27.21.1.5 Test requirement

In all cases, the MS shall ignore the AoCC information sent to it in the Facility information elements as part of the CONNECT/FACILITY messages and not send any AoCC information acknowledgement. It shall be checked for 15 s that the MS does not transmit any AoCC information acknowledgement after the receipt of AoCC information.

27.21.2 Maximum frequency of ACM updating

27.21.2.1 Definition

During a call, the ACM shall be updated at the end of every interval. The interval length is the greater of either 5 s or the value given by parameter e2.

27.21.2.2 Conformance requirement

The ACM shall be incremented when the CCM is incremented or once every 5 s, whichever is the longer period.

Reference:

3GPP TS 02.24, subclause 4.3, part h.

27.21.2.3 Test purpose

To verify that the terminal, during a call, increments the ACM every 5 s when e2 is less or equal to 5 s.

27.21.2.4 Method of test

27.21.2.4.1 Initial conditions

The ME shall be connected to the SIM simulator, with all elementary files coded as default with the exception of:

EF_{SST} (SIM Service Table)

Logically: CHV1 disable function allocated and activated.

Abbreviated dialling numbers allocated and activated.

PLMN selector allocated and activated.

Fixed dialling numbers not activated.

AoC allocated and activated.

Coding:

	B1	B2	B3	B4
Value (binary)	xx0x1111	0011xx11	xxxxxxxx	0000xxxx

The coding of EF_{SST} shall conform with the capabilities of the SIM used.

EF_{ACM} (Accumulated call meter)

Logically: 50 units

EF_{ACMmax} (Accumulated call meter maximum)

Logically: 150 units

System Simulator:

1 cell, default parameters, IMSI attach/detach disabled.

Mobile Station:

The MS is in MM-state "idle, updated".

27.21.2.4.2 Procedure

a) The MS is made to initiate a call. The call is established with AoCC e-parameters sent in a Facility IE in the CONNECT message, as given below. The MS returns the AoCC acknowledgement within 1 second of the CONNECT message. It is an implementation option whether the AoCC acknowledge is sent by the MS before or after the CONNECT ACKNOWLEDGE.

b) The call is maintained for 90 s, then terminated by the SS. During the call, the SIM-simulator monitors the time intervals between successive INCREMENT commands. As the final INCREMENT command will have occurred as a result of call termination, the time interval calculated since the prior INCREMENT command shall be ignored.

Maximum Duration of Test:

2 minutes.

Expected Sequence:

Step	Direction	Message	Comments
1	MS		The MS is made to initiate a call
2	MS -> SS	CHANNEL REQUEST	
3	SS -> MS	IMMEDIATE ASSIGNMENT	
4	MS -> SS	CM SERVICE REQUEST	
5	SS -> MS	CM SERVICE ACCEPT	
6	MS -> SS	SETUP	
7	SS -> MS	CALL PROCEEDING	
8	SS -> MS	ASSIGNMENT COMMAND	to a supported channel type
9	MS -> SS	ASSIGNMENT COMPLETE	
10	SS -> MS	ALERTING	
11	SS -> MS	CONNECT	As default message except contains Facility IE with contents as indicated in i below
			Either A or B branch is taken
A12	MS -> SS	CONNECT ACKNOWLEDGE	
A13	MS -> SS	FACILITY	As default message except contains Facility IE with contents as indicated in ii below
B12	MS -> SS	FACILITY	As default message except contains Facility IE with contents as indicated in ii below
B13	MS -> SS	CONNECT ACKNOWLEDGE	
14			call duration 90 s after CAI information sent by SS,
15	SS -> MS	DISCONNECT	
16	MS -> SS	RELEASE	
17	SS -> MS	RELEASE COMPLETE	
18	SS -> MS	CHANNEL RELEASE	The main signalling link is released.

Specific Message Contents:

i) FACILITY Information Element with **Invoke = ForwardChargeInformation** component type as defined in 3GPP TS 04.80 subclause 3.6.1 table 3.3.

For ASN.1 description see default message contents in subclause 31.6.1.3.

The values of the e-parameters within the parameter part of the Facility Information Element shall be set as below:

	e-parameters						
parameter	1	2	3	4	5	6	7
value	1	1	1	0	0	0	0

Values shown in table are in the format and have units as in 3GPP TS 02.24 subclause 3.

ii) FACILITY Information Element with **Return Result** component type as defined in 3GPP TS 04.80 subclause 3.6.1 table 3.4.

For ASN.1 description see default message contents in subclause 31.6.1.3.

27.21.2.5 Test requirement

The MS shall, during a call, send INCREMENT commands to the SIM every 5 s.

27.21.3 Call terminated when ACM greater than ACMmax

27.21.3.1 Definition

ACMmax gives the maximum value of ACM, at which the current calls shall be terminated and no further outgoing calls and charged incoming calls may be made (except emergency calls).

27.21.3.2 Conformance requirement

ACM shall be incremented by the value of CCM.

If the ACMmax is valid, and the ACM becomes equal to or exceeds the value of the ACMmax, then all calls in progress, chargeable to the user, shall be terminated by the MS with cause value #68, once the chargeable interval determined by the CAI has elapsed, (except emergency calls).

Reference:

3GPP TS 02.24, subclause 4.3 part h and subclause 4.2.2.

3GPP TS 04.86, subclause 2.3.

27.21.3.3 Test purpose

1. To verify that the ME increments the ACM by the correct number of units, even though this may take ACM above ACMmax.
2. To verify that the ME terminates the call with cause value #68.

27.21.3.4 Method of test

27.21.3.4.1 Initial conditions

The ME shall be connected to a SIM or the SIM simulator, with all elementary files coded as default with the exception of:

EF_{SST} (SIM Service Table)

Logically: CHV1 disable function allocated and activated.

Abbreviated dialling numbers allocated and activated.

PLMN selector allocated and activated.

Fixed dialling numbers not activated.

AoC allocated and activated.

Coding:

	B1	B2	B3	B4
Value (Binary)	xx0x1111	0011xx11	xxxxxxxx	0000xxxx

The coding of EF_{SST} shall conform with the capabilities of the SIM used.

EF_{ACM} (Accumulated call meter)

Logically: 80 units

EF_{ACMmax} (Accumulated call meter maximum)

Logically: 94 units

System Simulator:

1 cell, default parameters, IMSI attach/detach disabled.

Mobile Station:

The MS is in MM-state "idle, updated".

27.21.3.4.2 Procedure

a) The MS is made to initiate a call. The call is established with AoCC e-parameters sent in a Facility IE in the CONNECT message, as given below. The MS returns the AoCC acknowledgement within 1 second of the CONNECT message. It is an implementation option whether the AoCC acknowledge is sent by the MS before or after the CONNECT ACKNOWLEDGE.

b) The call is maintained until cleared by the MS (after 30 s) with cause value #68.

c) The contents of ACM are checked.

Maximum Duration of Test:

2 minutes.

Expected Sequence:

Step	Direction	Message	Comments
1	MS		The MS is made to initiate a call
2	MS -> SS	CHANNEL REQUEST	
3	SS -> MS	IMMEDIATE ASSIGNMENT	
4	MS -> SS	CM SERVICE REQUEST	
5	SS -> MS	CM SERVICE ACCEPT	
6	MS -> SS	SETUP	
7	SS -> MS	CALL PROCEEDING	
8	SS -> MS	ASSIGNMENT COMMAND to a supported channel type	
9	MS -> SS	ASSIGNMENT COMPLETE	
10	SS -> MS	ALERTING	
11	SS -> MS	CONNECT	As default message except contains Facility IE with contents as indicated in i below
			Either A or B branch is taken
A12	MS -> SS	CONNECT ACKNOWLEDGE	
A13	MS -> SS	FACILITY	As default message except contains Facility IE with contents as indicated in ii below
B12	MS -> SS	FACILITY	As default message except contains Facility IE with contents as indicated in ii below
B13	MS -> SS	CONNECT ACKNOWLEDGE	
14			call duration 30 s after CAI information sent by SS
15	MS -> SS	DISCONNECT	Cause value #68
16	SS -> MS	RELEASE	
17	MS -> SS	RELEASE COMPLETE	
18	MS -> SS	CHANNEL RELEASE	The main signalling link is released.

Specific Message Contents:

i) FACILITY Information Element with **Invoke = ForwardChargeInformation** component type as defined in 3GPP TS 04.80 subclause 3.6.1 table 3.3.

For ASN.1 description see default message contents in subclause 31.6.1.3.

The values of the e-parameters within the parameter part of the Facility Information Element shall be set as below:

	e-parameters						
parameter	1	2	3	4	5	6	7
value	10	10	1	0	0	0	0

Values shown in table are in the format and have units as in 3GPP TS 02.24 clause 3.

ii) FACILITY Information Element with **Return Result** component type as defined in 3GPP TS 04.80 subclause 3.6.1 table 3.4.

For ASN.1 description see default message contents in subclause 31.6.1.3.

27.21.3.5 Test requirement

1) The MS shall terminate the call correctly 30 s after CAI was sent.

2) The value of ACM shall be 100 units.

27.21.4 Response codes of increase command

27.21.4.1 Definition

ACM has a maximum value in terms of coding, and an attempt by the ME to exceed that value by sending an INCREASE command shall result in an error message from the SIM.

27.21.4.2 Conformance requirement

The ME shall perform the increasing procedure, sending the amount to be increased.

The running accumulated charge shall be stored in the ACM of the SIM.

Where this charge cannot be stored in the MS, use of the telecommunications service shall be prevented.

References:

3GPP TS 11.11, subclause 11.5.3; 3GPP TS 02.86, subclauses 2.2.1 and 2.1.

27.21.4.3 Test purpose

To verify that the ME clears a charged call if the SIM indicates that the ACM cannot be increased.

27.21.4.4 Method of test

27.21.4.4.1 Initial conditions

The ME shall be connected to the SIM simulator, with all elementary files coded as default with the exception of:

EF_{SST} (SIM Service Table)

Logically: CHV1 disable function allocated and activated.

Abbreviated dialling numbers allocated and activated.

PLMN selector allocated and activated.

Fixed dialling numbers not activated.

AoC allocated and activated.

Coding:

	B1	B2	B3	B4
Value (binary)	xx0x1111	0011xx11	xxxxxxxx	0000xxxx

The coding of EF_{SST} shall conform with the capabilities of the SIM used.

EF_{ACM} (Accumulated call meter)

Logically: (Maximum-10) units

EF_{ACMmax} (Accumulated call meter maximum)

Logically: (Maximum-2) units

System Simulator:

1 cell, default parameters, IMSI attach/detach disabled.

Mobile Station:

The MS is in MM-state "idle, updated".

27.21.4.4.2 Procedure

a) The MS is made to initiate a call. The call is established with AoCC e-parameters sent in a Facility IE in the CONNECT message, as given below. The MS returns the AoCC acknowledgement within 1 second of the CONNECT message. It is an implementation option whether the AoCC acknowledge is sent by the MS before or after the CONNECT ACKNOWLEDGE.

b) After an interval has elapsed, the ME increments the ACM. When an INCREASE command is received, the SIM-sim sends back the error "98 50".

c) Conditions are reset to those described in the initial conditions. Steps a) and b) of the test are repeated, except that the error code sent by the SIM simulator at step b) is now "6F xx".

d) Conditions are reset to those described in the initial conditions. Steps a) and b) of the test are repeated, except that the error code sent by the SIM simulator at step b) is now "92 40".

Maximum Duration of Test:

3 minutes.

Expected Sequence:

Step	Direction	Message	Comments
1	MS		The MS is made to initiate a call
2	MS -> SS	CHANNEL REQUEST	
3	SS -> MS	IMMEDIATE ASSIGNMENT	
4	MS -> SS	CM SERVICE REQUEST	
5	SS -> MS	CM SERVICE ACCEPT	
6	MS -> SS	SETUP	
7	SS -> MS	CALL PROCEEDING	
8	SS -> MS	ASSIGNMENT COMMAND to a supported channel type	
9	MS -> SS	ASSIGNMENT COMPLETE	
10	SS -> MS	ALERTING	
11	SS -> MS	CONNECT	As default message except contains Facility IE with contents as indicated in i below
			Either A or B branch is taken
A12	MS -> SS	CONNECT ACKNOWLEDGE	
A13	MS -> SS	FACILITY	As default message except contains Facility IE with contents as indicated in ii below
B12	MS -> SS	FACILITY	As default message except contains Facility IE with contents as indicated in ii below
B13	MS -> SS	CONNECT ACKNOWLEDGE	
14			call duration approx 10s after CAI information sent by SS
15	MS -> SS	DISCONNECT	
16	SS -> MS	RELEASE	
17	MS -> SS	RELEASE COMPLETE	
18	MS -> SS	CHANNEL RELEASE	The main signalling link is released.

Specific Message Contents:

i) FACILITY Information Element with **Invoke = ForwardChargeInformation** component type as defined in 3GPP TS 04.80 subclause 3.6.1 table 3.3.

The values of the e-parameters within the parameter part of the Facility Information Element shall be set as below:

	e-parameters						
parameter	1	2	3	4	5	6	7
value	20	10	1	0	0	0	0

Values shown in table are in the format and have units as in 3GPP TS 02.24 subclause 3.

ii) FACILITY Information Element with **Return Result** component type as defined in 3GPP TS 04.80 subclause 3.6.1 table 3.4.

27.21.4.5 Test requirement

In each of the three cases, as described in steps b), c) and d) of the procedure, the MS shall terminate the call correctly when it receives an indication from the SIM that the ACM cannot be incremented.

28 Test of autocalling restrictions

28.1 General

It is essential that all autocalling apparatus is prevented from continuously dialling a given number, to avoid machines repeatedly disturbing PSTN subscribers in error, or numerous repeat attempts to unobtainable numbers which cause waste of valuable network resources. Therefore autocalling restrictions are defined by 3GPP TS 02.07.

The tests shall be performed using all of the call methods specified by the supplier in the PIXIT statement (annex 3). The supplier shall state any autocalling procedures implemented and how many times they can be repeated to a single number and the minimum re-attempt interval(s), i.e. the complete re-try schedule or algorithm with parameter values. The supplier shall further describe any automatic methods for making repeated calls to a single number. The supplier shall also state in the PIXIT statement (annex 3) the number of B-party numbers that can be stored on the list of blacklisted numbers as described in 3GPP TS 02.07, annex A.

For an external R-interface the supplier shall state in the PIXIT statement (annex 3) the procedure for autocalling restrictions for that interface and the possible parameter settings for the number of times the LTE can make a re-attempt and the minimum accepted time between re-attempts accepted by the MS. The conditions for clearing the autocalling constraints shall be stated in the PIXIT statement (annex 3).

For external interfaces the LTE must be programmed so that it clearly attempts to violate the autocalling constraints.

28.2 Constraining the access to a single number (3GPP TS 02.07 category 3)

During this test the SETUP messages shall contain the same B-party number.

No manual intervention shall be performed except to initiate and end the test.

28.2.1 Conformance requirement

A repeat call attempt may be made when a call attempt is unsuccessful for the reasons listed below (as defined in 3GPP TS 04.08 / 3GPP TS 24.008).

These reasons are classified in three major categories:

1. "Busy destination".
2. "Unobtainable destination - temporary".
3. "Unobtainable destination - permanent/long term".

NOTE: Cause values for each category are defined in 3GPP TS 02.07, annex A.

The table below describes a repeat call restriction pattern to any B number. This pattern defines a maximum number (n) of call repeat attempts; when this number n is reached, the associated B number shall be blacklisted by the MT until a manual re-set at the MT is performed in respect of that B number. When a repeat attempt to anyone B number fails, or is blacklisted, this does not prevent calls being made to other B numbers.

For the categories 1 and 2 above, n shall be 10; for category 3, n shall be 1.

Call attempt	Minimum duration between call attempts
Initial call attempt	-
1st repeat attempt	5 s
2nd repeat attempt	1 min
3rd repeat attempt	1 min
4th repeat attempt	1 min
5th repeat attempt	3 min
.	
.	
nth repeat attempt	3 min

Reference:

3GPP TS 02.07, annex A.

Purpose of the test

28.2.2 Test purpose

To ensure the correct behaviour of the MS to 3GPP TS 02.07 Category 3.

28.2.3 Method of test

Initial condition.

There shall be no numbers in the list of blacklisted numbers in the MS. The time set between the first re-attempt and the next re-attempt is set to the minimum value possible. The number of re-attempts is set to the lowest possible number, greater than 1, that is supported by the MS. The autocalling function is invoked for the B-party number to be used during the test.

Specific PICS statements:

- Implementation of cause number 27 of busy autocalling in category 2 (TSPC_AddInfo_Impl_CNr27_Cat2)
- Implementation of cause number 27 of busy autocalling in category 3 (TSPC_AddInfo_Impl_CNr27_Cat3)

PIXIT statements:

- Description of auto calling management:
- selection of the auto calling;
- indication that the call failed and a re-try is attempted;
- indication that a call finally failed;
- number of B-party numbers that can be stored in the list of blacklisted numbers
- Non standard keystroke sequences to be used on the EMMI (in line with 3GPP TS 11.10, clause 36).

Foreseen Final State of the MS

The MS has a valid TMSI. It is "idle updated".

Test Procedure

A MS initiated generic call setup is performed upto and including CIPERING MODE COMPLETE. The SS then releases the establishment with a cause value from Category 3 3GPP TS 02.07 annex A.

The MS will make one futher generic call setup attempt invoked by the auto calling function after a channel release is sent out by the SS.

Step	Direction	Message	Comments
1	MS		"called number" entered
2	MS -> SS	CHANNEL REQUEST	Establishment cause indicates "originating call".
3	SS -> MS	IMMEDIATE ASSIGNMENT	
4	MS -> SS	CM SERVICE REQUEST	Message is contained in SABM.
5	SS -> MS	AUTHENTICATION REQUEST	
6	MS -> SS	AUTHENTICATION RESPONSE	
7	SS -> MS	CIPHERING MODE COMMAND	
8	MS -> SS	CIPHERING MODE COMPLETE	
9	SS		SS starts ciphering.
10	MS -> SS	SETUP	
11	SS -> MS	CIPHERING MODE COMMAND	
12	MS -> SS	CIPHERING MODE COMPLETE	
13	SS		SS stops ciphering
14	SS -> MS	RELEASE COMPLETE	Cause value from category 3 of 3GPP TS 02.07, annex A.
15	SS -> MS	CHANNEL RELEASE	The main signalling link is released
16			The MS is invoking the auto calling function. The time between step 15 and 17 must be minimum 5 sec.
17	MS -> SS	CHANNEL REQUEST	Establishment cause indicates "originating call".
18	SS -> MS	IMMEDIATE ASSIGNMENT	
19	MS -> SS	CM SERVICE REQUEST	Message is contained in SABM.
20	SS -> MS	AUTHENTICATION REQUEST	
21	MS -> SS	AUTHENTICATION RESPONSE	
22	SS -> MS	CIPHERING MODE COMMAND	
23	MS -> SS	CIPHERING MODE COMPLETE	
24	SS		SS starts ciphering.
25	MS -> SS	SETUP	
26	SS -> MS	CIPHERING MODE COMMAND	
27	MS -> SS	CIPHERING MODE COMPLETE	
28	SS		SS stops ciphering
29	SS -> MS	RELEASE COMPLETE	Cause value from category 3 of 3GPP TS 02.07, annex A.
30	SS -> MS	CHANNEL RELEASE	The main signalling link is released
31	MS		Clear the auto calling constraint by manual intervention after a minimum of 2 minutes from step 30.

28.3 Constraining the access to a single number (3GPP TS 02.07 categories 1 and 2)

During this test the SETUP messages shall contain the same B-party number.

No manual intervention shall be performed except to initiate and end the test.

28.3.1 Conformance requirement

The MS must fulfil the requirements for category 1 and 2, see subclause 28.2.1

Reference:

3GPP TS 02.07, annex A.

28.3.2 Test purpose

To ensure the correct behaviour of the MS to 3GPP TS 02.07 Categories 1 and 2.

28.3.3 Method of test

Initial condition.

There shall be no numbers in the list of blacklisted numbers in the MS. The re-try scheme is set to give the shortest possible intervals between re-tries. The number of re-attempts is set to the maximum possible number (N), that is supported by the MS. The autocalling function is invoked for the B-party number to be used during the test.

Specific PICS statements:

- Implementation of cause number 27 of busy autocalling in category 2 (TSPC_AddInfo_Impl_CNr27_Cat2)
- Implementation of cause number 27 of busy autocalling in category 3 (TSPC_AddInfo_Impl_CNr27_Cat3)

PIXIT statements:

- Description of auto calling management:
- selection of the auto calling;
- indication that the call failed and a re-try is attempted;
- indication that a call finally failed;
- number of B-party numbers that can be stored in the list of blacklisted numbers
- Non standard keystroke sequences to be used on the EMMI (in line with 3GPP TS 11.10, clause 36).

Foreseen Final State of the MS

The MS has a valid TMSI. It is "idle updated".

Test Procedure

A, MS initiated, generic call setup is performed up to and including CIPHERING MODE COMPLETE. The SS then releases the establishment with a cause value from category 1 or 2 (3GPP TS 02.07, annex A).

The MS is continuously making new generic call setup attempts invoked by the auto calling function after each CHANNEL RELEASE from the SS.

Step	Direction	Message	Comments
1	MS		"called number" entered
2	MS -> SS	CHANNEL REQUEST	Establishment cause indicates "originating call".
3	SS -> MS	IMMEDIATE ASSIGNMENT	
4	MS -> SS	CM SERVICE REQUEST	Message is contained in SABM.
5	SS -> MS	AUTHENTICATION REQUEST	
6	MS -> SS	AUTHENTICATION RESPONSE	
7	SS -> MS	CIPHERING MODE COMMAND	SS starts deciphering after sending the message.
8	MS -> SS	CIPHERING MODE COMPLETE	
9	SS		SS starts ciphering.
10	MS -> SS	SETUP	
11	SS -> MS	CIPHERING MODE COMMAND	
12	MS -> SS	CIPHERING MODE COMPLETE	
13	SS		SS stops ciphering
14	SS -> MS	RELEASE COMPLETE	Cause value from category 1 or 2 of 3GPP TS 02.07, annex A. This shall be chosen randomly, from both categories. Cause no. 27 shall be excluded if the MS has implemented in category 3 of 3GPP TS 02.07, as declared in PIXIT statement
15	SS -> MS	CHANNEL RELEASE	The main signalling link is released
16			The MS is invoking the auto calling function. 1: At the first re-attempt the time between step 15 and 17 must be minimum 5 sec. 2: At the 2nd, 3rd and 4th re-attempt the time between step 15 and 17 must be minimum 1 min. 3: At the 5th to 10th re-attempt the time between step 15 and 17 must be minimum 3 min.
17	MS -> SS	CHANNEL REQUEST	Establishment cause indicates "originating call".
18	SS -> MS	IMMEDIATE ASSIGNMENT	
19	MS -> SS	CM SERVICE REQUEST	Message is contained in SABM.
20	SS -> MS	AUTHENTICATION REQUEST	
21	MS -> SS	AUTHENTICATION RESPONSE	
22	SS -> MS	CIPHERING MODE COMMAND	SS starts deciphering after sending the message.
23	MS -> SS	CIPHERING MODE COMPLETE	
24	SS		SS starts ciphering.
25	MS -> SS	SETUP	
26	SS -> MS	CIPHERING MODE COMMAND	
27	MS -> SS	CIPHERING MODE COMPLETE	
28	SS		SS stops ciphering
29	SS -> MS	RELEASE COMPLETE	Cause value from category 1 or 2 of 3GPP TS 02.07, annex A. This shall be chosen randomly, from both categories. Cause no. 27 shall be excluded if the MS has implemented in category 3 of 3GPP TS 02.07, as declared in PIXIT statement
30	SS -> MS	CHANNEL RELEASE	The main signalling link is released.
31			The auto calling function shall repeat step 16 to 30 (N-1) times. The MS shall not make more than maximum 10 re-attempts.
32	MS		Clear the auto calling constraint by manual intervention after a minimum of 4 minutes from step 31. Following the final completion of step 31 the MS initiate a call prior to manual intervention.

28.4 Behaviour of the MS when its list of blacklisted numbers is full

The number of B-party numbers that can be stored in the list of blacklisted numbers, as stated in the PIXIT statement (annex 3), is M.

28.4.1 Conformance requirement

The number of B numbers that can be held in the blacklist is at the manufacturers discretion but there shall be at least 8. However, when the blacklist is full the MT shall prohibit further automatic call attempts to any one number until the blacklist is manually cleared at the MT in respect of one or more B numbers.

Reference:

3GPP TS 02.07, annex A.

28.4.2 Test purpose

To ensure the correct behaviour of the MS when its list of blacklisted numbers is full.

28.4.3 Method of test

Initial condition.

The list of blacklisted numbers, in the MS, shall be full. This may be achieved as described in the procedure in subclause 28.2, applied to M B-party numbers.

Specific PICS statements:

- Implementation of cause number 27 of busy autocalling in category 2 (TSPC_AddInfo_Impl_CNr27_Cat2)
- Implementation of cause number 27 of busy autocalling in category 3 (TSPC_AddInfo_Impl_CNr27_Cat3)

PIXIT statements:

- Description of auto calling management:
- selection of the auto calling;
- indication that the call failed and a re-try is attempted;
- indication that a call finally failed;
- number of B-party numbers that can be stored in the list of blacklisted numbers.
- Non standard keystroke sequences to be used on the EMMI (in line with 3GPP TS 11.10, clause 36).

Foreseen Final State of the MS

The MS has a valid TMSI. It is "idle updated".

Test Procedure

The autocalling function is invoked for a B-party number that is not in the list of blacklisted numbers.

Clear the autocalling constraint by manual intervention after a minimum of 2 minutes.

28.4.4 Test requirements

The MS must not initiate a call.

Step	Direction	Message	Comments
1	MS		"called number" entered
2	MS -> SS	CHANNEL REQUEST	Establishment cause indicates "originating call".
3	SS -> MS	IMMEDIATE ASSIGNMENT	
4	MS -> SS	CM SERVICE REQUEST	Message is contained in SABM.
5	SS -> MS	AUTHENTICATION REQUEST	
6	MS -> SS	AUTHENTICATION RESPONSE	
7	SS -> MS	CIPHERING MODE COMMAND	SS starts deciphering after sending the message.
8	MS -> SS	CIPHERING MODE COMPLETE	
9	SS		SS starts ciphering.
10	MS -> SS	SETUP	
11	SS -> MS	CIPHERING MODE COMMAND	SS stops deciphering after sending the message.
12	MS -> SS	CIPHERING MODE COMPLETE	
13	SS		SS stops ciphering.
14	SS -> MS	RELEASE COMPLETE	Cause value from category 3 of 3GPP TS 02.07, annex A. This shall be chosen randomly. Cause no. 27 shall be excluded if the MS has implemented in category 2 of 3GPP TS 02.07, as declared in PIXIT statement
15	SS -> MS	CHANNEL RELEASE	The main signalling link is released
16			The MS is invoking the auto calling function. The time between step 15 and 17 must be minimum 5 sec.
17	MS -> SS	CHANNEL REQUEST	Establishment cause indicates "originating call".
18	SS -> MS	IMMEDIATE ASSIGNMENT	
19	MS -> SS	CM SERVICE REQUEST	Message is contained in SABM.
20	SS -> MS	AUTHENTICATION REQUEST	
21	MS -> SS	AUTHENTICATION RESPONSE	
22	SS -> MS	CIPHERING MODE COMMAND	SS starts deciphering after sending the message.
23	MS -> SS	CIPHERING MODE COMPLETE	
24	SS		SS starts ciphering.
25	MS -> SS	SETUP	
26	SS -> MS	CIPHERING MODE COMMAND	SS stops deciphering after sending the message.
27	MS -> SS	CIPHERING MODE COMPLETE	
28	SS		SS stops ciphering.
29	SS -> MS	RELEASE COMPLETE	Cause value from category 3 of 3GPP TS 02.07, annex A. This shall be chosen randomly. Cause no. 27 shall be excluded if the MS has implemented in category 2 of 3GPP TS 02.07, as declared in PIXIT statement
30	SS -> MS	CHANNEL RELEASE	The main signalling link is released.
31			The test shall be repeated from steps 1 to 30 using a different B party number each time until the blacklist is full as declared in PIXIT statement. The MS shall not make more than a maximum of 1 re-attempt on each number.
32			The test shall be repeated from steps 1 to 15 using a non-blacklisted B party number
33	SS		The SS verifies that the MS does not initiate an automatic re-attempt for a minimum of 2 minutes from step 32.
34	MS		Clear the auto calling constraint by manual intervention.

29 Testing of bearer services

29.1 General

In 3GPP TS 07.01, subclause 2 the reference configurations for access to the data services of a GSM PLMN are described. For testing purposes only the following classifications are used:

- MT2 configuration (Um- and R-interface available for testing).
- Configurations (only Um-interface available for testing) where it is possible to enable the MS to issue or accept a data call and send data over the Um-interface. An MT1 connected to an ISDN TE belongs to this type.

- For efficient testing it is essential that such configurations have some means to specifically activate every function towards the Um-interface the MS will perform during operation.
- The correctness of the data bits transferred to the Um-interface will not be tested in these configurations. However the correctness of the 3GPP TS 04.21 frames sent by the MS will be tested.

Testing the S-interface for the MT1 configuration is for further study.

For some tests it is of no importance whether the call is MO or MT. However, there might be configurations allowing the call to be established only from one side. In this case the appropriate actions shall be taken to establish the call.

In all other cases the data call shall be set up by the SS (i.e. MT) with an appropriate BC-IE which is supported by the MS.

At the beginning of all tests the MS shall be in the idle updated state.

29.2 Testing of transparent data services

During all the tests the 3GPP TS 04.21 frames received as output of the channel coder in the SS shall be checked for correctness against 3GPP TS 04.21; this means checking that:

- S bits are coded as zeroes unless otherwise specified;
- the E bits have the correct value (for the synchronous services);
- the data bits correctly include the start and stop bits (for the asynchronous services).

29.2.1 Verification of synchronization

29.2.1.1 Definition

-29.2.1.2 Conformance requirement

A Mobile Stations in MT2 configuration has to comply with all requirements whilst for other configurations some of the requirements are not relevant. These restrictions are explicitly indicated in subclause 29.2.1.5.

29.2.1.3 Test purpose

This test verifies the correct synchronization procedure of user data and status information which are mapped on modified ITU-T Recommendation V.110 frames (as per 3GPP TS 04.21).

As V-series interfaces are supported in full duplex mode, it will test the capability to synchronize these frames in the direction from the TAF to the IWF and vice versa.

29.2.1.4 Method of test

The test shall be carried out under ideal radio conditions for all bearer services and user rates in transparent mode that are supported by the MS in case of mobile originated and terminated calls and in-call modification. The setting of Bearer Capability Information Elements in signalling messages sent to the MS by the SS must be supported by the MS for the bearer service(s) to be tested.

NOTE 1: Since "steady state" is implementation dependent, there is no means to define a test "steady state detected". However, the whole testing procedure is limited to 1s. This includes an implicit upper time limit for the MS to detect a steady state. A MS failing this test is highly estimated to never detect a steady state under real radio conditions.

NOTE 2: ti, as used in the description of the test procedures, are points of time, not timers.

29.2.1.4.1 Procedure for Mobile Originated Calls

a) The MS is connected to the System Simulator at the Um interface and to the LTE using the appropriate R interface in case of MT2 only.

b) The MS is configured for data transmission. In the case of MT2 configurations, the LTE shall set the signalling lines of the R interface Ct 105, Ct 108.2 for V-series interface to ON.

c) A mobile originated call shall be set up.

d) At the reception of the SETUP message sent by the MS the SS shall send a CONNECT message and starts sending "1/OFF". t1 is at the completion of the CONNECT message.

e) The reception of "1/OFF" at the SS side (see table 29-1) defines t2. t2 will be reset at the reception of again "1/OFF" after an interruption of continuous "1/OFF" pattern.

f) The SS checks bits S1, S3, S6 and S8 of the modified ITU-T Recommendation V.110 frames (as described in 3GPP TS 04.21). Let t3 be the time when all four bits change from OFF to ON (i.e. if t<t3, (S1,S3,S6,S8) <> (0,0,0,0) and t>=t3,(S1,S3,S6,S8) = (0,0,0,0)).

29.2.1.4.2 Procedure for Mobile Terminated Calls

a) The MS is connected to the System Simulator at the Um interface and to the LTE using the appropriate R interface in case of MT2 only.

b) The MS is configured for data transmission. In the case of MT2 configurations, The LTE shall set the signalling lines of the R interface Ct. 105, Ct 108.2 for V-series interface to ON.

c) A mobile terminated call shall be set up.

d) At the reception of CONNECT the SS sends CONNECT ACKNOWLEDGE. t1 is at the completion of the CONNECT ACKNOWLEDGE message.

e) The reception of "1/OFF" at the SS side (see table 29-1) defines t2. t2 will be reset at the reception of again "1/OFF" after an interruption of continuous "1/OFF" pattern.

f) The SS checks bits S1, S3, S6 and S8 of the modified ITU-T Recommendation V.110 frames (as described in 3GPP TS 04.21). Let t3 be the time when all four bits change from OFF to ON (i.e. if t<t3, (S1,S3,S6,S8) <> (0,0,0,0) and t>=t3,(S1,S3,S6,S8) = (0,0,0,0)).

29.2.1.4.3 Procedure for In Call Modification

a) The MS is connected to the System Simulator at the Um interface and to the LTE using the appropriate R interface in case of MT2 only.

b) The MS is configured for data transmission. In the case of MT2 configurations, the LTE shall set the signalling lines of the R interface Ct. 105, Ct 108.2 for V-series interface to ON.

c) A speech call shall be established with a SETUP message containing two bearer capabilities for speech and the bearer service to be tested.

d) The MS shall start the ICM procedure with a bearer capability information element supporting the bearer service to be tested.

e) At the reception of the MODIFY message sent by the MS the SS shall send a CHANNEL MODE MODIFY message.

f) At the reception of the CHANNEL MODE MODIFY ACKNOWLEDGE message the SS shall send a MODIFY COMPLETE message. t1 is at the completion of the MODIFY COMPLETE message.

g) The reception of "1/OFF" (see table 29-1) defines t2. t2 will be reset at the reception of again "1/OFF" after an interruption of continuous "1/OFF" pattern.

h) The SS checks bits S1, S3, S6 and S8 of the modified ITU-T Recommendation V.110 frames (as described in 3GPP TS 04.21). Let t3 be the time when all four bits change from OFF to ON (i.e. if t<t3, (S1,S3,S6,S8) <> (0,0,0,0) and t>=t3,(S1,S3,S6,S8) = (0,0,0,0)).

29.2.1.5 Test requirements

29.2.1.5.1 Test requirements for Mobile Originated Calls

1) After step b) Cts 106, 107, 109 must be in the "OFF" condition, dataline 104 shall be set to "1".

2) At t1 + 500 ms Ct 107 must still be in the "OFF" condition.

3) Between t1 + 500 ms and t1 + 1 000 ms Ct 107 must switch to the "ON" condition. This indicates successful synchronization of TAF towards IFE.

4) Between t2 and t3 the SS must receive continuous "1/OFF" frames.

5) The time between t2 and t3 must be more than 450 ms.

6) At t1 +1000ms the SS must check 3GPP TS 04.21 frames sent by the MS with SA and SB bits (i.e. bits S1, S3, S4, S6, S8 and S9) set to "ON". This indicates successful synchronization of IFE towards TAF. At this point of time the whole synchronization procedure has been completed successfully.

NOTE: If the MS is not MT2, only requirements 4 to 6 apply.

29.2.1.5.2 Test requirements for Mobile Terminated Calls

1) After step b) Cts 106, 107, 109 must be in the "OFF" condition, dataline 104 shall be set to "1".

2) At t1 + 500 ms Ct 107 must still be in the "OFF" condition.

3) Between t1 + 500 ms and t1 + 1 000 ms Ct 107 must switch to the "ON" condition. This indicates successful synchronization of TAF towards IFE.

4) Between t2 and t3 the SS must receive continuous "1/OFF" frames.

5) The time between t2 and t3 must be more than 450 ms.

6) At t1 +1000 ms the SS must check 3GPP TS 04.21 frames sent by the MS with SA and SB bits (i.e. bits S1, S3, S4, S6, S8 and S9) set to "ON". This indicates successful synchronization of IFE towards TAF. At this point of time the whole synchronization procedure has been completed successfully.

NOTE: If the MS is not MT2, only requirements 4 to 6 apply.

29.2.1.5.3 Test requirements for In Call Modification

1) After step b) Cts 106, 107, 109 must be in the "OFF" condition, dataline 104 shall be set to "1".

2) At t1 + 500 ms Ct 107 must still be in the "OFF" condition.

3) Between t1 + 500 ms and t1 + 1 000 ms Ct 107 must switch to the "ON" condition. This indicates successful synchronization of TAF towards IFE.

4) Between t2 and t3 the SS must receive continuous "1/OFF" frames.

5) The time between t2 and t3 must be more than 450 ms.

6) At t1 +1 000 ms the SS must check 3GPP TS 04.21 frames sent by the MS with SA and SB bits (i.e. bits S1, S3, S4, S6, S8 and S9) set to "ON". This indicates successful synchronization of IFE towards TAF. At this point of time the whole synchronization procedure has been completed successfully.

NOTE: If the MS is not MT2, only requirements 4 to 6 apply.

Table 29-1: Definition of synchronization pattern "1/OFF"
3GPP TS 04.21 60 bits frame

Synch-Frame							Data-Frame						
1	1	1	1	1	1	1	D1	D2	D3	D4	D5	D6	S1
1	1	1	1	1	1	1	D7	D8	D9	D10	D11	D12	X
1	1	1	1	1	1	1	D13	D14	D15	D16	D17	D18	S3
1	1	1	1	1	1	1	D19	D20	D21	D22	D23	D24	S4
1	1	1	1	1	1	1	E4	E5	E6	E7	D25	D26	S27
1	1	1	1	1	1	1	D28	D29	D30	S6	D31	D32	S33
1	1	1	1	1	1	1	D34	D35	D36	X	D37	D38	S39
1	1	1	1	1	1	1	D40	D41	D42	S8	D43	D44	S45
1	1	1	1				D46	D47	D48	S9			

Table 29-1: Definition of synchronization pattern "1/OFF"
3GPP TS 04.21 36 bits frame

Synch-Frame								Data-Frame							
1	1	1	1	1	1	1	1	D1	D2	D3	S1	D4	D5	D6	X
1	1	1	1	1	1	1	1	D7	D8	D9	S3	D10	D11	D12	S4
1	1	1	1	1	1	1	1	E4	E5	E6	E7	D13	D14	D15	S6
1	1	1	1	1	1	1	1	D16	D17	D18	X	D19	D20	D21	S8
1	1	1	1	1				D22	D23	D24	S9				

29.2.2 Filtering of channel control information for transparent BCs

29.2.2.1 Definition

-29.2.2.2 Conformance requirement

An MS supporting data services shall decode and filter channel control information received over the Um-interface.

1. 3GPP TS 04.21, clause 7;
2. 3GPP TS 07.01, subclause 8.2.2;
3. 3GPP TS 07.02, subclause 3.2.1 (for asynchronous bearer services only);
4. 3GPP TS 07.03, subclauses 4.2.1 and 4.2.2 (for synchronous bearer services only).

29.2.2.3 Test purpose

The purpose of this test is to verify the correct decoding and filtering of channel control information from the 3GPP TS 04.21 frames to the V.24/X.21 interface circuits. The tests apply after synchronization has been completed.

29.2.2.4 Method of test

The Test shall be carried out for all user data rates supported by the MS (see below) and the circuits CT106 (V.24) (interface circuit bit X) and CT109 (V.24) (interface circuit bit SB) and I (X.21) (S-bits). The test shall be carried out only for those frame formats and circuits which are supported by the MS. The test is to be repeated for all circuits.

Let T(ON-OFF) and T(OFF-ON) be the timers to integrate the ON-OFF and the OFF-ON transition respectably for the circuit to be tested as stated in 3GPP TS 07.01, subclause 8.2.2.

Procedure:

a) A data call shall be set up between the SS and the MS with a combination of BCIEs (see below) supported by the MS. The interface circuit bit(s) in the 3GPP TS 04.21 frame shall be set to OFF. The next step shall be entered 6 s after CT107 has been set to ON by the MS.

b) The SS shall set the interface circuit bit(s) to continuously ON, wait half of T(OFF-ON) and then set the interface circuit bit(s) again to continuously OFF. The SS shall wait 6 s before entering the next step.

c) The SS shall set the interface circuit bit(s) to continuously ON, wait twice T(OFF-ON) and then set the interface circuit bit(s) again to continuously OFF. The SS shall wait 6 s before entering the next step.

d) The SS shall set interface circuit bit(s) to continuously ON and wait 6 s before entering the next step

e) The SS shall set the interface circuit bit(s) to continuously OFF, wait half of T(ON-OFF) and then set the interface circuit bit(s) again to continuously ON. The SS shall wait 6 s before entering the next step.

f) The SS shall set the interface circuit bit(s) to continuously OFF, wait twice T(ON-OFF) and then set the interface circuit bit(s) again to continuously ON. The SS shall wait 6 s before entering the next step.

29.2.2.5 Test requirements

1) After step a) the interface circuit at the R-interface shall be OFF.

2) During step b) the interface circuit at the R-interface shall not change.

3) During step c) the interface circuit at the R-interface shall change to ON and then again to OFF.

4) After step d) the interface circuit at the R-interface shall be ON.

5) During step e) the interface circuit at the R-interface shall not change.

6) During step f) the interface circuit at the R-interface shall change to OFF and then again to ON.

29.2.2.6 BCIE

The following combinations shall be considered (ref. 3GPP TS 07.01, annex 2):

a) User Rate = 9,6 kbit/s;

b) User Rate = 4,8 kbit/s;

c) User Rate = 2,4 kbit/s;

d) User Rate = 1,2 kbit/s;

e) User Rate = 1 200/75 bit/s (only with asynchronous Bearer Services);

f) User Rate = 300 bit/s (only with asynchronous Bearer Services).

The remaining parameters of the BCIE and the channel type (FR/HR) shall be set to a value supported by the MS.

29.2.3 Correct Terminal Compatibility Decision

29.2.3.1 Negotiation of Radio Channel Requirement (RCR)

29.2.3.1.1 Test purpose

To verify that the MS ignores the RCR field in a mobile terminating setup and negotiates according to its capabilities and to the service requested. A Dual Rate support MS shall accept the channel rate chosen be the network in the ASSIGNMENT COMMAND message.

29.2.3.1.2 Initial conditions

For an MS with an external interface, the interface shall be setup in such a way that the MS is able to successfully receive the call for the service in question.

Specific PICS statements:

-

PIXIT statements:

- Way to receive the call

- Features which must be activated by MMI before an incoming call can be accepted.

29.2.3.1.3 Test method

a) The SS transmits a SETUP message containing a BC-IE among those declared as supported by the MS and with the RCR field set to "01".

b) The SS sends a ASSIGNMENT COMMAND message with a channel type set to "Full Rate" unless the CALL CONFIRM message indicates "dual rate mobile station/full rate preferred". In that case, the channel type is set to "Half Rate".

c) The call is released and steps a) and b) are repeated with RCR field set to "00".

d) The call is released and steps a) and b) are repeated with RCR field set to "10".

e) The call is released and steps a) and b) are repeated with RCR field set to "11".

29.2.3.1.4 Test requirements

1) After step a), the MS shall send a CALL CONFIRM message. If present, the BC-IE shall be coded according to 3GPP TS 07.01. If any other parameters than those listed below have different values than those of the BC-IE included in the SETUP, then the test shall be failed:

   - Number of stop bits, number of data bits, parity;
   - Connection Element, Structure, Intermediate rate, User Information Layer 2 Protocol, Modem Type, NIRR;
   - Radio Channel Requirement.

2) After step b), the MS shall answer to the ASSIGNMENT COMMAND message with an ASSIGNMENT COMPLETE message.

29.2.3.2 Negotiation of Connection Element (CE)

29.2.3.2.1 Test purpose

To verify that the MS accepts a CE equal to "Both, Transparent Preferred" or "Both Non Transparent Preferred" and indicates its choice in the CALL CONFIRM message.

29.2.3.2.2 Initial condition

For an MS with an external interface, the interface shall be setup in such a way that the MS is able to successfully receive the call for the service in question.

Specific PICS statements:

-

PIXIT statements:

- Way to receive the call
- Features which must be activated by MMI before an incoming call can be accepted.

29.2.3.2.3 Test method

a) The SS transmits a SETUP message containing a BC-IE among those declared as supported by the MS and with the CE field set to "Both Transparent Preferred". The RCR parameter shall be set to "Full Rate". The UIL2P is not included (i.e. octet 7 is absent). The NIRR is set to "no meaning" (i.e. 0). The IR is set to "16 kbit/s". The modem type is any according to declared capabilities. The user rate is any according to declared capabilities and modem type.

b) The call is released and step a) is repeated with CE field set to "Both Non Transparent Preferred".

29.2.3.2.4 Test requirements

After step a), the MS shall send a CALL CONFIRM message. The BC-IE shall be present and shall be coded according to 3GPP TS 07.01 and shall correspond to a Bearer Service or Teleservice supported by the MS. The CE shall be set to either "Transparent" or "Non Transparent" If any other parameters than those listed bellow have different values than those of the BC-IE included in the SETUP, then the test shall be failed:

- number of stop bits, number of data bits, parity;
- Connection Element, Structure, Intermediate rate, User Information Layer 2 Protocol, Modem Type, NIRR;
- Radio Channel Requirement.

29.2.3.3 Negotiation of Number of Stop Bits, Number of Data bits, and Parity

29.2.3.3.1 Test purpose

To verify that the MS accepts any value for the parameters Number of Stop Bits, Number of Data bits, and Parity in a mobile terminating Setup and negotiates according to its capabilities and to the service requested.

29.2.3.3.2 Initial condition

For an MS with an external interface, the interface shall be setup in such a way that the MS is able to successfully receive the call for the service in question.

Specific PICS statements:

-

PIXIT statements:

- Way to receive the call
- Features which must be activated by MMI before an incoming call can be accepted.

29.2.3.3.3 Test method

a) The SS transmits a SETUP message containing a BC-IE among those declared as supported by the MS and corresponding to an asynchronous Bearer Service, and with the Number of Stop Bits (NSB) field set to "1 bit", the Number of Data Bits (NDB) field set to "8 bits", and the Parity field set to "none".

b) The call is released and step a) is repeated with the Number of Stop Bits (NSB) field set to "2 bit", the Number of Data Bits (NDB) field set to "7 bits", and the Parity field set to "odd".

29.2.3.3.4 Test requirements

After steps a) and b), the MS shall send a CALL CONFIRMED message. If present, the BC-IE shall be coded according to 3GPP TS 07.01 and shall correspond to a Bearer Service supported by the MS. If any other parameters than those listed bellow have different values than those of the BC-IE included in the SETUP, then the test shall be failed:

- Number of stop bits, number of data bits, parity;
- Connection Element, Structure, Intermediate rate, User Information Layer 2 Protocol, Modem Type, NIRR;
- Radio Channel Requirement.

29.2.3.4 Negotiation of Modem Type

29.2.3.4.1 Test purpose

To verify that the MS accepts the value "autobauding type 1" for the parameter Modem Type in a mobile terminating Setup and negotiates according to its capabilities and to the service requested.

NOTE: It is not clear if the MS should also accept any possible value for the Modem Type field.

29.2.3.4.2 Initial condition

For an MS with an external interface, the interface shall be setup in such a way that the MS is able to successfully receive the call for the service in question.

Specific PICS statements:

-

PIXIT statements:

- Way to receive the call
- Features which must be activated by MMI before an incoming call can be accepted.

29.2.3.4.3 Test method

a) The SS transmits a SETUP message containing a BC-IE among those declared as supported by the MS and corresponding to a non transparent Bearer Service (the Connection Element field is coded "Non transparent"), and with the Modem Type field set to "autobauding type 1".

b) The call is released and step a) is repeated with the same BC in the SETUP message, but with the Connection Element set to "both, non-transparent preferred".

29.2.3.4.4 Test requirements

After steps a) and b), the MS shall send a CALL CONFIRMED message. If present, the BC-IE shall be coded according to 3GPP TS 07.01 and shall correspond to a Bearer Service or Teleservice supported by the MS. If any other parameters than those listed bellow have different values than those of the BC-IE included in the SETUP, then the test shall be failed:

- Number of stop bits, number of data bits, parity;
- Connection Element, Structure, Intermediate rate, User Information Layer 2 Protocol, Modem Type, NIRR;
- Radio Channel Requirement.

29.2.3.5 Negotiation of Intermediate Rate

29.2.3.5.1 Test purpose

To verify that the MS responds correctly to a request for a negotiation of the Intermediate Rate parameter in a mobile terminating Setup and negotiates according to its capabilities and to the service requested.

NOTE: The MS may support these services with a 6 Kbit/s or (non exclusive) 12 Kbit/s radio interface rate.

29,2,3.5.2 Initial condition

For an MS with an external interface, the interface shall be setup in such a way that the MS is able to successfully receive the call for the service in question.

Specific PICS statements:

-

PIXIT statements:

- Way to receive the call
- Features which must be activated by MMI before an incoming call can be accepted.

29.2.3.5.3 Test method

a) The SS transmits a SETUP message containing a BC-IE among those declared as supported by the MS and corresponding to a non transparent Bearer Service (the Connection Element field is coded "Non transparent") with the user rate lower to or equal 4,8 kbit/s, and with the NIRR field set to "No meaning". The RCR field is set to "full rate", and the Intermediate Rate field is set to "16 kbit/s".

b) The call is released and step a) is repeated with the same BC in the SETUP message, but with the Connection Element set to "both, non-transparent preferred".

c) The call is released and steps a) and b) are repeated with the NIRR field of the SETUP message set to "6 kbit/s".

29.2.3.5.4 Test requirements

1) After steps a), b) and c), the MS shall send a CALL CONFIRMED message. If present, the BC-IE shall be coded according to 3GPP TS 07.01 and shall correspond to a Bearer Service or Teleservice supported by the MS. If any other parameters than those listed bellow have different values than those of the BC-IE included in the SETUP, then the test shall be failed:

   - Number of stop bits, number of data bits, parity;
   - Connection Element, Structure, Intermediate rate, User Information Layer 2 Protocol, Modem Type, NIRR;
   - Radio Channel Requirement.

2) If the BC-IE is present in the CALL CONFIRMED message after step c) and if the Connection Element field contains the value "non transparent", the Intermediate Rate field shall indicate:

   - 8 kbit/s if the NIRR field is set to "6 kbit/s";

- 16 kbit/s if the NIRR field is set to "no meaning".

29.2.3.6 Negotiation of User Information Layer 2 Protocol

29.2.3.6.1 Test purpose

To verify that the MS accepts any value (including the absence of) the UIL2P parameter in a mobile terminating Setup and negotiates according to its capabilities and to the service requested.

29.2.3.6.2 Initial condition

For an MS with an external interface, the interface shall be setup in such a way that the MS is able to successfully receive the call for the service in question.

Specific PICS statements:

-

PIXIT statements:

- Way to receive the call
- Features which must be activated by MMI before an incoming call can be accepted.

29.2.3.6.3 Test method

a) The SS transmits a SETUP message containing a BC-IE among those declared as supported by the MS and corresponding to a non transparent Bearer Service (the Connection Element field is coded "Non transparent") and with no UIL2P parameter (i.e. octet 7 of the BC IE is absent).

b) The call is released and step a) is repeated with the same BC in the SETUP message, but with the value "ISO6429, codeset 0 (DC1/DC3)" in the UIL2P parameter.

c) The call is released and step b) is repeated with the same BC in the SETUP message, but with the value "COPnoFLCt" in the UIL2P parameter.

d) The call is released and steps a), b) and c) are repeated with the same BC in the SETUP message, but with the Connection Element set to "both, non-transparent preferred".

29.2.3.6.4 Test requirements

1) After steps a), b) and c), the MS shall send a CALL CONFIRMED message. If present, the BC-IE shall be coded according to 3GPP TS 07.01 and shall correspond to a Bearer Service or Teleservice supported by the MS. If any other parameters than those listed bellow have different values than those of the BC-IE included in the SETUP, then the test shall be failed:

   - Number of stop bits, number of data bits, parity;
   - Connection Element, Structure, Intermediate rate, User Information Layer 2 Protocol, Modem Type, NIRR;
   - Radio Channel Requirement.

2) If the BC-IE is present in the CALL CONFIRMED message, and if the Connection Element is set to "transparent", octet 7 (containing the UIL2P parameter) shall be absent.

29.2.3.7 Negotiation between TS 61 and TS 62: Mobile Originated call

29.2.3.7.1 Test purpose

To verify that the MS accepts a negotiation from TS 61 to TS 62.

29.2.3.7.2 Initial condition

For an MS with an external interface, the interface shall be setup in such a way that the MS is able to successfully set up a call for TS 61.

Specific PICS statements:

-

PIXIT statements:

- Way to set up the call
- Features which must be activated by MMI before an outgoing call can be set up.

29.2.3.7.3 Test method

a) The MS is made to set up a call for TS 61. If the MS supports it, the first phase of the call is speech.

b) The SS responds to the SETUP message with a CALL PROCEEDING message containing a BC-IE coded according to 3GPP TS 07.01 and corresponding to TS 62.

c) The SS sends an ALERTING message followed by a CONNECT message.

d) If the MS supports it, steps a), b) and c) are repeated with a call setup for TS 61 with the first phase of the call being fax.

29.2.3.7.4 Test requirements

1) After step b), the MS shall accept the call (i.e. it shall not reject the call with a DISCONNECT message).

2) After step c), the MS shall answer with a CONNECT ACKNOWLEDGE message.

29.2.3.8 Negotiation between TS 61 and TS 62: Mobile Terminated call

29.2.3.8.1 Test purpose

To verify that an MS that does not support TS 61 accepts a Mobile Terminated call setup request for TS 61 and negotiates the demand to TS 62.

29.2.3.8.2 Initial condition

For an MS with an external interface, the interface shall be setup in such a way that the MS is able to successfully receive the call for the service in question.

Specific PICS statements:

-

PIXIT statements:

- Way to receive the call
- Features which must be activated by MMI before an incoming call can be accepted.

29.2.3.8.3 Test method

a) The SS transmits a SETUP message containing two BC-IEs: the first BC shall indicate speech, the second BC shall indicate fax group 3.

b) The call is released, and the SS transmits a SETUP message containing two BC-IEs: the first BC shall indicate fax group 3, the second BC shall indicate speech.

29.2.3.8.4 Test requirements

After steps a) and b), the MS shall send a CALL CONFIRMED message with one and only one BC-IE. The BC-IE shall be coded according to 3GPP TS 07.01 and shall correspond to TS 62.

29.2.4 Data Rate Adaptation for Synchronous Transparent Bearer Capabilities

29.2.4.1 Definition

-29.2.4.2 Conformance requirement

An MS supporting synchronous transparent bearer capabilities shall perform data rate adaptation and support the frames at the Um-interface according to the following specifications:

1. 3GPP TS 04.21, clauses 5 and 7.

29.2.4.3 Test purpose

The purpose of these tests is to verify:

- that the format and the data bits of the 3GPP TS 04.21 frames sent by the MS are consistent with the data input and data rate at the R-interface; and

- that the data bits output by the MS at the R-interface are consistent with the received 3GPP TS 04.21 frames.

29.2.4.4 Method of test

The Test shall be carried out for all possible user data rates which are supported by the MS (see below). In case of an MT2 configuration, the interface circuits CT105 and CT108 shall be set to the ON condition from the start.

Procedure:

a) A data call shall be set up between the SS and the MS with a BCIE (see below) supported by the MS. The next step shall be entered immediately after TCH synchronization has been completed at the SS side.

b) The interface circuit bit(s) in the 3GPP TS 04.21 frame shall be set to ON and the SS shall start to transmit pseudo random data bits in the 3GPP TS 04.21 frames over the Um-interface to the MS.

c) MT2 configuration: The SS shall input pseudo random data over the R-interface of the MS.

   MT0 configuration: the transmission of data from the MS over the Um-interface shall be stimulated (if it does not start automatically).

d) Approximately 5 s after the data have been received by the SS over the Um-interface the test shall be stopped.

29.2.4.5 Test requirements

1) During the test no 3GPP TS 04.21 frame with incorrect format (i.e. format not compliant to 3GPP TS 04.21 (see conformance requirement) or not corresponding to the user data rate currently under test) shall have been received by the SS.

2) Only MT2 configuration: the user data stream input to the R-interface shall match bit-exactly the user data stream sent to the SS over the Um-interface and the user data stream output from the R-interface shall match bit-exactly the user data stream sent by the SS over the Um-interface.

29.2.4.6 BCIE

The following combinations shall be considered (ref. 3GPP TS 07.01, annex 2):

a) User Rate = 9,6 kbit/s;

b) User Rate = 4,8 kbit/s;

c) User Rate = 2,4 kbit/s;

d) User Rate = 1,2 kbit/s.

The remaining parameters of the BCIE and the channel type (FR/HR) shall be set to a value supported by the MS.

29.2.5 Network Independent Clocking

For further study.

29.2.6 Asynchronous Transparent Bearer Capabilities

29.2.6.1 Data Rate Adaptation

29.2.6.1.1 Definition

-29.2.6.1.2 Conformance requirement

An MS supporting asynchronous transparent bearer capabilities shall perform data rate adaptation and support the frames at the Um-interface according to the following specifications:

1. 3GPP TS 04.21, subclauses 4.1 and 4.4, clauses 5 and 7.

29.2.6.1.3 Test purpose

The purpose of these tests is to verify the conversion between an asynchronous data stream at the R-interface and the 3GPP TS 04.21 frames at the Um-interface.

29.2.6.1.4 Method of test

The Test shall be carried out for all possible user data rates which are supported by the MS in asynchronous mode (see below).

Procedure:

a) A data call shall be set up between the SS and the MS with a BCIE (see below) supported by the MS. The next step shall be entered immediately after TCH synchronization has been completed at the SS side.

b) The interface circuit bit(s) in the 3GPP TS 04.21 frame shall be set to ON and the SS shall start to transmit pseudo random characters as described below to the MS.

c) MT2 configuration: The SS shall input pseudo random characters as described below over the R-interface to the MS.

   MT0 configuration: the transmission of data from the MS over the Um-interface shall be stimulated (if it does not start automatically).

d) Approximately 5 s after the data have been received by the SS over the Um-interface the test shall be stopped.

29.2.6.1.5 Test requirements

1) During the test no 3GPP TS 04.21 frame with incorrect format (i.e. format not compliant to 3GPP TS 04.21 (see conformance requirement) or not corresponding to the user data rate currently under test) shall have been received by the SS.

2) MT2 configuration only: the user data stream input to the R-interface shall match character by character the user data stream sent to the SS over the Um-interface and the user data streams output from the R-interface shall match character by character the user data stream sent by the SS over the Um-interface.

29.2.6.1.6 Generation of the asynchronous pseudo random characters

Downlink direction:

The 3GPP TS 04.21 frames shall contain a bit stream which consists of repeating:

- a character which is generated pseudo randomly every time;

- n stop bits, where n is drawn pseudo randomly from the interval 1..15 every time.

Uplink direction:

The data stream at the R-interface consists of repeating:

- a character which is generated pseudo randomly every time;
- 1 stop bit;
- 1,13 ± 1 % bit frames (i.e. 1/nominal data rate) of stop polarity.

29.2.6.1.7 BCIE

Same as subclause 29.2.3.

The Number of Data Bits per character (excl. parity) shall be 8. No parity bit shall be used. The Number of Stop Bits shall be 1. If the MS does not support these values different ones shall be chosen.

The remaining parameters of the BCIE shall and the channel type (FR/HR) be set to a value supported by the MS.

29.2.6.2 Passage of the Break Signal

29.2.6.2.1 Definition

-29.2.6.2.2 Conformance requirement

An MS supporting asynchronous transparent bearer capabilities shall perform passage of the break signal in uplink and downlink direction according to:

1. 3GPP TS 04.21, subclauses 4.1, 4.2 and 4.4, clauses 5 and 7.

29.2.6.2.3 Test purpose

The purpose of these tests is to verify the ability of the MS to transfer a Break Signal to the R-interface and vice versa.

29.2.6.2.4 Method of test

The Test shall be carried out for all possible user data rates which are supported by the MS in asynchronous mode (see below).

Procedure:

a) A data call shall be set up between the SS and the MS with a BCIE (see below) supported by the MS. The next step shall be entered immediately after TCH synchronization has been completed at the SS side.

b) The interface circuit bit(s) in the 3GPP TS 04.21 frame shall be set to ON.

c) The SS shall send pseudo random characters with start and stop bit(s) (as selected by the BCIE) in the 3GPP TS 04.21 frames to the MS for approximately 5 s. Then it shall send the following bit sequence in the 3GPP TS 04.21 frames:

   - 2M+3 bits of start polarity;
   - 2M bits of stop polarity.

d) The SS shall send pseudo random characters with start and stop bit(s) (as selected by the BCIE) in the 3GPP TS 04.21 frames to the MS for approximately 2 s. Then it shall send the following bit sequence in the 3GPP TS 04.21 frames:

   - for 1 s bits of start polarity;
   - 2M bits of stop polarity,

   where M is as defined in 3GPP TS 04.21, subclause 4.2, and then again pseudo random characters as above.

e) The SS shall input pseudo random characters with start and stop bit(s) (as selected by the BCIE) over the R-interface to the MS for approximately 2 s. Then it shall input the following bit sequence to the R-interface:

   - M bits of start polarity;
   - 2M bits of stop polarity.

f) The SS shall input pseudo random characters with start and stop bit(s) (as selected by the BCIE) over the R-interface to the MS for approximately 2 s. Then it shall input the following bit sequence to the R-interface:

- for 1 s bits of start polarity;
- 2M bits of stop polarity,

where M is as defined in 3GPP TS 04.21, subclause 4.2, and then again pseudo random characters as above.

g) the test shall be stopped 2 s later.

29.2.6.2.5 Test requirements

1) During the test no 3GPP TS 04.21 frame with incorrect format (i.e. format not compliant to 3GPP TS 04.21 (see conformance requirement) or not corresponding to the user data rate currently under test) shall have been received by the SS.

2) The user data stream sent over the Um-interface by the SS shall match character by character the user data stream output at the R-interface.

3) The two Break Signals shall be detectable at the R-interface between the same characters as having been sent.

4) The user data stream received over the Um-interface by the SS shall match character by character the user data stream input at the R-interface.

5) The two Break Signals shall be detectable at the Um-interface between the same characters as having been input.

29.2.6.2.6 BCIE

Same as subclause 29.2.2.6.

29.2.6.3 Overspeed/Underspeed Handling (Local Terminal)

29.2.6.3.1 Definition

-29.2.6.3.2 Conformance requirement

An MS supporting asynchronous transparent bearer capabilities shall handle overspeed and underspeed of the local terminal according to:

1. 3GPP TS 04.21, subclauses 4.1, 4.3 and 4.4, clauses 5 and 7.

29.2.6.3.3 Test purpose

The purpose of these tests is to verify the ability of the MS to deal with plesiosynchronous bit clocks in the MS and the TE in case of asynchronous Bearer Capabilities.

29.2.6.3.4 Method of test

The Test shall be carried out for all possible user data rates supported by the MS in asynchronous mode (see below).

Procedure:

a) A data call shall be set up between the SS and the MS with a BCIE (see below) supported by the MS. The next step shall be entered immediately after CT107 has been set to on by the MS.

b) The interface circuit bit(s) in the 3GPP TS 04.21 frame shall be set to ON.

c) The SS shall input continuously pseudo random characters with a bit clock of:

- nominal user data rate +2,5 % bit/s in case of less than 600 bit/s user data rate;
- nominal user data rate +1 % in the other cases.

(ref. 3GPP TS 04.21, subclause 4.3) to the R-interface of the MS for approximately 5 s.

d) The SS shall input continuously pseudo random characters with a bit clock of nominal user rate -2,5 % (ref. ITU-T Recommendation V.14, clause 3) to the R-interface of the MS for approximately 5 s.

e) The test shall be stopped.

29.2.6.3.5 Test requirements

1) During the test no 3GPP TS 04.21 frame with incorrect format (i.e. format not compliant to 3GPP TS 04.21 (see conformance requirement) or not corresponding to the user data rate currently under test) shall have been received by the SS.

2) The user data stream input to the R-interface shall match character by character the user data stream sent to the SS over the Um-interface.

29.2.6.3.6 BCIE

Same as subclause 29.2.2.6.

The Number of Data Bits per character (excl. parity) shall be 8. No parity bit shall be used. The Number of Stop Bits shall be 1. If the MS does not support these values different ones shall be chosen.

The remaining parameters of the BCIE and the channel type (FR/HR) shall be set to a value supported by the MS.

29.2.6.4 Overspeed/Underspeed Handling (Remote Terminal)

29.2.6.4.1 Definition

-29.2.6.4.2 Conformance requirement

An MS supporting asynchronous transparent bearer capabilities shall handle overspeed and underspeed of the remote terminal (which shows in the structure of the 3GPP TS 04.21 frames received over the Um-interface) according to:

1. 3GPP TS 04.21, subclauses 4.1, 4.3 and 4.4, clauses 5 and 7.

29.2.6.4.3 Test purpose

The purpose of these tests is to verify the ability of the MS to deal with plesiosynchronous bit clocks in the MS and the remote Terminal in case of asynchronous Bearer Capabilities.

The case of underspeed is covered by subclause 29.6.1. The case of overspeed shall be tested as follows.

29.2.6.4.4 Method of test

The Test shall be carried out for all possible user data rates supported by the MS in asynchronous mode (see below).

Procedure:

a) A data call shall be set up between the SS and the MS with a BCIE (see below) supported by the MS. The next step shall be entered immediately after CT107 has been set to on by the MS.

b) The interface circuit bit(s) in the 3GPP TS 04.21 frame shall be set to ON.

c) The SS shall start sending pseudo random characters in the 3GPP TS 04.21 frames over the Um-interface with minimal number of stop bits between the characters and where one stop bit is omitted every 8th character.

e) The test shall be stopped 5 s later.

29.2.6.4.5 Test requirements

1) During the test no 3GPP TS 04.21 frame with incorrect format (i.e. format not compliant to 3GPP TS 04.21 (see conformance requirement) or not corresponding to the user data rate currently under test) shall have been received by the SS.

2) The user data stream sent by the SS over the Um-interface shall match character by character the user data stream sent by the MS over the R-interface.

29.2.6.4.6 BCIE

Same as subclause 29.2.6.3.6.

29.2.7 Interchange circuit mapping for transparent bearer capabilities

29.2.7.1 Definition

This test cannot be applied fully to MSs which support e.g.:

- CT108/2 for releasing the call (e.g. support of ITU-T Recommendation V.25bis) and/or
- similar use of the circuit C for ITU-T Recommendation X.21.

Therefore the test shall be applied only for those interchange circuits which do not influence Layer 3 signalling.

In case of circuit C the X.21-byte timing circuit B shall not be used.

29.2.7.2 Conformance requirement

1) An MS supporting transparent bearer capabilities with a V-series R-interface shall map the interchange circuits CT105 and CT108/2 to the 3GPP TS 04.21 frames sent over the Um-interface according to:

   1.1 3GPP TS 04.21, subclauses 4.1 and 4.4, clauses 5 and 7.

   1.2 3GPP TS 07.02, subclause 3.2.1.

2) An MS supporting transparent bearer capabilities with an X-series R-interface shall map the interchange circuit C to the 3GPP TS 04.21 frames sent over the Um-interface according to:

   2.1 3GPP TS 04.21, subclauses 4.1 and 4.4, clauses 5 and 7.

   2.2 3GPP TS 07.03, subclauses 4.2.1 and 4.2.2.

29.2.7.3 Test purpose

The purpose of these tests is to verify the ability of the MS to correctly convey changes of the interface circuits at the R-interface to the 3GPP TS 04.21 frame sent over the Um-interface in case of Transparent Bearer Capabilities.

29.2.7.4 Method of test

Specific PICS statements:

-

PIXIT statements:

- Interchange Circuits which influence Layer 3 signalling

The Test shall be carried out for all user data rates supported by the MS (see below) and the circuits CT105 and CT108/2 (ITU-T Recommendation V.24) and C (ITU-T Recommendation X.21). The test shall be carried out only for those frame formats and circuits which are supported by the MS (exceptions see above).

Procedure:

a) A data call shall be set up between the SS and the MS with a BCIE (see below) supported by the MS. The next step shall be entered immediately after CT107 has been set to ON by the MS.

b) The interface circuit bit(s) in the 3GPP TS 04.21 frame shall be set to ON and the SS shall input continuously pseudo random data to the R-interface during the following steps. The SS shall wait for approximately 1 s before entering the next step.

c) The SS shall set the interchange circuit at the R-interface to OFF and wait for 2 s.

d) The SS shall again set the interchange circuit at the R-interface to ON.

e) After further 2 s the test shall be stopped.

29.2.7.5 Test requirements

1) During the test no 3GPP TS 04.21 frame with incorrect format (i.e. format not compliant to 3GPP TS 04.21 (see conformance requirement) or not corresponding to the user data rate currently under test) shall have been received by the SS.

2) The change of the interchange circuit signal level shall be indicated in the 3GPP TS 04.21 frames as required by 3GPP TS 04.21 and ITU-T Recommendation V.110 (i.e. OFF state shall start and end in the correct 3GPP TS 04.21 frame).

29.2.7.6 BCIE

Same as subclause 29.2.2.5.

29.3 Testing of non transparent data services (RLP tests)

SS sends NULL (C/R=0, P/F=0) frames when it has nothing else to send in ADM mode.

SS does not use DTX if not explicitly indicated in the test and sends supervisory RR (C/R=0, P/F=0) frames when it has nothing else to send in ABM mode. N(R) is equal to N(R) of the previous frame. For the first frame N(R)=0.

The information field of the Supervisory frames sent by the SS is fully coded with "1".

The tolerance on timers or delays is ±10%.

The SS will check FSI (Frame Start Identifier) alignment in all received RLP frames. The information field of the Supervisory frames sent by the MS is never verified.

The SABM-UA exchange for RLP link establishment is initiated by the MS.

Immediately upon RLP link connection, the MS may send an I+S frame containing updated status bits SA, SB and X and the SS must send it.

29.3.1 Initialization

29.3.1.1 Normal initialization done by the MS

29.3.1.1.1 Test purpose

To test the normal establishment of multiple frame operation between the SS and the MS.

This test is performed twice for testing MO and MT data calls:

29.3.1.1.2 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use default RLP parameters.

MO data call:

The MS is made to establish a MO non transparent data call, so that the initial conditions are that the MS is in call state U10 ("Call Active") after having sent a CONNECT ACKNOWLEDGE message.

MT data call:

The SS establishes a MT non transparent data call, so that the initial conditions are that the MS is in call state U10 ("Call Active") after having received a CONNECT ACKNOWLEDGE message from the SS.

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case). The SS shall accept and use the new RLP parameters till the end of the test.

Procedure

The MS shall send a SABM frame.

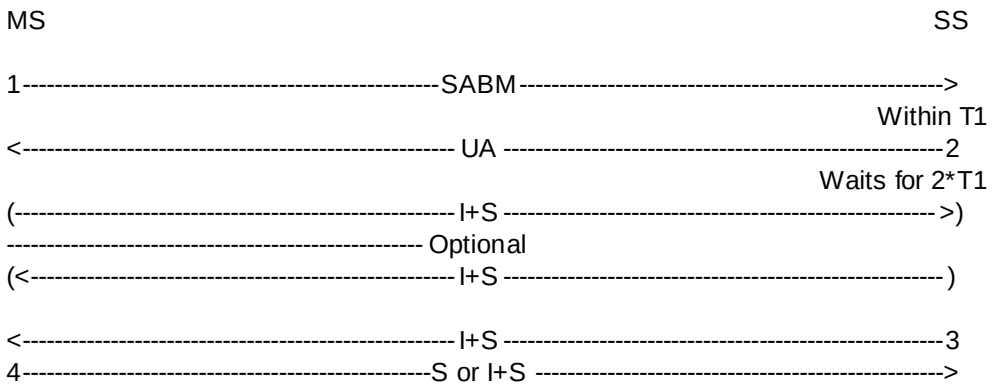
The SS responds with a correct UA frame (within T1).

The SS waits for 2*T1 after the UA to ensure the SABM frame is not repeated. This confirms that the UA has been received.

The MS shall be in ABM mode. After optional status bits exchange between the MS and the SS, this is verified by sending an I + S frame and waiting for the acknowledgement from the MS.

The MS is returned to the idle state by clearing the call.

Expected sequence



The frames from the SS will be:

2: One UA frame containing:

R=0, F=1.

3: One correct I+S frame in a RR frame with N(S)=0.

29.3.1.1.3 Test requirements

The frames from the MS shall be:

1: One SABM frame containing:

C=1, P=1.

The SABM shall not be repeated.

4: One S or I+S frame with N(R)=1 acknowledging the I+S frame.

29.3.1.2 Initialization failure

29.3.1.2.1 Loss of UA frame

29.3.1.2.1.1 Test purpose

To test the MS response to the loss of an UA frame during initialization.

29.3.1.2.1.2 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use default RLP parameters.The MS is made to establish a MO non transparent data call so that the initial conditions are that the MS is in call state U10 ("Call Active") after having sent a CONNECT ACKNOWLEDGE message.

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case). The SS shall accept and use the new RLP parameters till the end of the test.

Procedure

The MS shall send an SABM frame.

The SS ignores the first SABM frame from the MS.

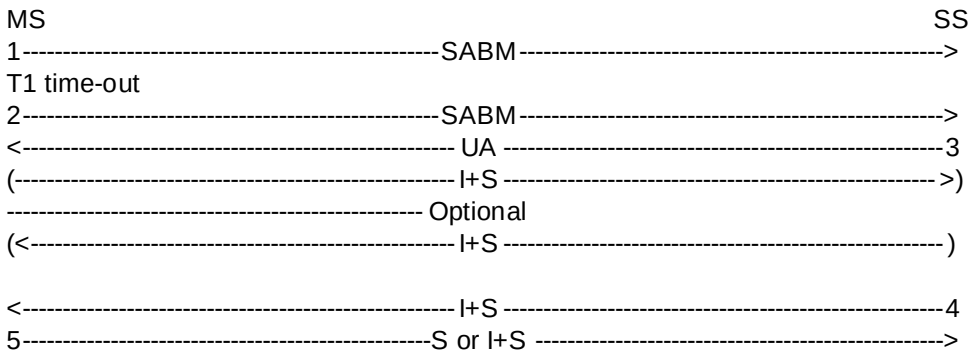
The MS shall wait for time-out of timer T1 and then send a second SABM frame.

The SS responds to the second SABM frame with an UA frame (within T1).

The MS enters in ABM mode. After optional status bits exchange between the MS and the SS, this is verified by sending an I+S frame and waiting for the acknowledgement from the MS.

The MS is returned to the idle state by clearing the call.

Expected sequence



The frames from the SS will be:

3: One UA frame containing:

R=0, F=1.

within T1 after the second SABM.

4: One correct I+S frame in a RR frame with N(S)=0.

29.3.1.2.1.3 Test requirements

The frames from the MS shall be:

1, 2: One SABM frame containing:

C=1, P=1.

The second SABM frame shall follow the first SABM frame after time-out of timer T1.

5: One S or I+S frame with N(R)=1 acknowledging the I+S frame.

29.3.1.2.2 Total loss of UA frame

29.3.1.2.2.1 Test purpose

To test the MS response to a total loss of UA frame during initialization.

29.3.1.2.2.2 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use default RLP parameters.

The MS is made to establish a MO non transparent data call so that the initial conditions are that the MS is in call state U10 ("Call Active") after having sent a CONNECT ACKNOWLEDGE message.

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case). The SS shall accept and use the new RLP parameters till the end of the test.

Procedure

The MS shall send an SABM frame.

The SS ignores the SABM frame from the MS.

The MS shall wait for time-out of timer T1 and then send a new SABM frame.

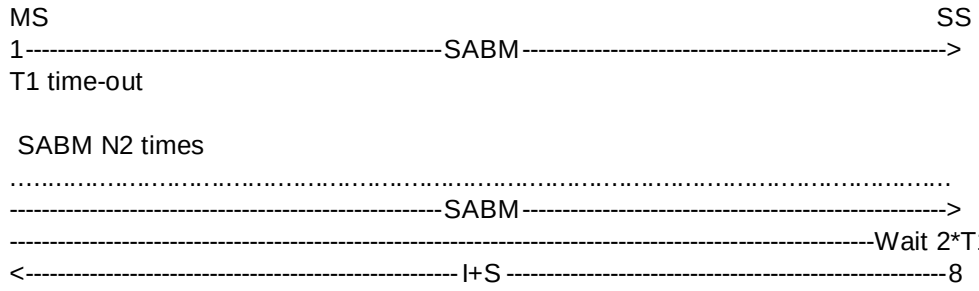
The SS ignores the SABM frame sent by the MS. These 2 last steps are repeated N2 times.

The SS waits for 2 * T1 to ensure the SABM frame is not repeated.

The MS shall not enter in ABM mode. This is verified by sending an I+S frame. The MS shall ignore this frame.

The MS is returned to the idle state by clearing the call.

Expected sequence:



The frames from the SS will be:

8: One correct I+S frame in a RR frame containing with N(S)=0.

29.3.1.2.2.3 Test requirements:

The frames from the MS shall be:

1, ... N2: One SABM frame containing:

C=1, P=1.

An SABM frame follows the previous one after time-out of timer T1.

29.3.2 Data transfer

29.3.2.1 Default conditions

The initial conditions are that the MS is in call state U10 ("Call Active") and in RLP ABM mode.

During the synchronization of the traffic channel, the MS and the SS have transmitted I+S frames. Unless, other indication in the test, each test of this subclause will begin in the following conditions:

- the MS has previously sent I+S frames numbered N(S)=0,...,N_{MS}-1 mod(62) and has previously sent a frame containing N(R) = N_{SS} mod (62);
- the SS has previously sent I+S frames numbered N(S)=0,...,N_{SS}-1 mod(62) and has previously sent a frame containing N(R) = N_{MS} mod (62).

The first I+S frame that an MS will send in a test will be numbered N(S)= N_{MS} and the first I+S frame that the SS will send will be numbered N_{SS}.

29.3.2.2 MS sends I+S frames

29.3.2.2.1 N(S) sequence number

29.3.2.2.1.1 Test purpose

To test the correct handling of the N(S) sequence number.

29.3.2.2.1.2 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use RLP default parameters except the window size from MS to IWF (SS), called K_{MI}.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Since some RLP parameters are different from the default parameters, a negotiation procedure will be initiated by the MS after the CONNECKT ACKNOWLEDGE message. The MS may negotiate the RLP default parameters within allowed ranges, defined in 3GPP TS 04.22, except the window size from MS to IWF (SS), called KMI, which has to be a non default value.

The SS shall accept and use the new RLP parameters till the end of the test.

After the negotiation procedure the ABM will be entered. This test is performed twice with 2 different values of KMI, randomly chosen.

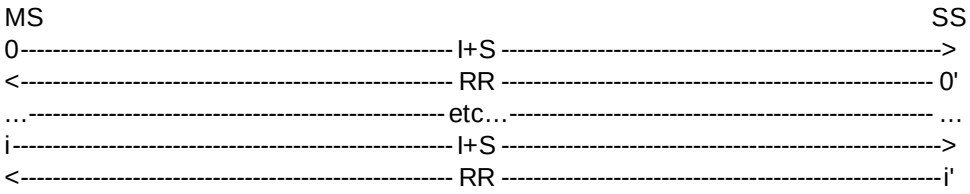
Procedure

After optional status bits exchange between the MS and the SS, the MS is made to send continuously I+S frames (more than 2*64 frames). The MS shall send I+S frames with N(S) incremented by 1 mod(62) in each frame.

The SS acknowledges the I+S frames in RR frame in sequence.

The MS is returned to the idle state by clearing the call.

Expected sequence



The frames from the SS will be:

0',...,i': One supervisory RR frame containing:

N(R) = NMS+1, ... , NMS+i+1 mod(62).

29.3.2.2.1.3 Test requirements

The frames from the MS shall be:

0,...,i: One I+S frame containing:

N(S) = NMS, ... , NMS+i mod(62)

29.3.2.2.2 Transmission window

29.3.2.2.2.1 Test purpose

To test the correct handling of the transmission window.

29.3.2.2.2.2 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use RLP default parameters except the window size from MS to IWF (SS), called KMI.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Since some RLP parameters are different from the default parameters, a negotiation procedure will be initiated by the MS after the CONNECKT ACKNOWLEDGE message. The MS may negotiate the RLP default parameters within allowed ranges, defined in 3GPP TS 04.22, except the window size from MS to IWF (SS), called KMI, which has to be a non default value.

The SS shall accept and use the new RLP parameters till the end of the test.

After the negotiation procedure the ABM will be entered.

This test is performed twice with 2 different values of KMI, randomly chosen.

Procedure

The MS is made to send continuously I+S frames with a delay inferior to T1 between each frame.

The SS does not acknowledge the first KMI frames.

The MS stops sending I+S frames after having sent KMI frames, due to the window size.

The SS waits for 0,5*T1 after the last frame of the sequence (N(S)=NMS+KMI-1) to acknowledge the first j frames, with j<KMI.

The MS shall transmit j new I+S frames and stop sending I+S frames after having sent them, due to the window size.

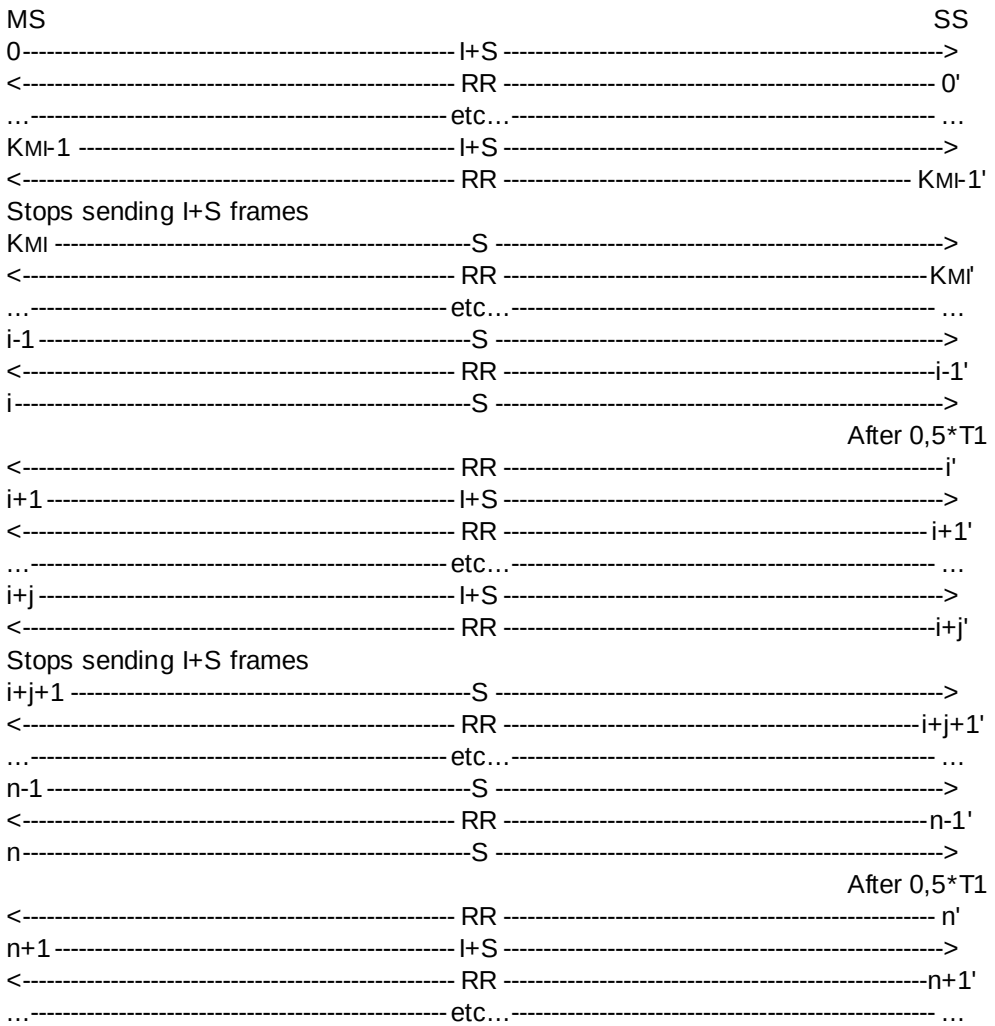
The SS waits for 0,5*T1 after the last frame of the sequence (N(S)=NMS+KMI-1+j mod (62)) to acknowledge all frames transmitted by the MS.

The MS shall transmit all the following I+S frames.

The SS acknowledges the I+S frames sequentially (i.e. 1 after 1).

The MS is returned to the idle state by clearing the call.

Expected sequence



The frames from the SS will be:

0',...,i-1': One RR frame containing:

N(R)=NMS mod(62).

i': One RR frame containing:

N(R)=NMS+j mod(62) with j <KMI,

after a delay of 0,5*T1 after the last received I+S frame.

i+1',..,n-1': One RR frame containing:

N(R)=NMS+j mod(62).

n': One RR frame containing:

N(R)=NMS+KMI+j mod(62),

after a delay of 0,5*T1 after the last received I+S frame.

n+1', n+2',...: One RR frame containing:

N(R) = NMS + KMI + j + 1 , NMS + KMI + j + 2 ,... mod(62).

29.3.2.2.2.3 Test requirements

The frames from the MS shall be:

0,...,KMI-1: One I+S frame containing:

N(S) = NMS, ..., NMS + KMI - 1 mod(62).

MS stops sending I+S frames until reception of an acknowledgement of at least one I+S frame.

KMI,...,i: One S frame.

i+1,...,i+j: One I+S frame containing:

N(S)=NMS+KMI,...,NMS+KMI+j-1 mod(62).

MS stops sending I+S frames until reception of an acknowledgement of at least one I+S frame.

i+j+1,...,n: One S frame.

n+1,n+2...: One I+S frame containing:

N(S)=NMS+KMI+j,NMS+KMI+j+1,... mod(62).

29.3.2.2.3 Busy condition

29.3.2.2.3.1 Test purpose

To test the correct handling of a RNR frame received.

29.3.2.2.3.2 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use default RLP parameters.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case). The SS shall accept and use the new RLP parameters till the end of the test.

The ABM will be entered.

Procedure

The MS is made to send continuously I+S frames.

The SS acknowledges the received I+S frames in supervisory RR frames. After 1 second it acknowledged the received I+S frames in supervisory RNR frames.

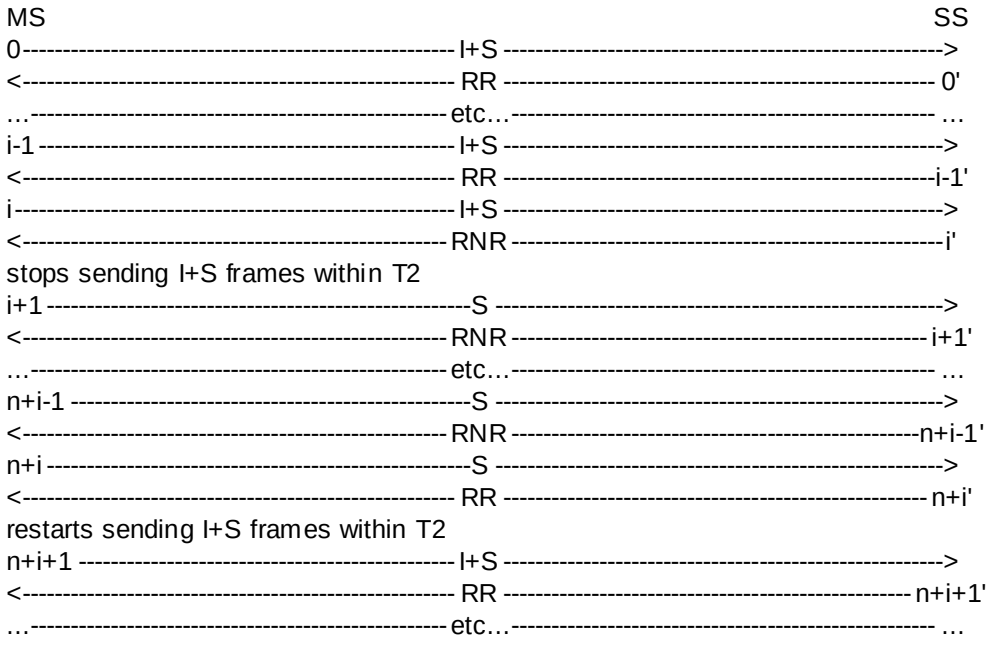
After the first RNR frame, the MS shall stop sending I+S frames and shall start sending supervisory frames within T2.

After 1 second receiving supervisory frames, the SS sends RR frames instead of RNR.

After the first RR frame, the MS will restart the transmission of I+S frames within T2.

The MS is returned to the idle state by clearing the call.

Expected sequence



The frames from the SS will be:

0',...,i-1': One RR frame containing:

N(R)=N_{MS}+1,...,N_{MS}+i mod(62).

i',...,n+i-1': One RNR frame containing:

N(R)=N_{MS}+i+1 mod(62).

n+i': One RR frame containing:

N(R)=N_{MS}+i+1 mod(62).

n+i+1',n+i+2',...: One RR frame containing:

N(R)=NMS+i+2,NMS+i+3,... mod(62).

29.3.2.2.3.3 Test requirements

The frames from the MS shall be:

0,...,i: One I+S frame containing:

N(S)=NMS,...,NMS+i mod(62).

MS stops sending I+S frames within T2 after the reception of the first RNR frame from the SS.

i+1,...,n+i: One S frame.

MS restarts sending I+S frames within T2 after the reception of the first RR frame from the SS.

n+i+1,n+i+2,...: One I+S frame containing:

N(S)=NMS+i+1,NMS+i+2,... mod(62).

29.3.2.3 SS sends I+S frames

29.3.2.3.1 N(R) sequence number

29.3.2.3.1.1 Test purpose

To test the correct handling of the N(R) sequence number.

29.3.2.3.1.2 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use RLP default parameters except the window size from IWF (SS) to MS, called KIM.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Since some RLP parameters are different from the default parameters, a negotiation procedure will be initiated by the MS after the CONNECKT ACKNOWLEDGE message. The MS may negotiate the RLP default parameters within allowed ranges, defined in 3GPP TS 04.22, except the window size from IWF (SS) to MS, called KIM, which has to be a non default value.

The SS shall accept and use the new RLP parameters till the end of the test.

After the negotiation procedure the ABM will be entered.This test is performed twice with 2 different values of KIM, randomly chosen.

Procedure

The SS is made to send continuously I+S frames (more than 2*64 frames). The delay between two I+S frames shall be superior to T2 and inferior to T1.

The MS is made to send no data i.e. no I+S frame.

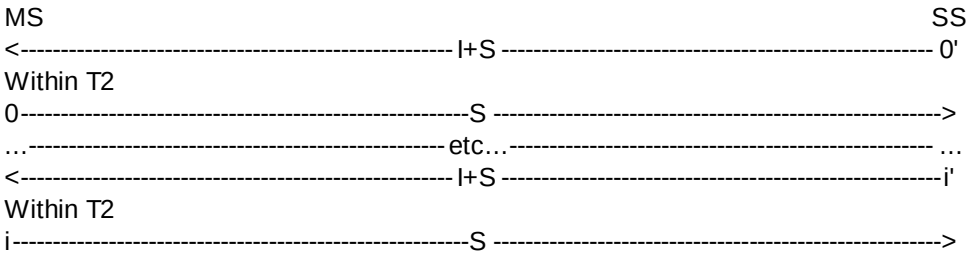
NOTE: The MS may have previously sent I+S frames.

The SS sends I+S frames in I+S RR frames.

The MS shall acknowledge the I+S frames in RR frame sequentially within T2.

The MS is returned to the idle state by clearing the call.

Expected sequence



The frames from the SS will be:

0,...,i': One I+S frame containing

N(S)=NSS,...,NSS+i mod(62).

29.3.2.3.1.3 Test requirements

The frames from the MS shall be:

0,...,i: One S frame containing:

N(R)=NSS+1,...,NSS+i+1 mod (62).

The MS shall acknowledge the I+S frames sent by the SS within T2.

NOTE: If T2 parameter is equal to default T2 (<80 ms), the SS has to checked that the MS acknowledges an I+S frame within 80 ms.

29.3.2.3.2 Busy condition

29.3.2.3.2.1 Test purpose

To test the correct handling of a RNR frame with information received.

29.3.2.3.2.2 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use default RLP parameters.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case). The SS shall accept and use the new RLP parameters till the end of the test.

The ABM will be entered.

Procedure

The SS is made to send continuously I+S frames. The delay between two consecutive I+S frames shall be inferior to T1.

The MS is made to send continuously I+S frames with a delay inferior to T1 between each frame.

The SS acknowledges the received I+S frames in I+S RR frames. After 1 second, it acknowledged the received I+S frames in supervisory RNR frames. The MS shall acknowledge the I+S frames in I+S RR frame sequentially.

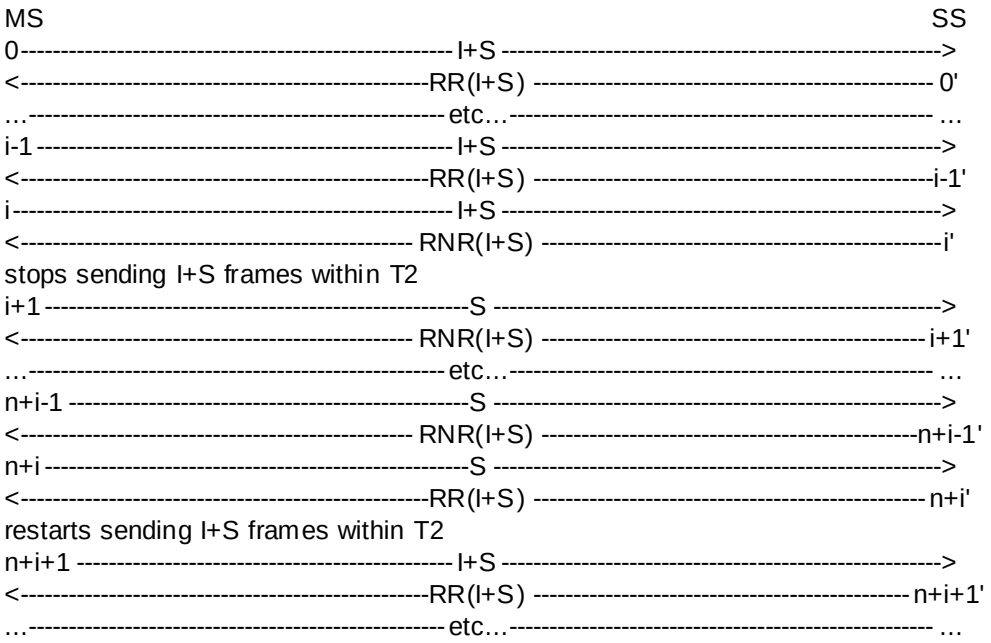
After the first RNR frame, the MS shall stop sending I+S frames and shall acknowledge the I+S received frame in supervisory frames within T2.

After 1 second receiving supervisory frames, the SS sends I+S RR frames instead of RNR.

After the first RR frame, the MS will restart the transmission of I+S frames, it shall acknowledge the I+S received frame in I+S frame within T2.

The MS is returned to the idle state by clearing the call.

Expected sequence



The frames from the SS will be:

0',...,i-1': One I+S RR frame containing:

N(S)=N_{SS},...,N_{SS}+i-1 mod(62),

N(R)=N_{MS}+1,...,N_{MS}+i mod(62).

i',...,n+i-1': One I+S RNR frame containing:

N(S)=N_{SS}+i,...,N_{SS}+n+i-1 mod(62),

N(R)=N_{MS}+i+1 mod(62).

n+i',n+i+1',...: One I+S RR frame containing:

N(S)=N_{SS}+n+i,N_{SS}+n+i+1,... mod(62),

N(R)=N_{MS}+i+1,N_{MS}+i+2,... mod(62).

29.3.2.3.2.3 Test requirements

The frames from the MS shall be:

0,...,i: One I+S frame containing:

N(S)=N_{MS},...,N_{MS}+i mod(62),

N(R)=N_{SS},...,N_{SS}+i mod(62).

MS stops sending I+S frames within T2 after the reception of the first RNR frame from the SS.

i+1,...,n+i: One S frame containing:

N(R)=NSS+i+1,...,NSS+n+i mod(62).

MS restarts sending I+S frames within T2 after the reception of the first RR frame from the SS.

n+i+1,n+i+2,...: One I+S frame containing:

N(S)=NMS+i+1,NMS+i+2,... mod(62),

N(R)=NSS+n+i+1,NSS+n+i+1... mod(62).

29.3.2.4 SS rejects I+S frames

29.3.2.4.1 REJ frame

29.3.2.4.1.1 Test purpose

To test the correct handling of a REJ frame received.

29.3.2.4.1.2 Method of test

Initial Conditions

The window size from MS to IWF (SS) is called KMI.

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use default RLP parameters.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case). The SS shall accept and use the new RLP parameters till the end of the test.

The ABM will be entered.

Procedure

The MS is made to send continuously I+S frames with a delay inferior to T1 between each frame.

The SS acknowledges the i first I+S frames in supervisory RR frames.

The SS does not acknowledge the following I+S frames.

The SS rejects the 2 last I+S frames with a REJ and then send UI frames.

The MS shall retransmit the rejected I+S frames and the continue to send I+S frames.

The MS shall stop sending I+S frame when the transmission window is full.

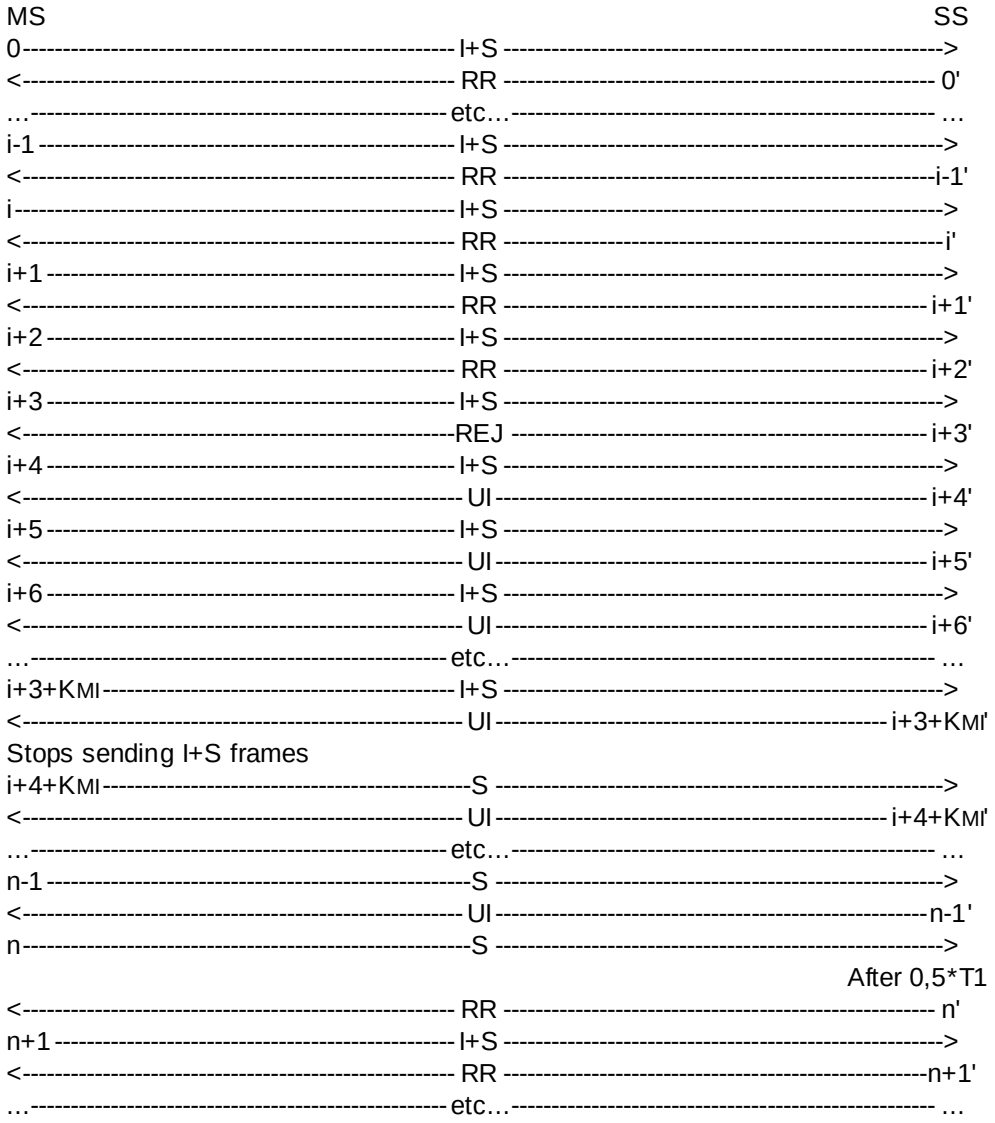
The SS acknowledges all the received I+S frames with a RR frame after a delay of 0,5*T1 after the last received I+S frame.

The MS restarts sending I+S frame.

The SS acknowledges the received I+S frames.

The MS is returned to the idle state by clearing of the call.

Expected sequence



The frames from the SS will be:

0',...,i-1': One RR frame containing:

N(R)=NMS+1,..,NMS+i mod(62).

i',...,i+2': One RR frame containing:

N(R)=NMS+i mod(62).

i+3': One REJ frame containing:

N(R)=NMS+i+2 mod(62).

i+4',..,n-1': One UI frame.

n': One RR frame containing:

N(R)=NMS+i+2+KMI mod(62),

after a delay of 0,5*T1 after the last received I+S frame.

n+1',...: One RR frame containing

N(R)=NMS+i+3+KMI,... mod(62).

29.3.2.4.1.3 Test requirements

The frames from the MS shall be:

0,...,i+3: One I+S frame containing

N(S)=NMS,...,NMS+i+3 mod(62).

i+4,i+5: One I+S frame containing

N(S)=NMS+i+2,NMS+i+3 mod(62).

i+6,...,i+3+KMI: One I+S frame containing:

N(S)=NMS+i+4...,NMS+i+KMI+1 mod(62).

i+4+KMI,...,n: One S frame.

MS stops sending I+S frames until reception of an acknowledging of at least 1 I+S frame of the window (received N(R) from NMS+i+3 to NMS+i+2+KMI mod(62)).

n+1,...: One I+S frame containing:

N(S)=NMS+i+KMI,... mod(62).

29.3.2.4.2 SREJ frame

29.3.2.4.2.1 Test purpose

To test the correct handling of a SREJ frame received.

29.3.2.4.2.2 Method of test

Initial Conditions

The window size from MS to IWF (SS) is called KMI.

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use default RLP parameters.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case). The SS shall accept and use the new RLP parameters till the end of the test.

The ABM will be entered.

Procedure

The MS is made to send continuously I+S frames with a delay inferior to T1 between each frame.

The SS acknowledges the i first I+S frames in supervisory RR frames.

The SS does not acknowledge the following I+S frames.

The SS rejects one I+S frame with a SREJ and then send UI frames.

The MS shall retransmit the rejected I+S frame and the continue to send I+S frames.

The MS shall stop sending I+S frame when the transmission window is full.

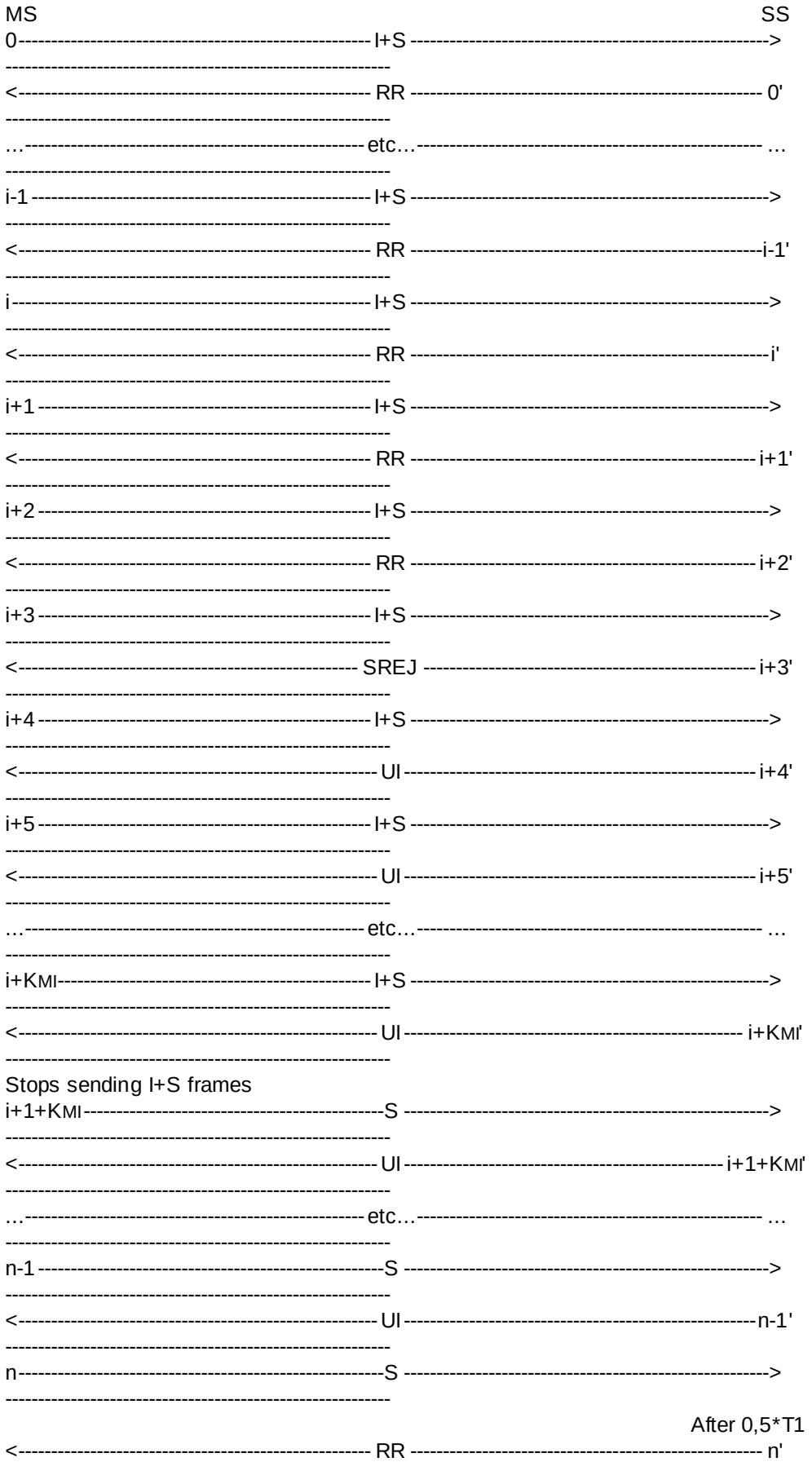
The SS acknowledges all the received I+S frames with a RR frame after a delay of 0,5*T1 after the last received I+S frame.

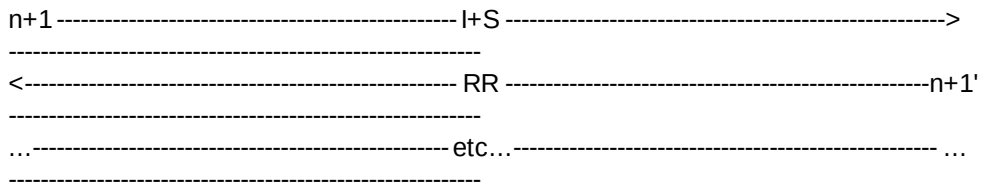
The MS restarts sending I+S frame.

The SS acknowledges the received I+S frames.

The MS is returned to the idle state by clearing of the call.

Expected sequence





The frames from the SS will be:

0',...,i-1': One RR frame containing:

N(R)=NMS+1,...,NMS+i mod(62).

i',...,i+2': One RR frame containing:

N(R)=NMS+i mod(62).

i+3': One SREJ frame containing:

N(R)=NMS+i+2 mod(62).

i+4',...,n-1': One UI frame.

n': One RR frame containing:

N(R)=NMS+i+KMI mod(62),

after a delay of 0,5*T1 after the last received I+S frame.

n+1',...: One RR frame containing:

N(R)=NMS+i+1+KMI mod(62).

29.3.2.4.2.3 Test requirements

The frames from the MS shall be:

0,...,i+3: One I+S frame containing:

N(S)=NMS,...,NMS+i+3 mod(62).

i+4: One I+S frame containing:

N(S)=NMS+i+2 mod(62).

i+5,...,i+KMI: One I+S frame containing:

N(S)=NMS+i+4...,NMS+i+KMI-1 mod(62).

i+1+KMI,...,n: One S frame.

MS stops sending I+S frames until reception of an acknowledging of at least 1 I+S frame of the window (received N(R) from NMS+i+1 to NMS+i+KMI mod(62)).

n+1,...: One I+S frame containing:

N(S)=NMS+i+KMI,... mod(62).

29.3.2.4.3 I+S reject frame

29.3.2.4.3.1 Test purpose

To test the correct handling of a I+S reject frame received.

29.3.2.4.3.2 Method of test

Initial Conditions

The window size from MS to IWF (SS) is called KMI.

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use default RLP parameters.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case). The SS shall accept and use the new RLP parameters till the end of the test.

The ABM will be entered.

Procedure

The MS is made to send continuously I+S frames with a delay inferior to T1 between each frame.

The SS acknowledges the i first I+S frames in supervisory RR frames.

The SS does not acknowledge the following I+S frames.

The SS rejects the 2 last I+S frames with a REJ.

The MS shall retransmit the 2 rejected I+S frames.

The SS acknowledges these 2 frames.

The MS shall continue sending I+S frames.

The SS does not acknowledge these frames.

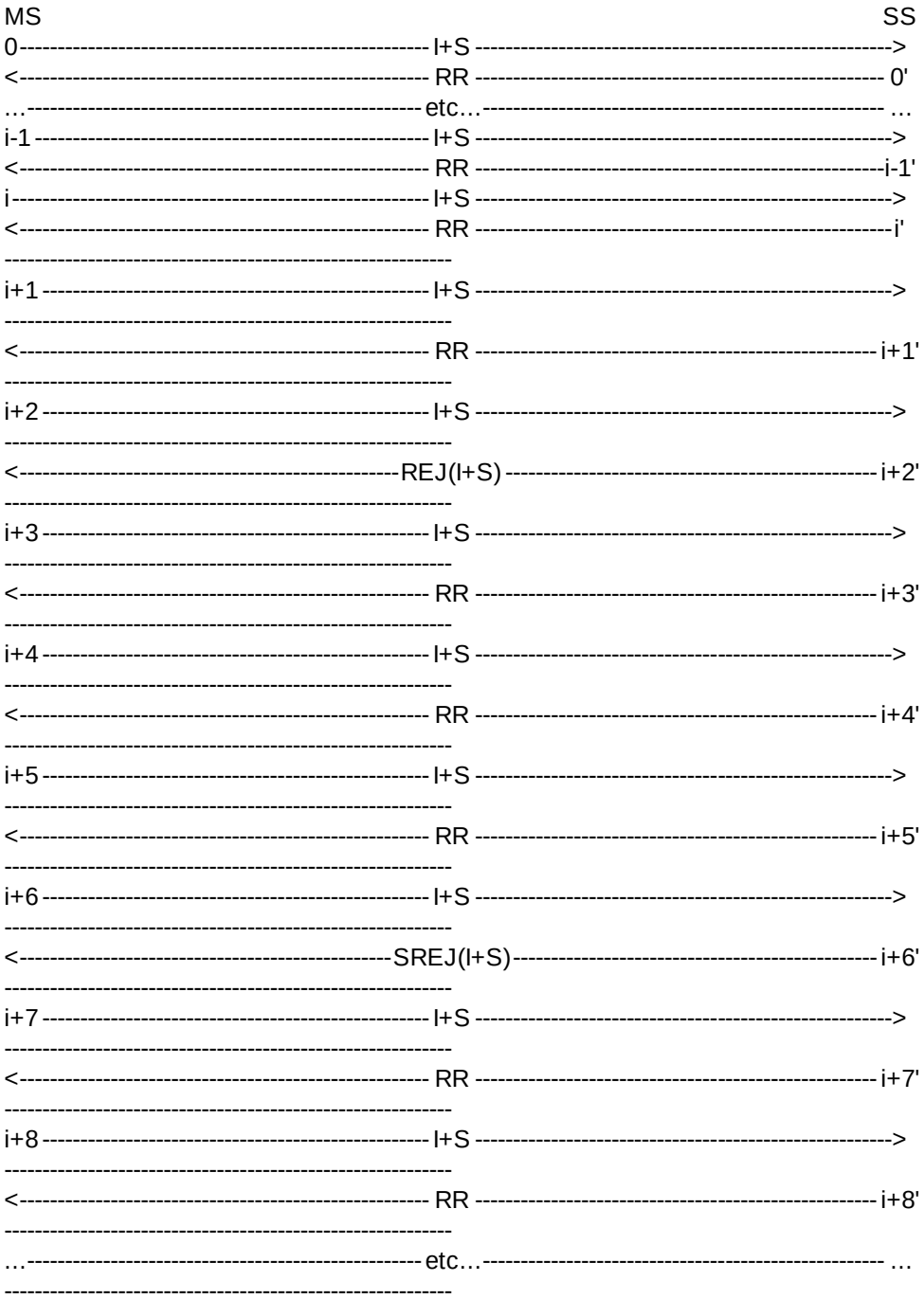
The SS rejects one I+S frame with a SREJ.

The MS shall retransmit the rejected I+S frame and continue sending I+S frames.

The SS acknowledges the received I+S frames.

The MS is returned to the idle state by clearing of the call.

Expected sequence



The frames from the SS will be:

0',...,i-1': One RR frame containing:

N(R)=N_{MS}+1,...,N_{MS}+i mod(62).

i',i+1': One RR frame containing:

N(R)=N_{MS}+i mod(62).

i+2': One I+S REJ frame containing:

N(R)=N_{MS}+i+1 mod(62),

N(S)=N_{SS} mod (62).

i+3',i+4': One RR frame containing:

N(R)=NMS+i+2,NMS+i+3 mod(62).

i+5': One RR frame containing:

N(R)=NMS+i+3 mod(62).

i+6': One I+S REJ frame containing:

N(R)=NMS+i+3 mod(62),

N(S)=NSS+1 mod (62).

i+7': One RR frame containing:

N(R)=NMS+i+3 mod(62).

i+8': One RR frame containing:

N(R)=NMS+i+6,... mod(62).

29.3.2.4.3.3 Test requirements

The frames from the MS shall be:

0,...,i+2: One I+S frame containing:

N(S)=NMS,...,NMS+i+2 mod(62).

i+3,i+4: One I+S frame containing:

N(S)=NMS+i+1,NMS+i+2 mod(62).

i+5,i+6: One I+S frame containing:

N(S)=NMS+i+3,NMS+i+4 mod(62).

i+7: One I+S frame containing:

N(S)=NMS+i+3 mod(62).

i+8,...: One I+S frame containing:

N(S)=NMS+i+5,... mod(62).

The MS shall acknowledge the I+S frames sent by the SS within T2.

29.3.2.5 MS rejects I+S frames

29.3.2.5.1 Rejection with REJ or SREJ supervisory frames

29.3.2.5.1.1 Conformance requirements

The MS shall be able to detect that an I+S frame is out of sequence, and to indicate to the network that some information needs to be retransmitted. This shall be done by using either a REJ or a SREJ RLP frame. The MS has the freedom to choose either one of these frames, but it shall correctly indicate which frames need to be retransmitted.

References

3GPP TS 04.22 subclauses 5.2.3.4, 5.2.3.6 and 5.3.2.

29.3.2.5.1.2 Test purpose

To test that the MS is able to send correct REJ or SREJ supervisory frames to ask for the transmission of a sequence when an out of sequence information frame has been received.

29.3.2.5.1.3 Test method

Initial Conditions

The window size from IWF (SS) to MS is called K_{IM}.

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use default RLP parameters.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case). The SS shall accept and use the new RLP parameters till the end of the test.

The ABM will be entered.

Specific PICS statements:

-

PIXIT statements:

- Bearer services supported
- Characteristics of non-transparent services.

Foreseen final state of the MS

Idle.

Test procedure

The SS is made to send continuously I+S frames. The delay between two consecutive I+S frames shall be inferior to T1.

The MS is made to send no user data. It sends only supervisory frames.

The SS sends a I+S frame numbered N_{SS}. The MS shall acknowledge this frame. Then the SS sends a I+S frame numbered $N_{SS}+2$.

The MS shall ask for the retransmission of the missing frame numbered $N_{SS}+1$. The MS may send a SREJ frame (see case a). If it cannot send SREJ, it shall send a REJ frame (see case b).

Case a: If the MS chooses to send a SREJ, it shall send a SREJ frame containing $N(R)=N_{SS}+1$.

The SS sends a I+S frame numbered $N_{SS}+4$.

The MS shall ask for the retransmission of the missing frame numbered $N_{SS}+3$ The MS may send a SREJ frame (see case a/a If it cannot send SREJ, it shall send a REJ frame (see case a/b).

Case a/a: If the MS chooses to send a SREJ, it shall send a SREJ frame containing $N(R)=N_{SS}+3$.

The SS sends a I+S frame numbered $N_{SS}+1$ and the MS shall acknowledge this frame ($N(R)=N_{SS}+3$).

The SS sends a I+S frame numbered $N_{SS}+3$ and the MS shall acknowledge this frame ($N(R)=N_{SS}+5$).

Case a/b: If the MS chooses to send a REJ, it shall send a REJ frame containing N(R)=Nss+1.

The SS sends I+S frames numbered Nss+1, ..., Nss+4 and the MS shall acknowledge these frames (N(R)=Nss+2, ... , Nss+5).

Case b: If the MS chooses to send a REJ, it shall send a REJ frame containing N(R)=Nss+1.

The SS sends I+S frames numbered Nss+1, Nss+2 and the MS shall acknowledge this frame (N(R)=Nss+2, Nss+3).

The SS sends a I+S frame numbered Nss+4.

The MS shall ask for the retransmission of the missing frame numbered Nss+3 The MS may send a SREJ frame (see case b/a If it cannot send SREJ, it shall send a REJ frame (see case b/b).

Case b/a: If the MS chooses to send a SREJ, it shall send a SREJ frame containing N(R)=Nss+3.

The SS sends a I+S frame numbered Nss+3 and the MS shall acknowledge this frame (N(R)=Nss+5).

Case b/b: If the MS chooses to send a REJ, it shall send a REJ frame containing N(R)=Nss+3.

The SS sends I+S frames numbered Nss+3, Nss+4 and the MS shall acknowledge these frames (N(R)=Nss+4, Nss+5).

The SS sends a I+S frame numbered Nss+5. The MS shall acknowledge this frame. Then the SS sends a I+S frame numbered Nss+5+KIM.

The MS shall ask for the retransmission of the missing frame numbered Nss+6 to Nss+4+KIM. The MS may send a SREJ frame (see sequence c with k=1). If it cannot send SREJ, it shall send a REJ frame (see sequence d with k=1).

Sequence c: If the MS chooses to send a SREJ, it shall send a SREJ frame containing N(R)=Nss+5+k.

The SS sends a I+S frame numbered Nss+5+k.

When using SREJ frames, the MS shall send RR frames to acknowledge the received I+S frames. The time when these RR frames are sent is not tested.

If k<KIM-1, the MS shall ask for the retransmission of the missing frames numbered Nss+5+k+1 to Nss+4+KIM. The MS may send a SREJ frame (see sequence c with k=k+1). If it cannot send SREJ, it shall send a REJ frame (see sequence d with k=k+1).

If k=KIM-1, the MS has no more frame to reject. It shall acknowledge the frame numbered Nss+5+KIM. with a frame containing N(R)=Nss+6+KIM.,. The SS sends I+S frames numbered Nss+6+KIM, etc... and the MS shall acknowledge these frames (N(R)=Nss+7+KIM, etc.

Sequence d: If the MS chooses to send a REJ, it shall send a REJ frame containing N(R)=Nss+5+k.

The SS sends a I+S frame numbered Nss+5+k and the MS shall acknowledge this frame (N(R)=Nss+5+k+1).

The SS sends a I+S frame numbered Nss+5+KIM.

If k<KIM-1, the MS shall ask for the retransmission of the missing frames numbered Nss+5+k+1 to Nss+4+KIM. The MS may send a SREJ frame (see sequence c with k=k+1). If it cannot send SREJ, it shall send a REJ frame (see sequence d with k=k+1).

If k=KIM-1, the MS has no more frame to reject. It shall acknowledge the frame numbered Nss+5+KIM. with a frame containing N(R)=Nss+6+KIM.,. The SS sends I+S frames numbered Nss+6+KIM, etc... and the MS shall acknowledge these frames (N(R)=Nss+7+KIM, etc.

The MS is returned to the idle state by clearing of the call.

Maximum duration of test

1 minute.

Expected sequence

	MS				SS
		<------	I+S	-------	0'
	0	-------	RR	------>	
		<------	I+S	-------	1'
	1		SREJ(a) or REJ(b) ?		
Case a					
	a - 1	-------	SREJ	------>	
		<------	I+S	-------	a - 2'
	a - 2		SREJ(a/a) or REJ(a/b) ?		
Case a/a					
	a/a - 1	-------	SREJ	------>	
		<------	I+S	-------	a/a - 2'
	a/a - 2	-------	RR	------>	
		<------	I+S	-------	a/a - 3'
	a/a - 3	-------	RR	------>	
Case a/b					
	a/b - 1	-------	REJ	------>	
		<------	I+S	-------	a/b - 2'
	a/b - 2	-------	RR	------>	
		<------	I+S	-------	a/b - 3'
	a/b - 3	-------	RR	------>	
		<------	I+S	-------	a/b - 4'
	a/b - 4	-------	RR	------>	
		<------	I+S	-------	a/b - 5'
	a/b - 5	-------	RR	------>	
Case b					
	b - 1	-------	REJ	------>	
		<------	I+S	-------	b - 2'
	b - 2	-------	RR	------>	
		<------	I+S	-------	b - 3'
	b - 3	-------	RR	------>	
		<------	I+S	-------	b - 4'
	b - 4		SREJ(b/a) or REJ(b/b) ?		
Case b/a					
	b/a - 1	-------	SREJ	------>	
		<------	I+S	-------	b/a - 2'
	b/a - 2	-------	RR	------>	
Case b/b					
	b/b - 1	-------	REJ	------>	

		<------	I+S	-------	b/b - 2'
	b/b - 2	-------	RR	------>	
		<------	I+S	-------	b/b - 3'
	b/b - 3	-------	RR	------>	
		<------	I+S	-------	i'
	i	-------	RR	------>	
		<------	I+S	-------	i+1'
	i+1		SREJ(c) or REJ(d) ?		

Sequence c (SREJ used)

	c/k - 0	-------	SREJ	------>	
		<------	I+S	-------	c/k - 0'
	c/k - 1		SREJ(c) or REJ(d) ?		

Sequence d (REJ used)

	d/k - 0	-------	REJ	------>	
		<------	I+S	-------	d/k - 0'
	d/k - 1	-------	RR	------>	
		<------	I+S	-------	d/k - 1'
	d/k - 2		SREJ(c) or REJ(d) ?		
	j	-------	RR	------>	
		<------	I+S	-------	j'
	...		etc...		...

The frames from the SS will be:

0': One I+S frame containing N(S)=N_{SS} mod(62), N(R)=N_{MS}+1 mod(62).

1': One I+S frame containing N(S)=N_{SS}+2 mod(62), N(R)=N_{MS}+1 mod(62).

Case a:

a - 2': One I+S frame containing N(S)=N_{SS}+4 mod(62), N(R)=N_{MS}+1 mod(62).

Case a/a:

a/a - 2': One I+S frame containing N(S)=N_{SS}+1 mod(62), N(R)=N_{MS}+1 mod(62).

a/a - 3': One I+S frame containing N(S)=N_{SS}+3 mod(62), N(R)=N_{MS}+1 mod(62).

Case a/b:

a/b - 2': One I+S frame containing N(S)=N_{SS}+1 mod(62), N(R)=N_{MS}+1 mod(62).

a/b - 3': One I+S frame containing N(S)=N_{SS}+2 mod(62), N(R)=N_{MS}+1 mod(62).

a/b - 4': One I+S frame containing N(S)=N_{SS}+3 mod(62), N(R)=N_{MS}+1 mod(62).

a/b - 5': One I+S frame containing N(S)=N_{SS}+4 mod(62), N(R)=N_{MS}+1 mod(62).

Case b:

b - 2': One I+S frame containing N(S)=N_{SS}+1 mod(62), N(R)=N_{MS}+1 mod(62).

b - 3': One I+S frame containing N(S)=N_{SS}+2 mod(62), N(R)=N_{MS}+1 mod(62).

b - 4': One I+S frame containing N(S)=N_{SS}+4 mod(62), N(R)=N_{MS}+1 mod(62).

Case b/a:

b/a - 2': One I+S frame containing N(S)=N_{SS}+3 mod(62), N(R)=N_{MS}+1 mod(62).

Case b/b:

b/b - 2': One I+S frame containing N(S)=N_{SS}+3 mod(62), N(R)=N_{MS}+1 mod(62).

b/b - 3': One I+S frame containing N(S)=N_{SS}+4 mod(62), N(R)=N_{MS}+1 mod(62).

i': One I+S frame containing N(S)=N_{SS}+5 mod(62), N(R)=N_{MS}+1 mod(62).

i+1': One I+S frame containing N(S)=N_{SS}+5+K_{IM} mod(62), N(R)=N_{MS}+1 mod(62).

Sequence c (with k=1 to K_{IM}-1):

c/k - 0': One I+S frame containing N(S)=N_{SS}+5+k mod(62), N(R)=N_{MS}+1 mod(62).

Sequence d (with k=1 to K_{IM}-1):

d/k - 0': One I+S frame containing N(S)=N_{SS}+5+k mod(62), N(R)=N_{MS}+1 mod(62).

d/k - 1': One I+S frame containing N(S)=N_{SS}+5+K_{IM} mod(62), N(R)=N_{MS}+1 mod(62).

j',...: One I+S frame containing N(S)=N_{SS}+K_{IM}+6,... mod(62), N(R)=N_{MS}+1 mod(62).

Specific message content

The frames from the MS shall be:

0: One RR frame containing N(R)=N_{SS}+1 mod(62).

1: The MS shall reject the missing I+S frame numbered N_{SS}+1. It may send a SREJ frame (see case a). If it cannot send SREJ, it shall send a REJ frame (see case b).

Case a

a - 1: One supervisory SREJ frame containing N(R)=N_{SS}+1 mod(62).

a - 2: The MS shall reject the missing I+S frame numbered N_{SS}+3. It may send a SREJ frame (see case a). If it cannot send SREJ, it shall send a REJ frame (see case b).

Case a/a

a/a - 1: One supervisory SREJ frame containing N(R)=N_{SS}+3 mod(62).

a/a - 2: One RR frame containing N(R)=N_{SS}+3 mod(62).

a/a - 3: One RR frame containing N(R)=N_{SS}+5 mod(62).

Case a/b

a/b - 1: One supervisory REJ frame containing N(R)=N_{SS}+1 mod(62).

a/b - 2: One RR frame containing N(R)=N_{SS}+2 mod(62).

a/b - 3: One RR frame containing N(R)=N_{SS}+3 mod(62).

a/b - 4: One RR frame containing N(R)=N_{SS}+4 mod(62).

a/b - 5: One RR frame containing N(R)=N_{SS}+5 mod(62).

Case b

b - 1: One supervisory REJ frame containing N(R)=N_{SS}+1 mod(62).

b - 2: One RR frame containing N(R)=N_{SS}+2 mod(62).

b - 3: One RR frame containing N(R)=Nss+3 mod(62).

b - 4: The MS shall reject the missing I+S frame numbered Nss+2. It may send a SREJ frame (see case a). If it cannot send SREJ, it shall send a REJ frame (see case b).

Case b/a

b/a - 1: One supervisory SREJ frame containing N(R)=Nss+2 mod(62).

b/a - 2: One RR frame containing N(R)=Nss+5 mod(62).

Case b/b

b/b - 1: One supervisory REJ frame containing N(R)=Nss+2 mod(62).

b/b - 2: One RR frame containing N(R)=Nss+4 mod(62).

b/b - 3: One RR frame containing N(R)=Nss+5 mod(62).

i: One RR frame containing N(R)=Nss+6 mod(62).

i+1: The MS shall reject all missing I+S frames (i.e. KIM-1 frames). It may send a SREJ frame (see sequence c with k=1). If it cannot send SREJ, it shall send a REJ frame (see sequence d with k=1).

Sequence c (with k=1 to KIM-1):

c/k - 0: One SREJ frame containing N(R)=Nss+5+k mod(62).

c/k - 1: If k<KIM-1, the MS shall reject all missing I+S frames (i.e. KIM-1 frames). It may send a SREJ frame (see sequence c with k=k+1). If it cannot send SREJ, it shall send a REJ frame (see sequence d with k=k+1). If k=KIM-1, the MS has no more frame to reject (see frame numbered j).

Sequence d (with k=1 to KIM-1):

d/k - 0: One REJ frame containing N(R)=Nss+5+k mod(62).

d/k - 1: One RR frame containing N(R)=Nss+5+k+1 mod(62).

d/k - 2: If k<KIM-1, the MS shall reject all missing I+S frames (i.e. KIM-1 frames). It may send a SREJ frame (see sequence c with k=k+1). If it cannot send SREJ, it shall send a REJ frame (see sequence d with k=k+1). If k=KIM-1, the MS has no more frame to reject (see frame numbered j).

j,...: One RR frame containing N(R)=Nss+KIM+6,... mod(62).

29.3.2.5.2 Retransmission of REJ or SREJ frames

29.3.2.5.2.1 Conformance requirements

The MS shall not retransmit a REJ frame upon time-out. It may repeat SREJ frames.

References

3GPP TS 04.22 subclauses 5.2.3.4 and 5.2.3.6.

29.3.2.5.2.2 Test purpose

To test that the MS is able to retransmit a SREJ supervisory frames, and does not retransmit a REJ frame.

29.3.2.5.2.3 Test method

Initial Conditions

The window size from IWF (SS) to MS is called KIM.

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use default RLP parameters.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case). The SS shall accept and use the new RLP parameters till the end of the test.

The ABM will be entered.

Specific PICS statements:

-

PIXIT statements:

- Bearer services supported
- Characteristics of non-transparent services.

Foreseen final state of the MS

Idle.

Test procedure

After optional status bits exchange between the MS and the SS, the SS is made to send continuously I+S frames. The delay between two consecutive I+S frames shall be inferior to T1.

The MS is made to send no user data. It sends only supervisory frames.

The SS sends a I+S frame numbered Nss. The MS shall acknowledge this frame. Then the SS sends a I+S frame numbered Nss+2.

The MS shall ask for the retransmission of the missing frame numbered Nss+1. The MS may send a SREJ frame (see case a). If it cannot send SREJ, it shall send a REJ frame (see case b).

Case a: If the MS chooses to send a SREJ, it shall send a SREJ frame containing N(R)=Nss+1.

The SS does not retransmit the rejected frame.

The MS may repeat (see case a1) or not (see case a2) the reject SREJ frame.

Case a1: If the MS chooses to retransmit the SREJ, it shall send a SREJ frame containing N(R)=Nss+1, at the expiry of T1.

The SS sends a I+S frame numbered Nss+1 and the MS shall acknowledge this frame (N(R)=Nss+3).

The SS sends a I+S frame numbered Nss+4.

The MS shall ask for the retransmission of the missing frame numbered Nss+3. The MS shall send a SREJ frame containing N(R)=Nss+3.

At expiry of T1, the MS shall send a new SREJ frame containing N(R)=Nss+3. This step is repeated N2 times.

The SS checks for 2*T1 that the SREJ frame is not repeated by the MS.

Case a2: If the MS chooses not to repeat the SREJ frame, The SS checks for 2*T1 that the SREJ frame is not repeated by the MS.

Case b: If the MS chooses to send a REJ, it shall send a REJ frame containing N(R)=Nss+1.

The SS does not retransmit the rejected frame.

The MS shall not repeat the reject REJ frame.

The SS checks for 2*T1 that the SREJ frame is not repeated by the MS.

The MS is returned to the idle state by clearing of the call.

Maximum duration of test

1 minute.

Expected sequence

	MS				SS
		<------	I+S	-------	0'
	0	-------	RR	------>	
		<------	I+S	-------	1'
	1		SREJ(a) or REJ(b) ?		
Case a					
	a - 1	-------	SREJ	------>	
	a - 2		SREJ repeated (a1) or not (a2) ?		
Case a1					
T1 Time-out	a1 - 1	-------	SREJ	------>	
		<------	I+S	-------	a1 - 1'
	a1 - 2	-------	RR	------>	
		<------	I+S	-------	a1 - 2'
	a1 - 3	-------	SREJ	------>	
T1 Time-out	a1 - 4	-------	SREJ	------>	
	...		etc...		...
T1 Time-out	a1 - 3+N2	-------	SREJ	------>	
T1 Time-out	SREJ not repeated				
Case a2					
T1 Time-out	SREJ not repeated				
Case b					
	b - 1	-------	REJ	------>	
T1 Time-out	SREJ not repeated				

The frames from the SS will be:

0': One I+S frame containing N(S)=NSS mod(62), N(R)=NMS+1 mod(62).

1': One I+S frame containing N(S)=NSS+2 mod(62), N(R)=NMS+1 mod(62).

Case a:

Case a1:

a1 - 1': One I+S frame containing N(S)=NSS+1 mod(62), N(R)=NMS+1 mod(62).

a1 - 2': One I+S frame containing N(S)=NSS+4 mod(62), N(R)=NMS+1 mod(62).

Specific message content

The frames from the MS shall be:

0: One RR frame containing N(R)=NSS+1 mod(62).

1: The MS shall reject the missing I+S frame numbered NSS+1. It may send a SREJ frame (see case a). If it cannot send SREJ, it shall send a REJ frame (see case b).

Case a

a - 1: One supervisory SREJ frame containing N(R)=NSS+1 mod(62).

a - 2: SREJ frame may be repeated, (see case a1) or not (see case a2).

Case a1

a1 - 1: On T1 Time-out, one supervisory SREJ frame containing N(R)=NSS+1 mod(62).

a1 - 2: One RR frame containing N(R)=NSS+3 mod(62).

a1 - 3,...,b2 - 3+N2: On T1 Time-out, one supervisory SREJ frame containing N(R)=NSS+3 mod(62).

Case b

b - 1: One supervisory REJ frame containing N(R)=NSS+1 mod(62).

29.3.2.5.3 I+S reject frame

29.3.2.5.3.1 Conformance requirements

The MS shall be able to use I+S frames to carry a REJ or SREJ frame when it detects that one or more numbered information frame is received out of sequence.

References

3GPP TS 04.22 subclauses 5.2.3.4 and 5.2.3.6.

29.3.2.5.3.2 Test purpose

To test the MS is able to send SREJ or REJ frames in I+S frames when an out of sequence information frame has been received.

29.3.2.5.3.3 Test method

Initial Conditions

The window size from IWF (SS) to MS is called KIM.

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use default RLP parameters.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case). The SS shall accept and use the new RLP parameters till the end of the test.

The ABM will be entered.

Specific PICS statements:

-

PIXIT statements:

- Bearer services supported
- Characteristics of non-transparent services.

Foreseen final state of the MS

Idle.

Test procedure

The SS is made to send continuously I+S frames. The delay between two consecutive I+S frames shall be inferior to T1.

The SS acknowledges all the received I+S frames.

The MS is made to send continuously I+S frames.

The SS sends a I+S frame numbered Nss. The MS shall acknowledge this frame. Then the SS sends a I+S frame numbered Nss+2.

The MS shall ask for the retransmission of the missing frame numbered Nss+1. The MS may send a SREJ frame (see case a). If it cannot send SREJ, it shall send a REJ frame (see case b). The MS has user data to transmit, it shall use an I+S frame (instead of supervisory frame) to reject the missing frame.

Case a: If the MS chooses to send a SREJ, it shall send a I+S SREJ frame containing N(R)=Nss+1.

The SS sends a I+S frame numbered Nss+1 and the MS acknowledges this frame (N(R)=Nss+3).

The SS sends a I+S frame numbered Nss+3, etc... and the MS acknowledges these frames (N(R)=Nss+4, etc...).

Case b: If the MS chooses to send a REJ, it shall send a I+S REJ frame containing N(R)=Nss+1.

The SS sends I+S frames numbered Nss+1, Nss+2, etc... and the MS shall acknowledge this frame (N(R)=Nss+2, Nss+3, etc...).

The MS is returned to the idle state by clearing of the call.

Maximum duration of test

1 minute.

Expected sequence

MS				SS
	<------	I+S	-------	0'
0	-------	I+S	------>	
	<------	I+S	-------	1'
1		SREJ(a) or REJ(b) ?		

Case a

a - 1	-------	SREJ(I+S)	------>	
	<------	I+S	-------	a - 2'
a - 2	-------	I+S	------>	
	<------	I+S	-------	a - 3'
a - 3	-------	I+S	------>	

Case b

b - 1	-------	REJ (I+S)	------>	
	<------	I+S	-------	b - 2'
b - 2	-------	I+S	------>	
	<------	I+S	-------	b - 3'
b - 3	-------	I+S	------>	
...		etc...		...

The frames from the SS will be:

0': One I+S frame containing N(S)=N_{SS} mod(62), N(R)=N_{MS}+1 mod(62).

1': One I+S frame containing N(S)=N_{SS}+2 mod(62), N(R)=N_{MS}+2 mod(62).

Case a:

a - 2': One I+S frame containing N(S)=N_{SS}+1 mod(62), N(R)=N_{MS}+3 mod(62).

a - 3': One I+S frame containing N(S)=N_{SS}+3 mod(62), N(R)=N_{MS}+4 mod(62).

Case b:

b - 2': One I+S frame containing N(S)=N_{SS}+1 mod(62), N(R)=N_{MS}+3 mod(62).

b - 3': One I+S frame containing N(S)=N_{SS}+2 mod(62), N(R)=N_{MS}+4 mod(62).

Specific message content

The frames from the MS shall be:

0: One I+S RR frame containing N(S)=N_{MS}+1, N(R)=N_{SS}+1 mod(62).

1: The MS shall reject the missing I+S frame numbered N_{SS}+1. It may send a I+S SREJ frame (see case a). If it cannot send SREJ, it shall send a I+S REJ frame (see case b).

Case a

a - 1: One I+S SREJ frame containing N(S)=NMS+2, N(R)=NSS+1 mod(62).

a - 2: One I+S RR frame containing N(S)=NMS+3, N(R)=NSS+3 mod(62).

a - 3: One I+S RR frame containing N(S)=NMS+4, N(R)=NSS+4 mod(62).

Case b

b - 1: One I+S REJ frame containing N(S)=NMS+2, N(R)=NSS+1 mod(62).

b - 2: One I+S RR frame containing N(S)=NMS+3, N(R)=NSS+2 mod(62).

b - 3: One I+S RR frame containing N(S)=NMS+4, N(R)=NSS+3 mod(62).

29.3.2.6 Checkpoint recovery

29.3.2.6.1 SS in checkpoint recovery mode

29.3.2.6.1.1 Test purpose

To test the correct handling of received frame with P=1.

29.3.2.6.1.2 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use default RLP parameters.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case). The SS shall accept and use the new RLP parameters till the end of the test.

The ABM will be entered.

Procedure

The MS is made to send continuously I+S frames with a delay inferior to T1 between each frame.

The SS is made to send continuously I+S frames with a delay superior to T2 and inferior to T1 between each frame.

The SS acknowledges the received I+S frames in its sending I+S frames.

The MS shall acknowledge the received I+S frames in its sending I+S frames.

After having sent i I+S frames, the SS sends a I+S frame with P bit set to 1.

The MS shall answer with a supervisory RR or RNR frame with F bit set to 1 and N(R) coded to the next frame waited by the MS.

The SS continue sending I+S frames and acknowledging the I+S frames received from the MS.

The MS shall continue sending I+S frames and acknowledging the I+S frames received from the SS.

The SS rejects 1 I+S frame in a supervisory SREJ frame with P bit set to 1.

The MS shall answer with a supervisory RR or RNR frame with F bit set to 1 and N(R) coded to the next frame waited by the MS.

Then the MS shall retransmit the rejected I+S frame.

The SS continue sending I+S frames and acknowledging the I+S frames received from the MS.

The MS shall continue sending I+S frames and acknowledging the I+S frames received from the SS.

After having sent j I+S frames, the SS sends a supervisory RR frame with P bit set to 1.

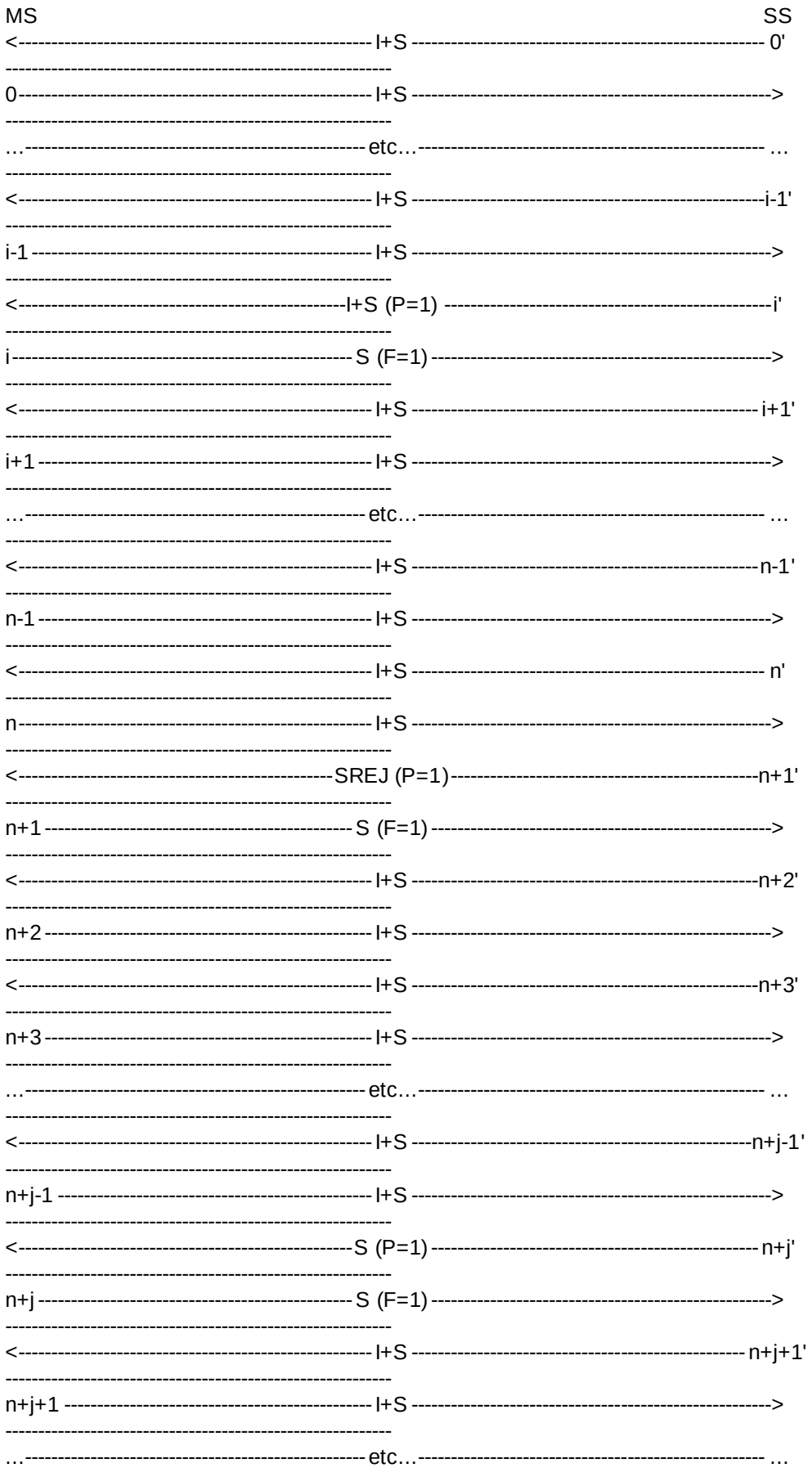
The MS shall answer with a supervisory RR or RNR frame with F bit set to 1 and N(R) coded to the next frame waited by the MS.

The SS continue sending I+S frames and acknowledging the I+S frames received from the MS.

The MS shall continue sending I+S frames and acknowledging the I+S frames received from the SS.

The MS is returned to the idle state by clearing of the call.

Expected sequence



The frames from the SS will be:

0',...,i-1': One I+S RR frame containing:

N(S)=NSS,...,NSS+i-1 mod(62),

N(R)=NMS,...,NMS+i-1 mod(62).

i': One I+S RR frame containing:

C/R=1,

P/F=1,

N(S)=NSS+i mod(62),

N(R)=NMS+i mod(62).

i+1',..,n-1': One I+S RR frame containing:

N(S)=NSS+i+1,..,NSS+n-1 mod(62),

N(R)=NMS+i-1...,NMS+n-3 mod(62).

n: One I+S RR frame containing:

N(S)=NSS+n mod(62),

N(R)=NMS+n-3 mod(62).

n+1: One supervisory SREJ frame containing:

C/R=1,

P/F=1,

N(R)=NMS+n-2 mod(62).

n+2': One I+S RR frame containing:

N(S)=NSS+n+1 mod(62),

N(R)=NMS+n-2 mod(62).

n+3',..,n+j-1': One I+S RR frame containing:

N(S)=NSS+n+2,..,NSS+n+j mod(62),

N(R)=NMS+n,... ,NMS+n+j-3 mod(62).

n+j: One supervisory SREJ frame containing:

C/R=1,

P/F=1,

N(R)=NMS+n-2 mod(62).

n+j+1',...: One I+S RR frame containing:

N(S)=NSS+n+j+1,... mod(62),

N(R)=NMS+n+j-2,... mod(62).

29.3.2.6.1.3 Test requirements

The frames from the MS shall be:

0,...,i-1: One I+S frame containing:

N(S)=NMS,...,NMS+i-1 mod(62),

N(R)=NSS+1,...,NSS+i mod(62).

i': One supervisory RR frame containing:

C/R=0,

P/F=1,

N(R)=NSS+i+1 mod(62).

i+1,...,n: One I+S frame containing:

N(S)=NMS+i,...,NMS+n-1 mod(62),

N(R)=NSS+i+2,...,NSS+n+1 mod(62).

n+1: One supervisory RR frame containing:

C/R=0,

P/F=1,

N(R)=NSS+n+1 mod(62).

n+2: One I+S frame containing:

N(S)=NMS+n-2 mod(62),

N(R)=NSS+n+2 mod(62).

n+3,...,n+j-1: One I+S frame containing:

N(S)=NMS+n,...,NMS+n+j-3 mod(62),

N(R)=NSS+n+3,...,NSS+n+j+1 mod(62).

n+j: One supervisory RR frame containing:

C/R=0,

P/F=1,

N(R)=NSS+n+j+1 mod(62).

n+j+1,...: One I+S frame containing:

N(S)=NMS+n+j-2 mod(62),

N(R)=NSS+n+j+2,... mod(62).

29.3.2.6.2 End of the window

29.3.2.6.2.1 Test purpose

To test the correct handling of checkpoint recovery at the end of the window.

29.3.2.6.2.2 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use RLP default parameters except the window size from MS to IWF (SS), called KMI.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Since some RLP parameters are different from the default parameters, a negotiation procedure will be initiated by the MS after the CONNECKT ACKNOWLEDGE message. The MS may negotiate the RLP default parameters within allowed ranges, defined in 3GPP TS 04.22, except the window size from MS to IWF (SS), called KMI, which has to be a non default value.

The SS shall accept and use the new RLP parameters till the end of the test.

After the negotiation procedure the ABM will be entered. This test is repeated twice with 2 different values of KMI, randomly chosen.

Procedure

The MS is made to send continuously I+S frames with a delay inferior to T1 between each frame.

The SS does not acknowledge the received I+S frames in RR frames.

The MS stops sending I+S frames after having sent KMI frames without acknowledgement, due to the window size.

At the expiry of T1 after the last sending I+S frame, the MS shall send a supervisory command RR frame with P bit set to 1.

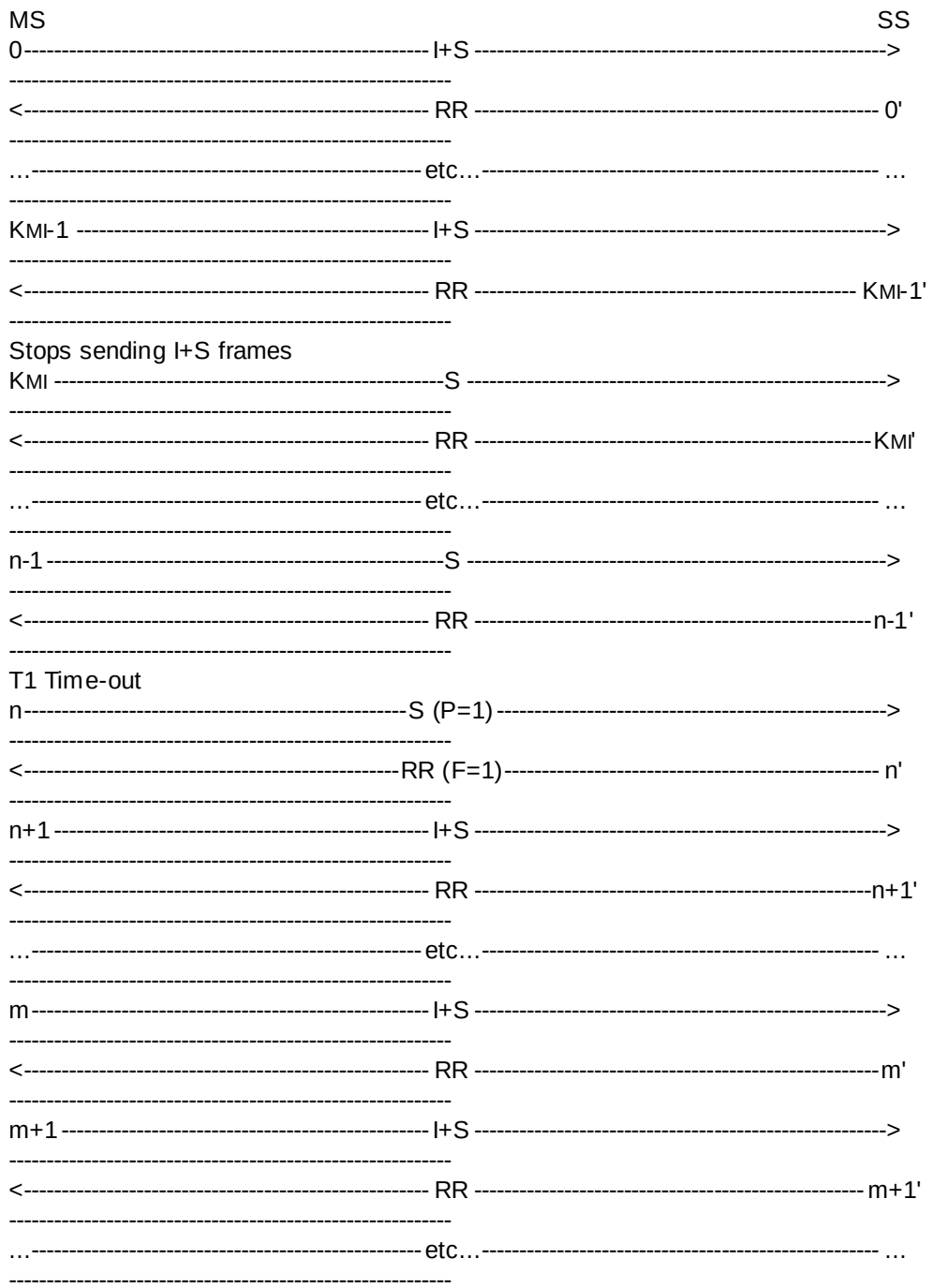
The SS answer in a RR response frame with F bit set to 1 and acknowledging j<KMI frames (j is randomly chosen).

The MS shall retransmit the KMI-j lost I+S frames and then shall continue to send I+S frames.

The SS acknowledges the received I+S frames in RR frames.

The MS is returned to the idle state by clearing of the call.

Expected sequence



The frames from the SS will be:

0',...,n-1': One RR frame containing:

N(R)=NMS mod(62).

n': One supervisory RR frame containing:

C/R=0,

P/F=1,

N(R)=NMS+i-1+j mod(62).

n+1',...: One supervisory RR frame containing:

N(R)=NMS+i+j mod(62).

29.3.2.6.2.3 Test requirements

The frames from the MS shall be:

0,...,KMI-1: One I+S frame containing:

N(S)=NMS,...,NMS+KMI-1 mod(62).

KMI,...,n-1: The MS stops sending I+S frames. It sends S frames.

n: On T1 Time-out after the last sent I+S frame, the MS sends a S frame containing C/R=1 and P/F=1.

n+1,...,m: The MS retransmits the lost I+S frames, it send I+S frames containing N(S)=NMS-1+j,...,NMS+KMI-1 mod(62).

m+1,...: One I+S frames containing:

N(S)=NMS+KMI,... mod(62)

29.3.2.6.3 End of a sequence

29.3.2.6.3.1 Test purpose

To test the correct handling of checkpoint recovery at the end of a sequence of frames

29.3.2.6.3.2 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use RLP default parameters except the window size from MS to IWF (SS), called KMI.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Since some RLP parameters are different from the default parameters, a negotiation procedure will be initiated by the MS after the CONNECKT ACKNOWLEDGE message. The MS may negotiate the RLP default parameters within allowed ranges, defined in 3GPP TS 04.22, except the window size from MS to IWF (SS), called KMI, which has to be a non default value.

The SS shall accept and use the new RLP parameters till the end of the test.

After the negotiation procedure the ABM will be entered.

This test is repeated twice with 2 different values of KMI, randomly chosen.

Procedure

The MS is made to send a sequence of i I+S frames (1<i<KIM) with a delay inferior to T1 between each frame.

The SS does not acknowledge the received I+S frames.

The MS sends S frames.

At the expiry of T1 after the last sending I+S frame, the MS shall send a supervisory command RR frame with P bit set to 1.

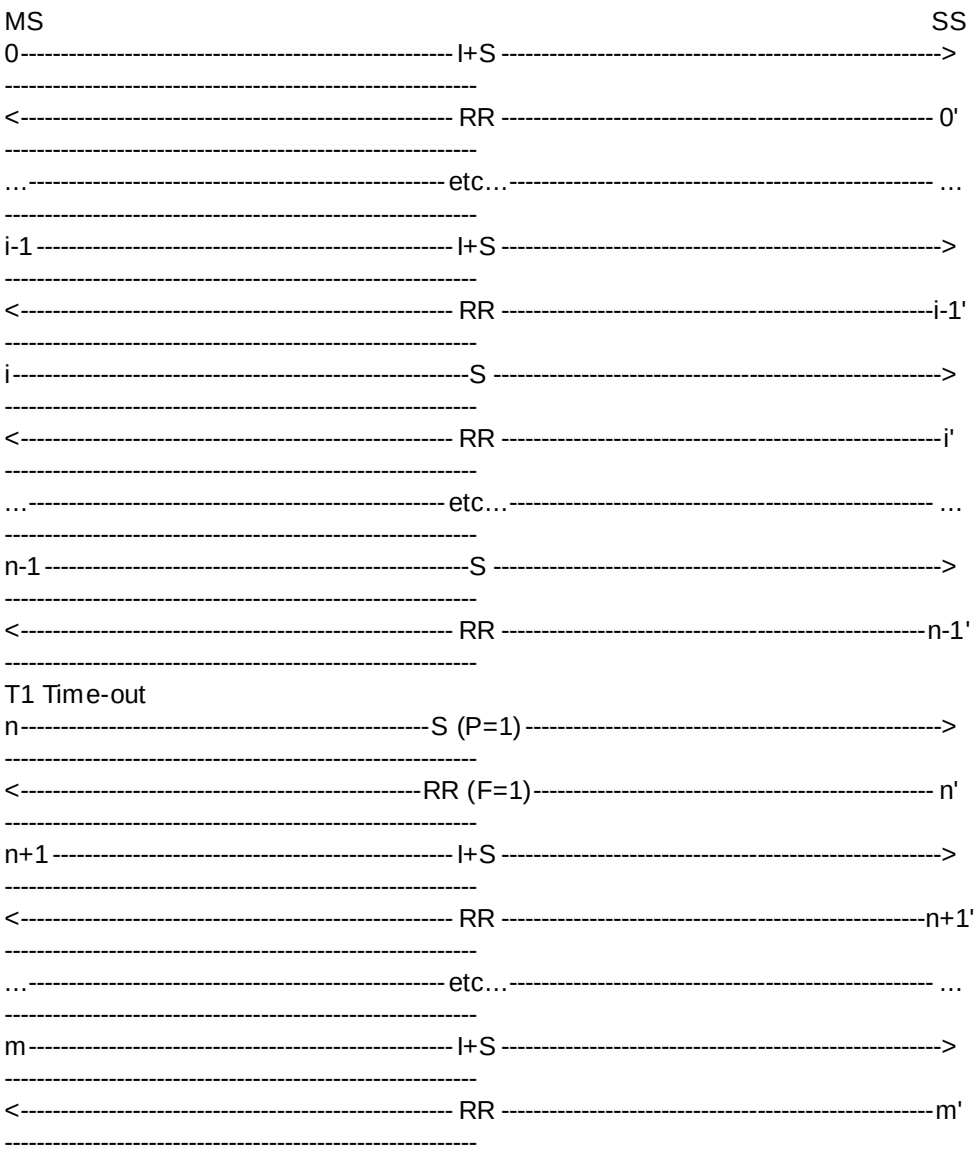
The SS answer in a RR response frame with F bit set to 1 and acknowledging j<i frames (j is randomly chosen).

The MS shall retransmit the i-j lost I+S frames.

The SS acknowledges the received I+S frames in RR frames.

The MS is returned to the idle state by clearing of the call.

Expected sequence



The frames from the SS will be:

0',...,n-1': One RR frame containing:

N(R)=N_{MS} mod(62).

n': One supervisory RR frame containing:

C/R=0,

P/F=1,

N(R)=N_{MS}+j mod(62).

n+1',...: One supervisory RR frame containing:

N(R)=NMS+j mod(62).

29.3.2.6.3.3 Test requirements

The frames from the MS shall be:

0,...,i-1: One I+S frame containing:

N(S)=NMS,...,NMS+i-1 mod(62).

i-1,...,n-1: The MS sends S frames.

n: On T1 Time-out after the last sent I+S frame, the MS sends a S frame containing C/R=1 and P/F=1.

n+1,...,m: The MS retransmits the lost I+S frames, it send I+S frames containing N(S)=NMS+j,...,NMS+i-1 mod(62).

29.3.2.6.4 Time-out of one frame

29.3.2.6.4.1 Test purpose

To test the correct handling of checkpoint recovery when a frame is not acknowledge.

29.3.2.6.4.2 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use default RLP parameters.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case). The SS shall accept and use the new RLP parameters till the end of the test.

The ABM will be entered.

Procedure

The MS is made to send only one I+S frames.

The SS does not acknowledge the received I+S frame.

At the expiry of T1 after the sending of the I+S frame, the MS shall send a supervisory command RR frame with P bit set to 1.

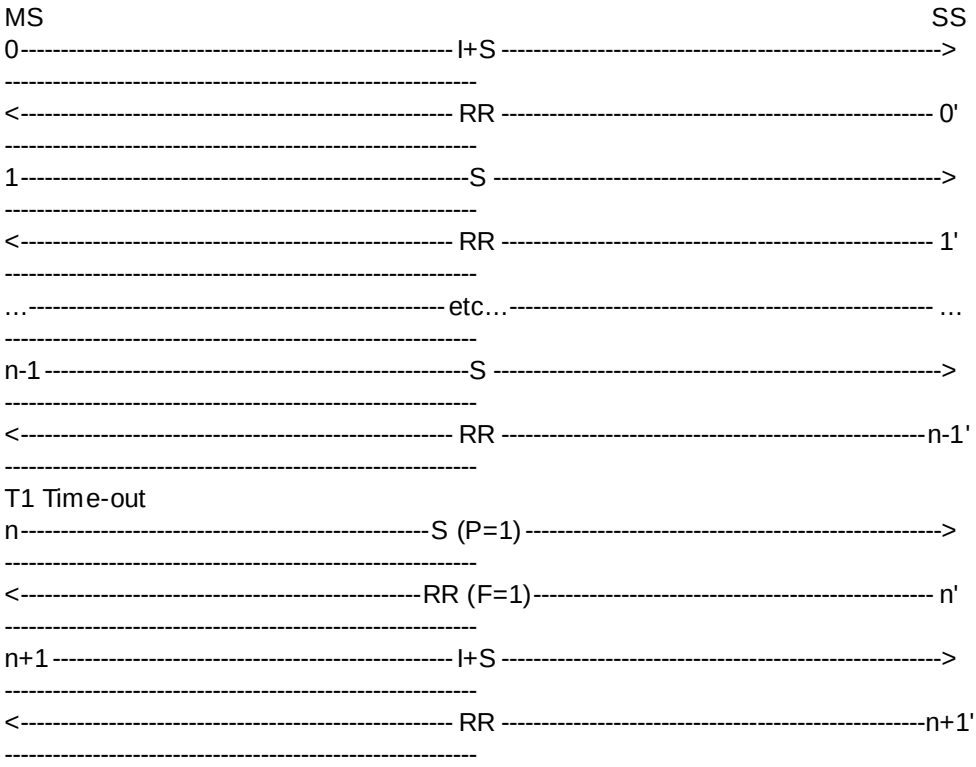
The SS answer in a RR response frame with F bit set to 1 and N(R) corresponding to the I+S frame sent by the MS.

The MS shall retransmit the I+S frame.

The SS acknowledges the received I+S frame in RR frame.

The MS is returned to the idle state by clearing of the call.

Expected sequence



The frames from the SS will be:

0',...,n-1': One RR frame containing:

N(R)=NMS mod(62).

n': One supervisory RR frame containing:

C/R=0,

P/F=1,

N(R)=NMS mod(62).

n+1': One supervisory RR frame containing:

N(R)=NMS+1 mod(62).

29.3.2.6.4.3 Test requirements

The frames from the MS shall be:

0,: One I+S frame containing:

N(S)=NMS mod(62).

1,...,n-1: The MS sends S frames.

n: On T1 Time-out after the I+S frame, the MS sends a S frame containing C/R=1 and P/F=1.

n+1: The MS retransmits the I+S frame containing N(S)=NMS mod(62).

29.3.2.6.5 No response to checkpointing

29.3.2.6.5.1 Test purpose

To test the correct repetition of a frame with P=1 if SS does not answer to checkpointing.

29.3.2.6.5.2 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use default RLP parameters.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case). The SS shall accept and use the new RLP parameters till the end of the test.

The ABM will be entered.

Procedure

The MS is made to send only one I+S frames.

The SS does not acknowledge the received I+S frame.

At the expiry of T1 after the sending of the I+S frame, the MS shall send a supervisory command RR frame with P bit set to 1.

The SS answer in a RR response frame with F bit set to 0 and N(R) acknowledging the I+S frame sent by the MS.

At the expiry of T1 after the sending of the frame with P=1, the MS shall send a new supervisory command RR frame with P bit set to 1.

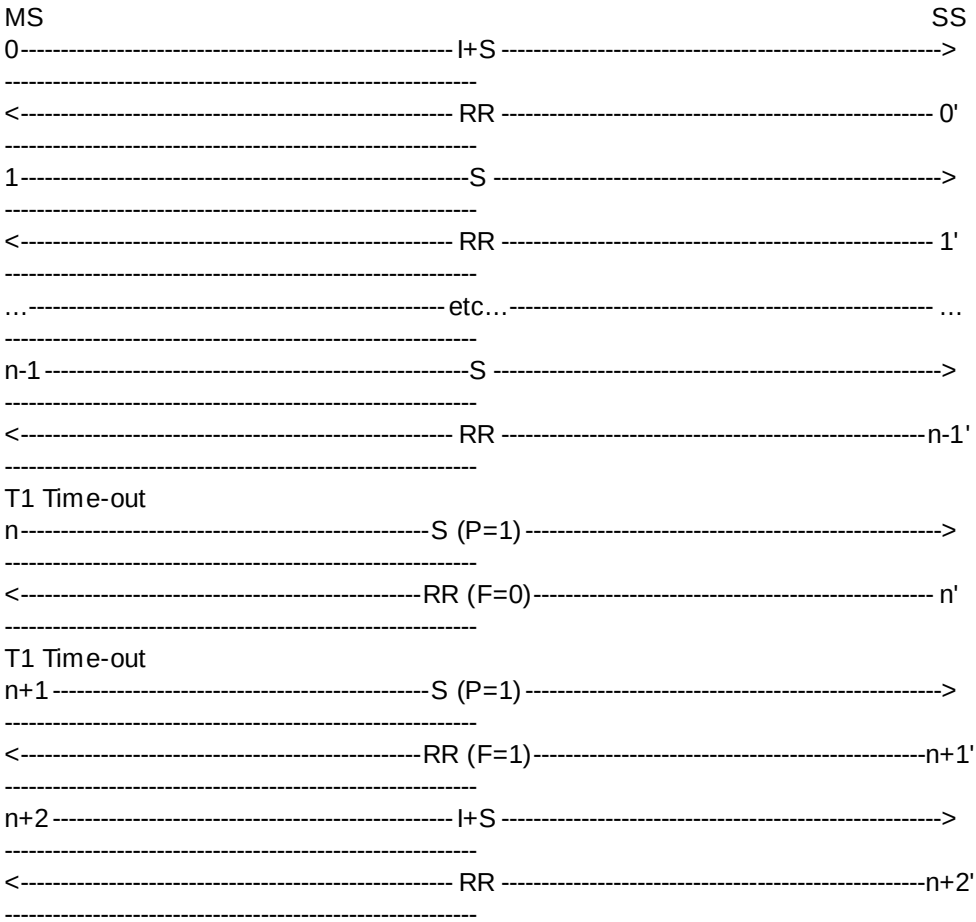
The SS answer in a RR response frame with F bit set to 1 and N(R) corresponding to the I+S frame sent by the MS.

The MS shall retransmit the I+S frame.

The SS acknowledges the received I+S frame in RR frame.

The MS is returned to the idle state by clearing of the call.

Expected sequence



The frames from the SS will be:

0',...,n-1': One RR frame containing:

N(R)=N_{MS} mod(62).

n': One supervisory RR frame containing:

C/R=0,

P/F=0,

N(R)=N_{MS}+1mod(62).

n+1': One supervisory RR frame containing:

C/R=0,

P/F=1,

N(R)=N_{MS} mod(62).

n+2': One supervisory RR frame containing:

N(R)=N_{MS}+1 mod(62).

29.3.2.6.5.3 Test requirements

The frames from the MS shall be:

0,: One I+S frame containing:

N(S)=NMS mod(62).

1,...,n-1: The MS sends S frames.

n: On T1 Time-out after the I+S frame, the MS sends a S frame containing C/R=1 and P/F=1.

n+1: On T1 Time-out after the sending of the first frame with P=1, the MS sends a S frame containing C/R=1 and P/F=1.

n+2: The MS retransmits the I+S frame containing N(S)=NMS mod(62).

29.3.2.6.6 Incorrect response to checkpointing

29.3.2.6.6.1 Test purpose

To test the correct repetition of a frame with P=1 if the answer to checkpointing is incorrect.

29.3.2.6.6.2 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use default RLP parameters.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case). The SS shall accept and use the new RLP parameters till the end of the test.

The ABM will be entered.

Procedure

The MS is made to send only one I+S frames.

The SS does not acknowledge the received I+S frame.

The MS sends supervisory frame with P set to 0 when it has nothing else to send.

At the expiry of T1 after the sending of the I+S frame, the MS shall send a supervisory command RR frame with P bit set to 1.

The SS answer in a supervisory SREJ response frame with F bit set to 1 and N(R) rejecting the I+S frame sent by the MS.

At the expiry of T1 after the sending of the frame with P=1, the MS shall send a new supervisory command RR frame with P bit set to 1.

The SS answer in a supervisory REJ response frame with F bit set to 1 and N(R) rejecting the I+S frame sent by the MS.

At the expiry of T1 after the sending of the frame with P=1, the MS shall send a new supervisory command RR frame with P bit set to 1.

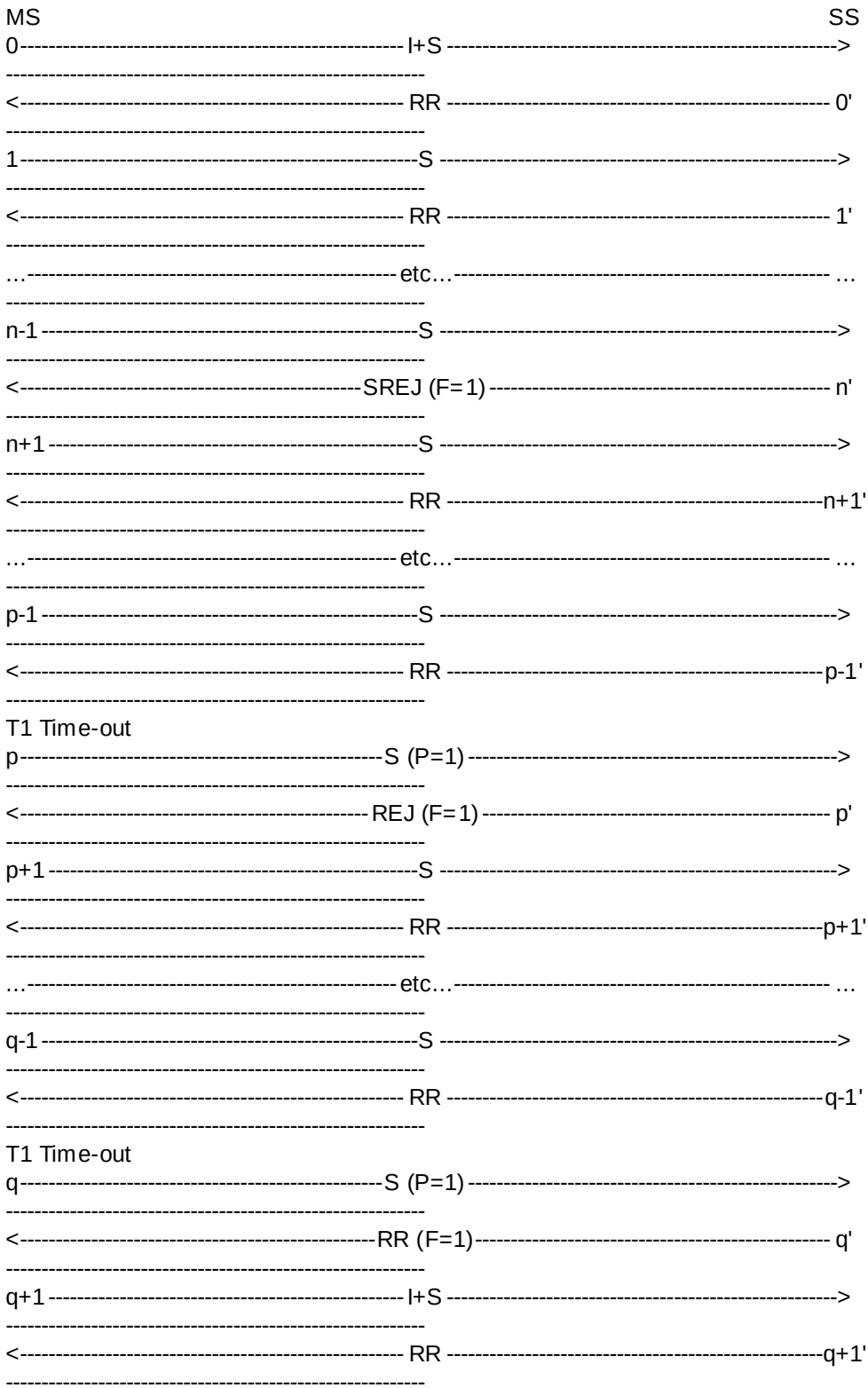
The SS answer in a RR response frame with F bit set to 1 and N(R) corresponding to the I+S frame sent by the MS.

The MS shall retransmit the I+S frame.

The SS acknowledges the received I+S frame in RR frame.

The MS is returned to the idle state by clearing of the call.

Expected sequence



The frames from the SS will be:

0',...,n-1': One RR frame containing:

N(R)=N_{MS} mod(62).

n': One supervisory SREJ frame containing:

C/R=0,

P/F=1,

N(R)=NMSmod(62).

m+1',...,p-1': One RR frame containing:

N(R)=NMS mod(62).

p': One supervisory REJ frame containing:

C/R=0,

P/F=1,

N(R)=NMSmod(62).

p+1',...,q-1': One RR frame containing:

N(R)=NMS mod(62).

q': One supervisory RR frame containing:

C/R=0,

P/F=1,

N(R)=NMSmod(62).

q+1': One RR frame containing:

N(R)=NMS+1 mod(62).

29.3.2.6.6.3 Test requirements

The frames from the MS shall be:

0,: One I+S frame containing:

N(S)=NMS mod(62).

1,...,n-1: The MS sends S frames.

n: On T1 Time-out after the I+S frame, the MS sends a S frame containing:

C/R=1,

P/F=1.

n+1,...,p-1: The MS sends S frames.

p: On T1 Time-out after the I+S frame, the MS sends a S frame containing:

C/R=1,

P/F=1.

p+1,...,q-1: The MS sends S frames.

q: On T1 Time-out after the I+S frame, the MS sends a S frame containing:

C/R=1,

P/F=1.

q+1: The MS retransmits the I+S frame containing:

N(S)=NMS mod(62).

29.3.2.6.7 Total loss of response to checkpointing

29.3.2.6.7.1 Definition

The last frame of a sequence of numbered information frames is guarded by timer T1. Failure to receive an acknowledgement, or a reject, within a time T1, shall result in the RLP entity starting a checkpoint recovery procedure. If the RLP peer entity fails to respond to a checkpoint command, which is also guarded by timer T1, the checkpoint recovery procedure shall be repeated, up to N2 times.

29.3.2.6.7.2 Conformance requirements

The MS shall start the checkpoint procedure after failure to receive acknowledgement of a numbered information frame within a time T1. 3GPP TS 04.22, subclauses 5.3.3 and 5.3.3.2.

The MS shall repeat the checkpoint procedure, up to N2 times, if the peer RLP entity fails to respond to a checkpoint command within a time T1. 3GPP TS 04.22, subclause 5.3.3.2.

The MS shall disconnect or reset the RLP link after the checkpoint procedure has been performed N2+1 times, 3GPP TS 04.22, subclause 5.3.3.2.

References

3GPP TS 04.22 subclauses 5.3.3 and 5.3.3.2.

29.3.2.6.7.3 Test purpose

To test the correct handling of a total loss of response to checkpointing.

29.3.2.6.7.4 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

If possible, the MS is configured to use RLP default parameters except the number of retransmission N2. If a MS cannot be configured to use a non default N2 value, the SS shall use XID negotiation to modify the value of N2 to be used during the test.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Since some RLP parameters are different from the default parameters, a negotiation procedure will be initiated by the MS after the CONNECKT ACKNOWLEDGE message. The MS may negotiate the RLP default parameters within allowed ranges, defined in 3GPP TS 04.22, except the number of retransmission N2, which has to be a non default value.

The SS shall accept and use the new RLP parameters till the end of the test.

After the negotiation procedure the ABM will be entered.

Once in ABM, the SS shall initiate the transmission of an I+S frame, which will transfer L2RCOP status information between peer L2RCOP entities (SS to MS). The MS may respond with an I+S frame containing L2RCOP status information. The SS shall be capable of initiating this sequence, or responding to an I+S L2RCOP status frame from the MS.

This test is repeated twice with 2 different values of N2, randomly chosen.

Test Procedure

The MS is made to send only one I+S frames.

The SS does not acknowledge the received I+S frame.

At the expiry of T1 after the sending of the I+S frame, the MS shall send a supervisory command RR frame with P bit set to 1.

The SS answer in a RR response frame with F bit set to 0 and N(R) acknowledging the I+S frame sent by the MS.

At the expiry of T1 after the sending of the frame with P=1, the MS shall send a new supervisory command RR frame with P bit set to 1.

The SS answer in a RR response frame with F bit set to 0 and N(R) corresponding to the I+S frame sent by the MS.

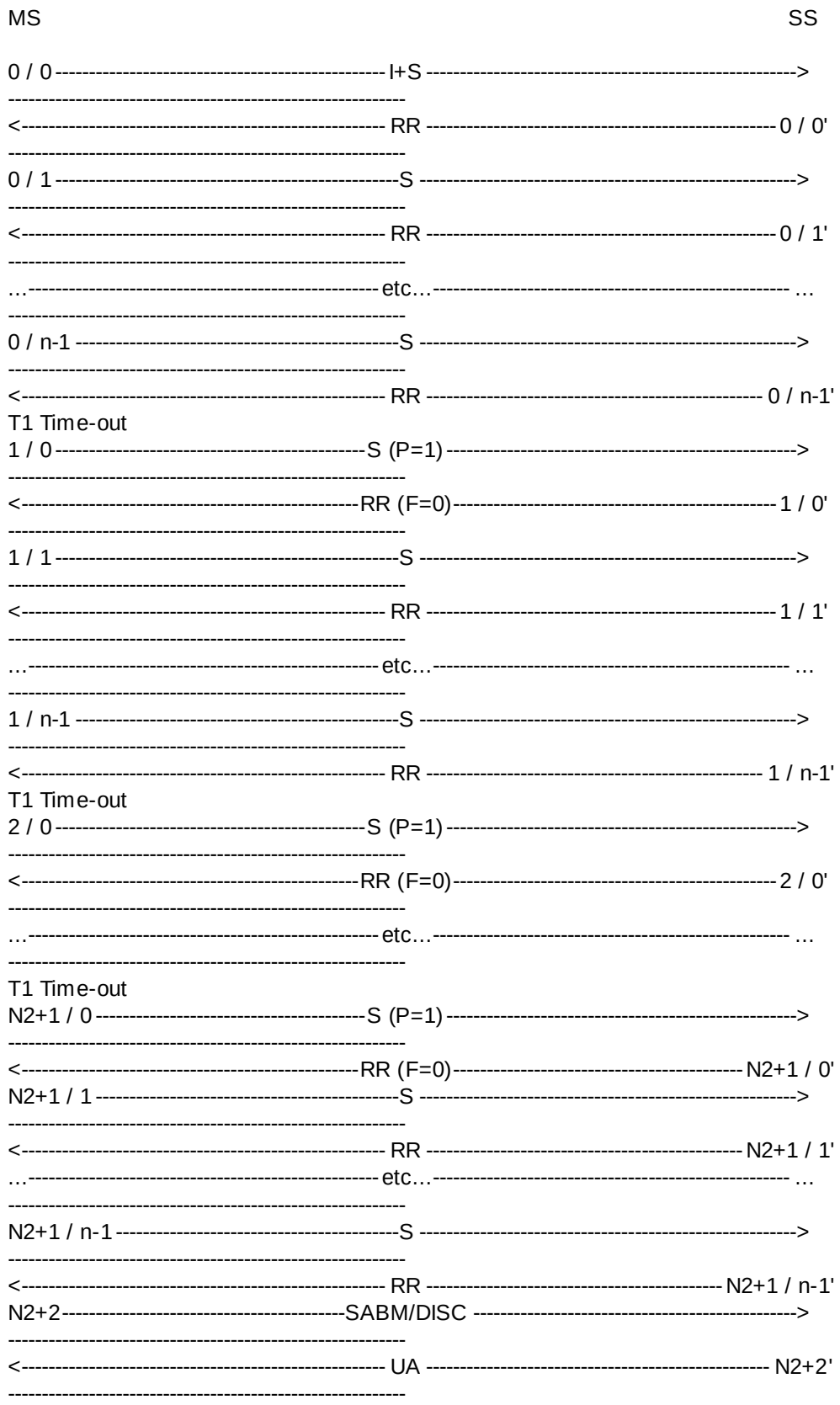
These 2 last steps are repeated N2 times.

At the expiry of T1 after the sending of the frame with P=1, the MS shall reset (SABM) or disconnect (DISC) the link.

The SS answer with an UA frame.

The MS is returned to the idle state by clearing of the call.

Expected sequence



The frames from the SS will be:

0 / i',...,0 / i': One RR frame containing:

P/F=0,

N(R)=NMS mod(62).

i = 0,...,n-1.

k / i',...,k / i': One RR frame containing:

P/F=0,

N(R)=NMS mod(62).

k = 1,..., N2+1, i = 0,...,n-1.

N2+2': One UA frame containing:

C/R=0,

P/F=P/F received in the DISC or SABM.

29.3.2.6.7.5 Test requirements

The frames from the MS shall be:

0 / 0: One I+S frame containing:

N(S)=NMS mod(62).

0 / 1,..., 0/ n-1: The MS sends S frames.

k / 0: On T1 Time-out after the I+S frame, the MS sends a S frame containing:

C/R=1,

P/F=1.

k = 1,..., N2+1.

k / 1,..., k / n-1: The MS sends S frames.

N2+2: The MS sends a SABM (C/R=1, P/F=1) or a DISC(C/R=1) frame.

29.3.2.6.8 Retransmission of a sequence

29.3.2.6.8.1 Test purpose

To test the correct repetition of a sequence of frame.

29.3.2.6.8.2 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use RLP default parameters except the number of retransmission N2.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Since some RLP parameters are different from the default parameters, a negotiation procedure will be initiated by the MS after the CONNECKT ACKNOWLEDGE message. The MS may negotiate the RLP default parameters within allowed ranges, defined in 3GPP TS 04.22, except the number of retransmission N2, which has to be a non default value.

The SS shall accept and use the new RLP parameters till the end of the test.

After the negotiation procedure the ABM will be entered.

This test is repeated twice with 2 different values of N2, randomly chosen. The window size fromMS to IWF (SS) is called KMI.

Procedure

The MS is made to send a sequence of i I+S frames (1<i<KIM) with a delay inferior to T1 between each frame.

The SS does not acknowledge the received I+S frames.

The MS starts sending supervisory frames after having sent i frames.

At the expiry of T1 after the last sending I+S frame, the MS shall send a supervisory command RR frame with P bit set to 1.

The SS answers in a RR response frame with F bit set to 1 and acknowledging no frames.

The MS shall retransmit the all I+S frames. Then the MS shall sends supervisory frames.

At the expiry of T1 after the last sending I+S frame, the MS shall send a supervisory command RR frame with P bit set to 1.

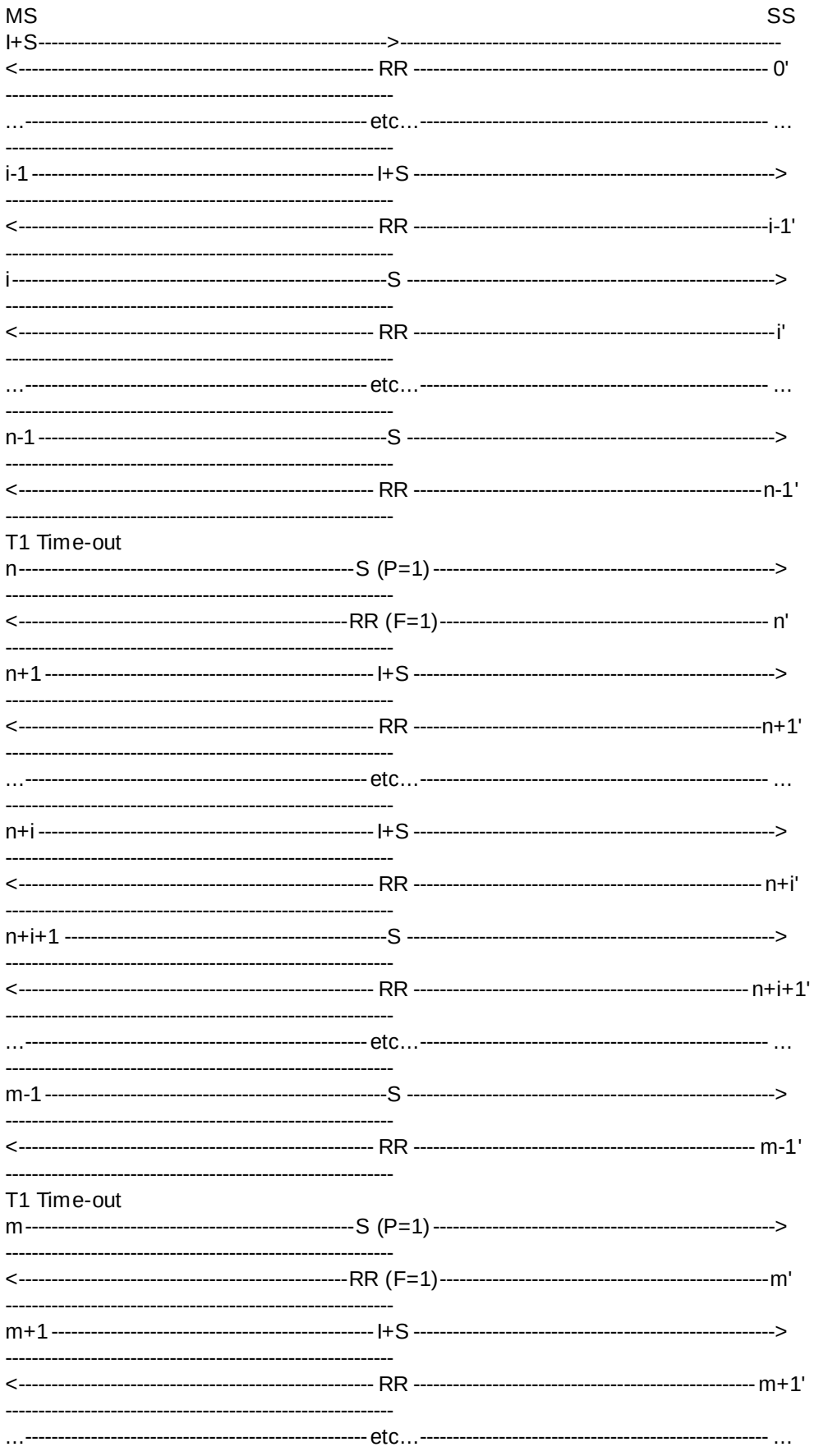
The SS answers in a RR response frame with F bit set to 1 and acknowledging j<i frames. (j randomly chosen).

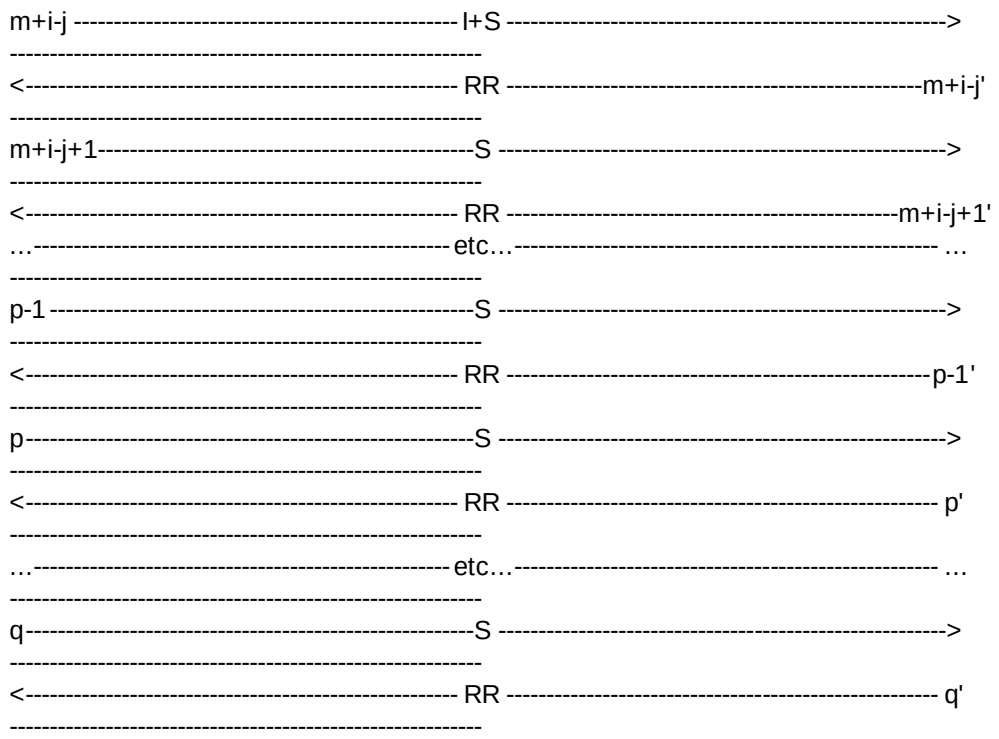
The MS shall retransmit the i-j lost I+S frames.

0,25*T1 after the last I+S frame of the sequence, the SS acknowledges all the received I+S frames in RR frame.

The MS is returned to the idle state by clearing of the call.

Expected sequence





The frames from the SS will be:

0',...,n-1': One RR frame containing:

N(R)=NMS mod(62).

n': One supervisory RR frame containing:

C/R=0,

P/F=1,

N(R)=NMS mod(62).

n+1',...,m-1': One supervisory RR frame containing:

N(R)=NMS mod(62).

m': One supervisory RR frame containing:

C/R=0,

P/F=1,

N(R)=NMS+j mod(62).

m+1,...,p-2': One supervisory RR frame containing:

N(R)=NMS+j mod(62).

p-1': 0,25*T1 after the last received I+S frame, the SS sends a supervisory RR frame containing:

N(R)=NMS+i mod(62).

p',...,q': during at least T1, the SS sends supervisory frames.

29.3.2.6.8.3 Test requirements

The frames from the MS shall be:

0,...,i-1: One I+S frame containing:

N(S)=NMS,...,NMS+i-1 mod(62).

i,...,n-1: The MS sends S frames with P bit set to 0.

n: On T1 Time-out after the I+S frame, the MS sends a S frame containing:

C/R=1,

P/F=1.

n+1,...,n+i: The MS retransmits the I+S frames containing:

N(S)=NMS,...,NMS+i-1 mod(62).

n+i+1,...,m-1: The MS sends S frames with P bit set to 0.

m: On T1 Time-out after the I+S frame, the MS sends a S frame containing:

C/R=1,

P/F=1.

m+1,...,m+i-j: The MS retransmits the I+S frames containing:

N(S)=NMS+j,...,NMS+i-1 mod(62).

m+i-j+1,...,q: The MS sends S frames with P bit set to 0.

29.3.2.6.9 N2 retransmission of a sequence

29.3.2.6.9.1 Definition

The last frame of a sequence of numbered information frames is guarded by timer T1. Failure to receive an acknowledgement, or a reject, within a time T1, shall result in the RLP entity starting a checkpoint recovery procedure. If the peer RLP entity responds with a Supervisory frame with the F-bit set to "1", the MS shall retransmit the numbered frames, if appropriate.

29.3.2.6.9.2 Conformance requirements

The MS shall start the checkpoint procedure after failure to receive acknowledgement of a numbered information frame within a time T1. 3GPP TS 04.22, subclauses 5.3.3 and 5.3.3.2.

The MS shall retransmit the I+S frame sequence starting at N(R), upon reception of a Supervisory frame with the F-bit set to "1" from the peer RLP entity. This shall constitute a retransmission of the original I+S sequence only if N(R) remains constant, 3GPP TS 04.22, subclause 5.3.3.

The MS shall disconnect or reset the RLP link after the I+S sequence and checkpoint procedure has been performed N2+1 times, 3GPP TS 04.22, subclause 5.3.3.2.

References

3GPP TS 04.22 subclauses 5.3.3 and 5.3.3.2.

29.3.2.6.9.3 Test purpose

To test the correct repetition of a sequence of frame.

29.3.2.6.9.4 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

If possible, the MS is configured to use RLP default parameters except the number of retransmission N2. If a MS cannot be configured to use a non default N2 value, the SS shall use XID negotiation to modify the value of N2 to be used during the test.

A non transparent data call will be established, so that the MS is in call state U10 ("Call Active").

Since some RLP parameters are different from the default parameters, a negotiation procedure will be initiated by the MS after the CONNECKT ACKNOWLEDGE message. The MS may negotiate the RLP default parameters within allowed ranges, defined in 3GPP TS 04.22, except the number of retransmission N2, which has to be a non default value.

The SS shall accept and use the new RLP parameters till the end of the test.

After the negotiation procedure the ABM will be entered.

Once in ABM, the SS shall initiate the transmission of an I+S frame, which will transfer L2RCOP status information between peer L2RCOP entities (SS to MS). The MS may respond with an I+S frame containing L2RCOP status information. The SS shall be capable of initiating this sequence, or responding to an I+S L2RCOP status frame from the MS.

This test is repeated twice with 2 different values of N2, randomly chosen.

The window size from MS to IWF (SS) is called KMI.

Test Procedure

The MS is made to send a sequence of i I+S frames (1<i<KMI, and i>N2) with a delay inferior to T1 between each frame.

The SS does not acknowledge the received I+S frames.

The MS shall send S frames after having sent the i I+S frames.

At the expiry of T1 after the last sending I+S frame, the MS shall send a supervisory command RR frame with P bit set to 1.

The SS answer in a RR response frame with F bit set to 1 and acknowledging 1 frame.

The MS shall retransmit the i-1 lost I+S frames.

The SS does not acknowledge the received I+S frames.

The MS shall send S frames after having sent the i I+S frames.

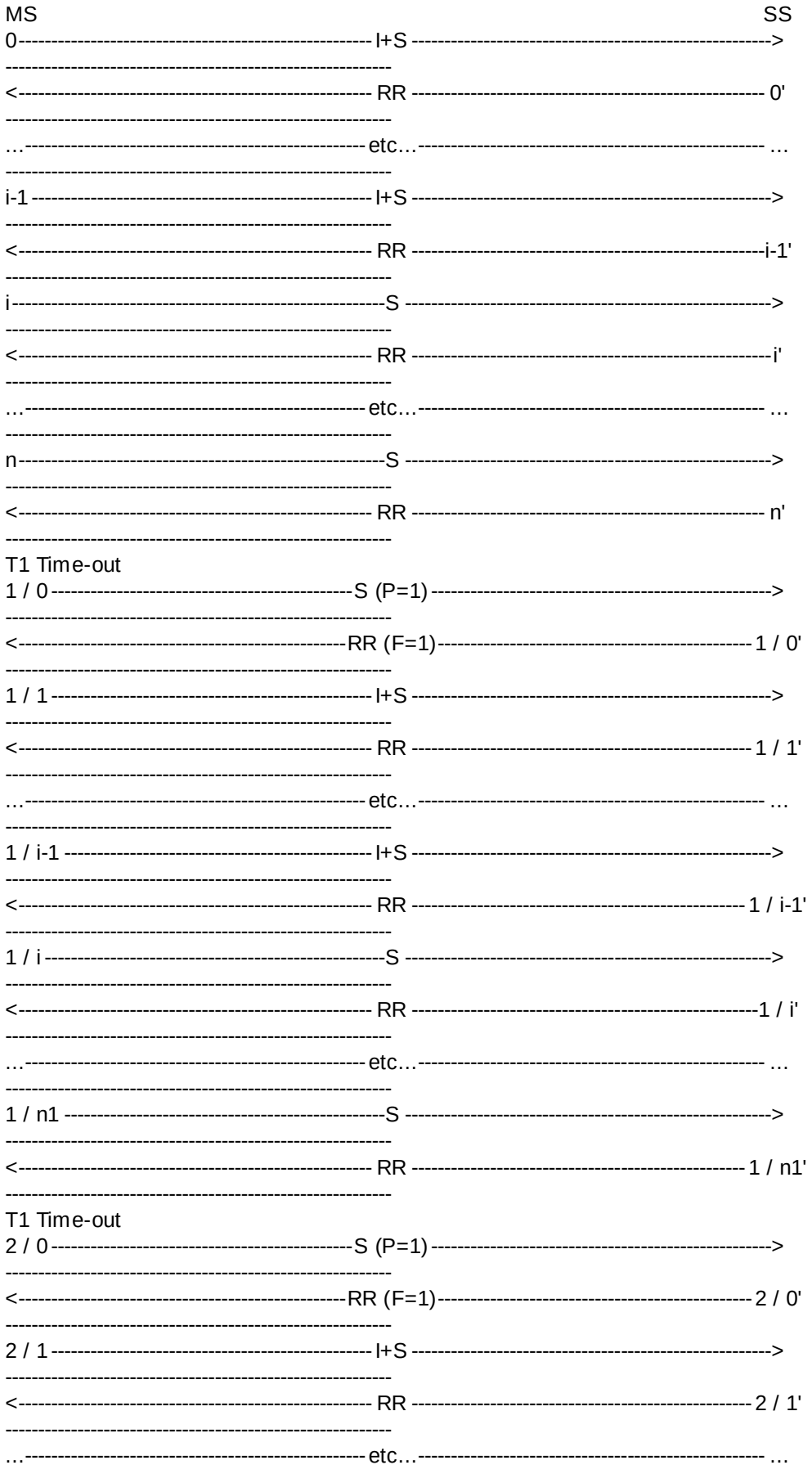
The 5 last steps are repeated N2 times.

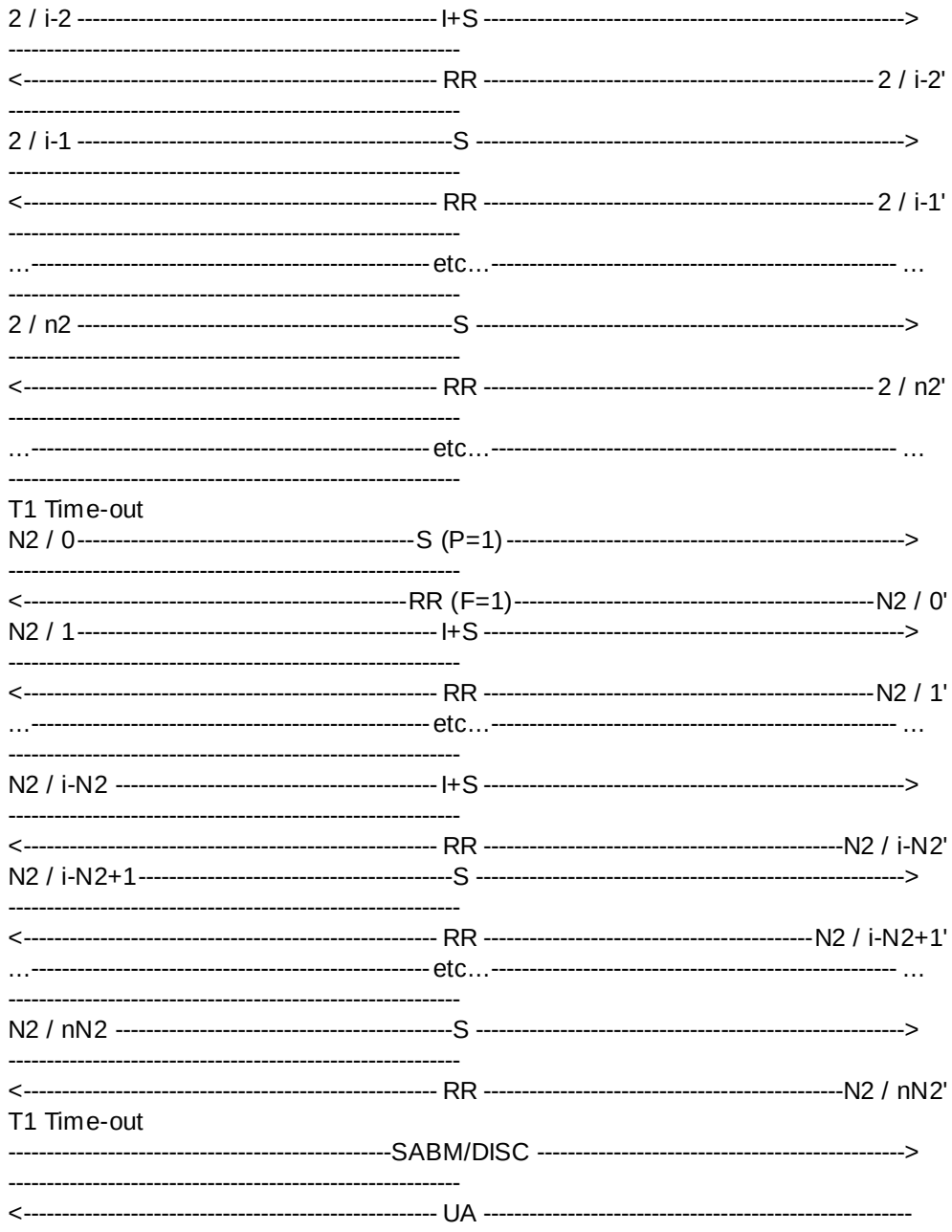
At the expiry of T1 after sending the last I+S frame, the MS shall reset or disconnect the RLP link by sending an SABM (C/R=1, P/F=1) or a DISC (C/R=1) frame.

The SS answer with an UA frame.

The MS is returned to the idle state by clearing of the call.

Expected sequence





The frames from the SS will be:

0',...,n': One RR frame containing:

N(R)=NMS mod(62).

k / 0': One supervisory RR frame containing:

C/R=0,

P/F=1,

N(R)=NMS+k mod(62).

k = 1, ..., N2+1.

k / 1',...,k / nk': One RR frame containing:

N(R)=NMS+k mod(62).

k = 1, ..., N2.

One UA frame with P/F bit equal to the P/F received.

29.3.2.6.9.5 Test requirements

The frames from the MS shall be:

0,...,i-1: One I+S frame containing:

N(S)=N_{MS},...,N_{MS}+i-1 mod(62).

i,..., n: The MS sends S frames.

k / 0: The MS stops sending I+S frames. It sends S frames. On T1 Time-out after the last sent I+S frame, the MS sends a S frame containing:

C/R=1,

P/F=1.

k = 1, ..., N2+1.

k / 1,..., k / i-k: The MS retransmits the I+S frames containing:

N(S)=N_{MS}+k,...,N_{MS}+i-1 mod(62).

k = 1, ..., N2.

k / i-k+1,..., k / nk: The MS sends S frames. k= 1, ..., N2.

The MS shall reset to disconnect the RLP link. It shall send an SABM (C/R=1, P/F=1) or a DISC (C/R=1).

29.3.3 Negotiation of the RLP parameters

29.3.3.1 Negotiation initiated by the SS

29.3.3.1.1 Conformance requirements

The MS shall be able to respond to a negotiation request from the network and to configure its RLP parameters accordingly. It shall do so in ABM mode as well as in ADM mode.

References

3GPP TS 04.22 subclause 5.2.2.6.

29.3.3.1.2 Test purpose

To test the correct handling of the MS to a received XID frame in ADM or ABM mode.

29.3.3.1.3 Test method

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use RLP default parameters. The window size from IWF (SS) to MS is called K_{IM}.

The MS is made to establish a MO non transparent data call. In initial conditions MS is in call state U10 ("Call Active") after having sent a CONN_ACK message.

Case a: No negotiation will be initiated by the MS.

Case b: The MS initiates negotiation of RLP default parameters.

NOTE: The MS is allowed to initiate the negotiation of the RLP default parameters, within allowed ranges, defined in 3GPP TS 04.22. The MS shall do this in the ADM, after having sent a CONNECT ACKNOWLEDGE message (MO-case) or after having received a CONNECT ACKNOWLEDGE message from the SS (MT-case.)

Specific PICS statements:

-

PIXIT statements:

- Bearer services supported
- Characteristics of non-transparent services.

Foreseen final state of the MS

Idle.

Test procedure

Case 1: Testing of the correct handling of the MS to a received XID frame in ADM

Immediately after having received the "CONN_ACK", the SS sends a correct XID frame containing randomly chosen parameters different from the default parameters and supported by the MS.

If the MS initiates a negotiation procedure, before the SS is able to transmit the XID frame (timing conflict), the SS should accept this - XID frame from the MS and start his own negotiation afterwards.

The MS shall respond with a XID frame. If parameters sent in this frame are different from those chosen by the SS, the correct sense of negotiation is checked. The final parameters are noted (T1, T2, N2, K_{IM} (window IWF (SS) -> MS), K_{MI} (window MS -> IWF (SS))).

The MS sends a SABM and the SS answers with an UA. Note: the SABM frame may be sent by the MS before the XID response frame. In such a case, the SS waits for the XID response before sending the UA.

Case 2: Testing of the correct handling of the MS to a received XID frame in ABM

The MS sends a SABM and the SS answer with an UA.

The SS sends a correct XID frame containing parameters different from the default parameters and supported by the MS.

The MS shall respond with a XID frame. If parameters sent in this frame are different from those chosen by the SS, the correct sense of negotiation is checked. The final parameters are noted (T1, T2, N2, K_{IM} (window IWF (SS) -> MS), K_{MI} (window MS -> IWF (SS))).

The SS checks that the MS uses the new parameters determined during the negotiation procedure.

Verification of T2

After optional status bits exchange between the MS and the SS, the SS is configured to send I+S frames with a delay inferior to T1 between each frame. The MS is made to send no user data, it sends only supervisory frame.

The SS sends an I+S frame numbered N(S)=N_{SS} mod(62), the MS shall acknowledge this frame within T2.

Verification of K_{IM}

The SS sends an I+S frame numbered $N_{SS}+K_{IM}+1$ mod(62). The MS shall ignore this frame (out of the window), it shall not acknowledge or reject it. This is checked during at least T2.

The SS sends an I+S frame numbered N(S)=$N_{SS}+1$ mod(62), the MS shall acknowledge this frame.

The SS sends an I+S frame numbered $N_{SS}+K_{IM}+1$ mod(62). The MS shall reject all the lost frames numbered $N_{SS}+2$ mod(62) to $N_{SS}+K_{IM}$ mod(62). It shall send a REJ or SREJ frame with N(R)=$N_{SS}+2$ mod(62).

If REJ frame is used by the MS, the SS restarts the transmission of I+S frames from frame numbered N_{SS}+2 mod(62). The MS shall acknowledge these frames. After having sent at least the frame numbered $N_{SS}+K_{IM}$+2 mod(62), the SS stops sending I+S frames.

If SREJ frame is used by the MS, the SS restarts the transmission of I+S frames from frame numbered N_{SS}+2 mod(62). It does send the frame numbered $N_{SS}+K_{IM}$+1 mod(62) a second time. The MS shall acknowledge these frames. After having sent at least the frame numbered $N_{SS}+K_{IM}$+2 mod(62), the SS stops sending I+S frames.

Verification of K_{MI}

The MS is now configured to send continuously I+S frames with a delay inferior to T1 between each frame.

The MS sends I+S frames, the SS does not acknowledge these frames.

After having sent K_{MI} I+S frames, the MS shall stop sending I+S frames (end of the window).

Verification of T1

At the expiry of T1 after the last I+S frame, the MS shall enter in "checkpoint recovery" mode, it shall send a supervisory RR frame with C=1 and P=1.

The SS does not answer to checkpointing.

Verification of N2

At the expiry of T1 after the last RR (C=1, P=1) frame, the MS shall resend a supervisory RR frame with C=1 and P=1. The SS does not answer to checkpointing. This is repeated N2 times.

After N2 retransmissions of the same RR frame (C=1, P=1), The MS shall reset or disconnect the RLP link by sending a SABM (C=1,P=1) or a DISC (C=1) frame. The SS answers with an UA (R=0) frame with F bit set to P bit received in SABM or DISC frame.

The MS is returned to the idle state by clearing of the call.

The test is performed for case 1 and 2.

Maximum duration of test

1 minute.

Expected sequence

MS				SS
Case 1				
optionally:				
	-------	XID	------>	
	<------	XID	-------	
		....		
	<------	XID	-------	0'
0	-------	XID	------>	
1	-------	SABM	------>	
	<------	UA	-------	1'
Case 2				
optionally:				
	-------	XID	------>	
	<------	XID	-------	
		.....		
0	-------	SABM	------>	
	<------	UA	-------	0'
	(-------	I+S	------>)	Optional
	(<------	S	-------)	
	<------	XID	-------	1'
1	-------	XID	------>	
	<------	I+S	-------	2'
2	-------	RR	------>	
	<------	I+S	-------	3'
3	-------	RR	------>	
	<------	I+S	-------	4'
4	-------	RR	------>	
	<------	I+S	-------	5'
5	-------	REJ or SREJ	------>	
	<------	I+S	-------	6'
6	-------	RR	------>	
...		etc...		...
	<------	I+S	-------	i-1'
i-1	-------	RR	------>	
	<------	RR	-------	i'
i	-------	RR	------>	
...		etc...		...
	<------	RR	-------	j-1'

j-1	-------	RR	------>	
j	-------	I+S	------>	
	<------	RR	-------	j'
...		etc...		...
j+KMI-1	-------	I+S	------>	
	<------	RR	-------	j+KMI-1'
j+KMI	-------	RR (P=1)	------>	
	<------	RR	-------	j+KMI'
j+KMI+1	-------	RR (P=1)	------>	
	<------	RR	-------	j+KMI+1'
...		etc...		...
j+KMI+N2	-------	RR (P=1)	------>	
	<------	RR	-------	j+KMI+N2'
j+KMI+N2+1	-------	SABM / DISC	------>	
	<------	UA	-------	j+KMI+N2+1'

The frame from the SS will be:

Case 1:

0': One XID frame containing: C=1, P=1.

1': One UA frame containing: R=0, F=1. Note: If SABM is received before the reception of the XID response frame, the SS will wait for the XID before sending the UA frame.

Case 2:

0': One UA frame containing: R=0, F=1.

1': One XID frame containing: C=1, P=1.

2': One I+S frame containing N(S)=NSS mod(62), N(R)=NMS mod (62).

3': One I+S frame containing N(S)=NSS+KIM+1 mod(62), N(R)=NMS mod (62).

4': A delay D (T2<D<T1) after step 3', one I+S frame containing N(S)=NSS+1 mod(62), N(R)=NMS mod (62).

5': One I+S frame containing N(S)=NSS+KIM+1 mod(62), N(R)=NMS mod (62).

If REJ frame is used by the MS:

6',..., KIM+5': One I+S frame containing N(S)=NSS+2, .., NSS+KIM+1 mod(62), N(R)=NMS mod (62).

KIM+6',...,i-1': One I+S frame containing N(S)=NSS+KIM+2,...,k-1 mod(62), N(R)=NMS mod (62).

If SREJ frame is used by the MS:

6',..., KIM+4': One I+S frame containing N(S)=NSS+2, .., NSS+KIM mod(62), N(R)=NMS mod (62).

KIM+5',...,i-1': One I+S frame containing N(S)=NSS+KIM+2,...,k-1 mod(62), N(R)=NMS mod (62).

The SS stops sending I+S frames.

i',...,j-1': One RR frame containing, N(R)=NMS mod (62).

j',...,j+KMI-1': One RR frame containing N(R)=NMS mod (62).

j+KMI',...,j+KMI+N2': One RR (R=0, F=0) frame containing N(R)=NMS mod (62).

j+KMI+N2+1': One UA (R=0) frame with F bit set to P bit received in SABM or DISC frame.

Specific message content

The frame from the MS shall be:

Case 1:

0: One XID frame containing: R=0, F=1. The MS may changed the RLP parameters. In this case the SS verifies the correct sense of negotiation. The final parameters are noted (T1, T2, N2, KIM, KMI).

1: One SABM frame containing: C=1,P=1.

NOTE: The MS may send an SABM frame before the XID.

Case 2:

0: One SABM frame containing: C=1,P=1.

1: One XID frame containing: R=0, F=1. The MS may changed the RLP parameters. In this case the SS verifies the correct sense of negotiation. The final parameters are noted (T1, T2, N2, KIM, KMI).

2: One RR frame containing N(R)=NSS+1 mod (62) within T2.

3: One RR frame containing N(R)=NSS+1 mod (62).

4: One RR frame containing N(R)=NSS+2 mod (62).

5: One REJ or SREJ frame containing N(R)=NSS+2 mod (62).

If REJ frame is used by the MS:

6,..., KIM+5: One RR frame containing N(R)=NSS+3, .., NSS+KIM+2 mod(62).

KIM+6,..,i-1: One RR frame containing N(R)=NSS+KIM+3,..,k mod(62).

If SREJ frame is used by the MS:

6,..., KIM+3: One RR frame containing N(R)=NSS+3, .., NSS+KIM mod(62).

KIM+4: One RR frame containing N(R)=NSS+KIM+2 mod(62).

KIM+5,..,i-1: One RR frame containing N(R)=NSS+KIM+3,..,k mod(62).

i,..,j-1: One RR frame containing, N(R)=k mod (62).

The MS starts sending data.

j,..,j+KMI-1: One I+S frame containing N(S)=NMS,..,NMS+KMI-1 mod(62), N(R)=k mod (62).

j+KMI: T1 after the last I+S frame sent, one supervisory RR (C=1, P=1) frame containing N(R)=k mod (62).

j+KMI+1,..,j+KMI+N2: At T1 expiry, one supervisory RR (C=1, P=1) frame containing N(R)=k mod (62).

j+KMI+N2+1: One SABM (C=1, P=1) or DISC (C=1) frame.

29.3.3.2 Negotiation initiated by the MS

29.3.3.2.1 Definition

The XID negotiation procedure allows RLP parameters to be negotiated between peer RLP entities.

29.3.3.2.2 Conformance requirements

The MS shall be able to initiate a negotiation with the network when its RLP parameters are set to non default values. It shall then configure its RLP parameters accordingly. It shall do so in ABM mode as well as in ADM mode.
3GPP TS 04.22, subclause 5.2.2.6.

References

3GPP TS 04.22 subclause 5.2.2.6.

29.3.3.2.3 Test purpose

To test that the MS initiate the negotiation if RLP parameters are different from default parameters.

29.3.3.2.4 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use RLP arbitrary chosen parameters different from the default parameters.

1. The MS is made to establish a MO non transparent data call. In initial conditions MS is in call state U10 ("Call Active") after having sent a CONN_ACK message.

2. The MS is made to establish a MT non transparent data call. In initial conditions MS is in call state U10 ("Call Active") after having received a CONN_ACK message.

This test is performed for initial conditions 1 and 2.

Once in ABM, the SS shall initiate the transmission of an I+S frame, which will transfer L2RCOP status information between peer L2RCOP entities (SS to MS). The MS may respond with an I+S frame containing L2RCOP status information. The SS shall be capable of initiating this sequence, or responding to an I+S L2RCOP status frame from the MS.

Specific PICS statements:

-

PIXIT statements:

- Bearer services supported

- Characteristics of non-transparent services.

Foreseen final state of the MS

Idle.

Test procedure

The MS shall send an XID (C=1, P=1) frame containing a set of RLP parameters different from the default set. The SS answers with XID (R=0, F=1) containing new parameters randomly chosen, the sense of negotiation is correct. Optionally, a renegotiation initiated by the MS should be possible, if the parameters, randomly chosen by the SS are not supported by the MS. In this case, the SS should accept the parameters renegotiated by the MS, if they are within the allowed range defined in 3GPP TS 04.22. The final parameters are noted (T1, T2, N2, K_{IM} (window IWF (SS) -> MS), K_{MI} (window MS -> IWF (SS))).

The MS established the ABM mode by sending a SABM (C=1, P=1) frame. The SS answers with a UA (R=0, F=1) frame. The SABM frame may be sent by the MS before the XID. In such a case, the SS answers to the XID after having established the ABM mode (i.e. after having sent the UA).

The SS checks that the MS uses the new parameters determined during the negotiation procedure.

Verification of T2:

The SS is configured to send I+S frames with a delay inferior to T1 between each frame. The MS is made to send no user data, it sends only supervisory frame.

The SS sends an I+S frame numbered N(S)=Nss mod(62), the MS shall acknowledge this frame within T2.

Verification of KIM:

The SS sends an I+S frame numbered Nss+KIM+1 mod(62). The MS shall ignore this frame (out of the window), it shall not acknowledge or reject it. This is checked during at least T2.

The SS sends an I+S frame numbered N(S)=Nss+1 mod(62), the MS shall acknowledge this frame.

The SS sends an I+S frame numbered Nss+KIM+1 mod(62). The MS shall reject all the lost frames numbered Nss+2 mod(62) to Nss+KIM mod(62). It shall send a REJ or SREJ frame with N(R)=Nss+2 mod(62)

If REJ frame is used by the MS, the SS restarts the transmission of I+S frames from frame numbered Nss+2 mod(62). The MS shall acknowledge these frames. After having sent at least the frame numbered Nss+KIM+2 mod(62), the SS stops sending I+S frames.

If SREJ frame is used by the MS, the SS restarts the transmission of I+S frames from frame numbered Nss+2 mod(62). It does send the frame numbered Nss+KIM+1 mod(62) a second time. The MS shall acknowledge these frames. After having sent at least the frame numbered Nss+KIM+2 mod(62), the SS stops sending I+S frames.

Verification of KMI:

The MS is now configured to send continuously I+S frames with a delay inferior to T1 between each frame.

The MS sends I+S frames, the SS does not acknowledge these frames.

After having sent KMI I+S frames, the MS shall stop sending I+S frames (end of the window).

Verification of T1:

At the expiry of T1 after the last I+S frame, the MS shall enter in "checkpoint recovery" mode, it shall send a supervisory RR frame with C=1 and P=1.

The SS does not answer to checkpointing.

Verification of N2:

At the expiry of T1 after the last RR (C=1, P=1) frame, the MS shall resend a supervisory RR frame with C=1 and P=1. The SS does not answer to checkpointing. This is repeated N2 times.

After N2 retransmissions of the same RR frame (C=1, P=1), The MS shall reset or disconnect the RLP link by sending a SABM (C=1,P=1) or a DISC (C=1) frame. The SS answers with an UA (R=0) frame with F bit set to P bit received in SABM or DISC frame.

The MS is returned to the idle state by clearing of the call.

Expected sequence

MS				SS
0	-------	XID	------>	
	<------	XID	-------	0

optional renegotiation:

	-------	XID	------>	
	<------	XID	-------	
1	-------	SABM	------>	
	<------	UA	-------	1'
	<------	I+S	-------	2'
2	-------	RR	------>	
	<------	I+S	-------	3'
3	-------	RR	------>	
	<------	I+S	-------	4'
4	-------	RR	------>	
	<------	I+S	-------	5'
5	-------	REJ or SREJ	------>	
	<------	I+S	-------	6'
6	-------	RR	------>	
...		etc...		...
	<------	I+S	-------	i-1'
i-1	-------	RR	------>	
	<------	RR	-------	i'
i	-------	RR	------>	
...		etc...		...
	<------	RR	-------	j-1'
j-1	-------	RR	------>	
j	-------	I+S	------>	
	<------	RR	-------	j'
...		etc...		...
j+K_{MI}-1	-------	I+S	------>	
	<------	RR	-------	j+K_{MI}-1'
j+K_{MI}	-------	RR	------>	
	<------	RR	-------	j+K_{MI}'

j+KMI+1	-------	RR	------>	
	<------	RR	-------	j+KMI+1'
...		etc...		...
j+KMI+N2	-------	RR	------>	
	<------	RR	-------	j+KMI+N2'
j+KMI+N2+1	-------	SABM / DISC	------>	
	<------	UA	-------	j+KMI+N2+1'

The frame from the SS will be:

0': One XID frame containing: R=0, F=1. The RLP parameters are changed by the SS, the sense of negotiation is correct. The final parameters are noted (T1, T2, N2, KIM, KMI).

1': One UA frame containing: R=0, F=1. Note: If SABM is received before the XID, the SS answers to the XID after having established the ABM mode (i.e. after having sent the UA).

2': One I+S frame containing N(S)=NSS mod(62), N(R)=NMS mod (62).

3': One I+S frame containing N(S)=NSS+KIM+1 mod(62), N(R)=NMS mod (62).

4': A delay D (T2<D<T1) after step 3', one I+S frame containing N(S)=NSS+1 mod(62), N(R)=NMS mod (62).

5': One I+S frame containing N(S)=NSS+KIM+1 mod(62), N(R)=NMS mod (62).

If REJ frame is used by the MS:

6',..., KIM+5': One I+S frame containing N(S)=NSS+2, .., NSS+KIM+1 mod(62), N(R)=NMS mod (62).

KIM+6',...,i-1': One I+S frame containing N(S)=NSS+KIM+2,..,k-1 mod(62), N(R)=NMS mod (62).

If SREJ frame is used by the MS:

6',..., KIM+4': One I+S frame containing N(S)=NSS+2, .., NSS+KIM mod(62), N(R)=NMS mod (62).

KIM+5',...,i-1': One I+S frame containing N(S)=NSS+KIM+2,..,k-1 mod(62), N(R)=NMS mod (62).

The SS stops sending I+S frames.

i',...,j-1': One RR frame containing, N(R)=NMS mod (62).

j',...,j+KMI-1': One RR frame containing N(R)=NMS mod (62).

j+KMI',...,j+KMI+N2': One RR (R=0, F=0) frame containing N(R)=NMS mod (62).

j+KMI+N2+1': One UA (R=0) frame with F bit set to P bit received in SABM or DISC frame.

29.3.3.2.5 Test requirements

Specific message content

The frame from the MS shall be:

0: One XID frame containing: C=1, P=1.

1: One SABM frame containing: C=1,P=1.

NOTE: The MS may send the SABM frame before the XID.

2: One RR frame containing N(R)=NSS+1 mod (62) within T2.

3: One RR frame containing N(R)=NSS+1 mod (62).

4: One RR frame containing N(R)=Nss+2 mod (62).

5: One REJ or SREJ frame containing N(R)=Nss+2 mod (62).

If REJ frame is used by the MS:

6,..., Kim+5: One RR frame containing N(R)=Nss+3, .., Nss+Kim+2 mod(62).

Kim+6,...,i-1: One RR frame containing N(R)=Nss+Kim+3,...,k mod(62).

If SREJ frame is used by the MS:

6,..., Kim+3: One RR frame containing N(R)=Nss+3, ..., Nss+Kim mod(62).

Kim+4: One RR frame containing N(R)=Nss+Kim+2 mod(62).

Kim+5,...,i-1: One RR frame containing N(R)=Nss+Kim+3,...,k mod(62).

i,...,j-1: One RR frame containing, N(R)=k mod (62).

The MS starts sending data.

j,...,j+Kmi-1: One I+S frame containing N(S)=Nms,...,Nms+Kmi-1 mod(62), N(R)=k mod (62).

j+Kmi: T1 after the last I+S frame sent, one supervisory RR (C=1, P=1) frame containing N(R)=k mod (62).

j+Kmi+1,...,j+Kmi+N2: At T1 expiry, one supervisory RR (C=1, P=1) frame containing N(R)=k mod (62).

j+Kmi+N2+1: One SABM (C=1, P=1) or DISC (C=1) frame.

29.3.3.3 Collision of XID frames

29.3.3.3.1 Definition

The XID negotiation procedure allows RLP parameters to be negotiated between peer RLP entities. If a collision of XID frames occurs, the MS shall ignore all XID frames and restart the parameter negotiation on expiry of timer T1.

29.3.3.3.2 Conformance requirements

The MS shall be able to ignore an XID frame from the network in the case where it has sent a XID frame asking for a negotiation to the network, and to restart the negotiation procedure after expiry of timer T1. 3GPP TS 04.22, 5.2.2.6.

References

3GPP TS 04.22 subclause 5.2.2.6.

29.3.3.3.3 Test purpose

To test that the correct reaction of the MS to a collision of XID frames.

29.3.3.3.4 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use RLP parameters different from the default parameters and arbitrary chosen.

The MS is made to establish a MO non transparent data call. In initial conditions MS is in call state U10 ("Call Active") after having sent a CONN_ACK message.

Once in ABM, the SS shall initiate the transmission of an I+S frame, which will transfer L2RCOP status information between peer L2RCOP entities (SS to MS). The MS may respond with an I+S frame containing L2RCOP status

information. The SS shall be capable of initiating this sequence, or responding to an I+S L2RCOP status frame from the MS.

Specific PICS statements:

-

PIXIT statements:

- Bearer services supported
- Characteristics of non-transparent services.

Foreseen final state of the MS

Idle.

Test procedure

The MS shall send an XID (C=1, P=1) frame containing a set of RLP parameters different from the default set. The SS sends a XID (C=1, P=1) command frame containing new parameters. After a delay the MS shall resend the same XID that it has previously sent. The SS answers with XID (R=0, F=1) accepting the parameters chosen by the MS. These parameters are noted (T1, T2, N2, K_{IM} (window IWF (SS) -> MS), K_{MI} (window MS -> IWF (SS))).

The MS established the ABM mode by sending a SABM (C=1, P=1) frame. The SS answers with a UA (R=0, F=1) frame. The SABM frame may be sent by the MS at any instant (i.e. just after having received an XID, before having sent the response). In such a case, the SS answers to the XID after having established the ABM mode (i.e. after having sent the UA).

The SS checks that the MS uses the new parameters determined during the negotiation procedure.

Verification of T2:

The SS is configured to send I+S frames with a delay inferior to T1 between each frame. The MS is made to send no user data, it sends only supervisory frame.

The SS sends an I+S frame numbered N(S)=N_{SS} mod(62), the MS shall acknowledge this frame within T2.

Verification of K_{IM}:

The SS sends an I+S frame numbered $N_{SS}+K_{IM}+1$ mod(62). The MS shall ignore this frame (out of the window), it shall not acknowledge or reject it. This is checked during at least T2.

The SS sends an I+S frame numbered N(S)=$N_{SS}+1$ mod(62), the MS shall acknowledge this frame.

The SS sends an I+S frame numbered $N_{SS}+K_{IM}+1$ mod(62). The MS shall reject all the lost frames numbered $N_{SS}+2$ mod(62) to $N_{SS}+K_{IM}$ mod(62). It shall send a REJ or SREJ frame with N(R)=$N_{SS}+2$ mod(62).

If REJ frame is used by the MS, the SS restarts the transmission of I+S frames from frame numbered $N_{SS}+2$ mod(62). The MS shall acknowledge these frames. After having sent at least the frame numbered $N_{SS}+K_{IM}+2$ mod(62), the SS stops sending I+S frames.

If SREJ frame is used by the MS, the SS restarts the transmission of I+S frames from frame numbered $N_{SS}+2$ mod(62). It does send the frame numbered $N_{SS}+K_{IM}+1$ mod(62) a second time. The MS shall acknowledge these frames. After having sent at least the frame numbered $N_{SS}+K_{IM}+2$ mod(62), the SS stops sending I+S frames.

Verification of K_{MI}:

The MS is now configured to send continuously I+S frames with a delay inferior to T1 between each frame.

The MS sends I+S frames, the SS does not acknowledge these frames.

After having sent K_{MI} I+S frames, the MS shall stop sending I+S frames (end of the window).

Verification of T1:

At the expiry of T1 after the last I+S frame, the MS shall enter in "checkpoint recovery" mode, it shall send a supervisory RR frame with C=1 and P=1.

The SS does not answer to checkpointing.

Verification of N2:

At the expiry of T1 after the last RR (C=1, P=1) frame, the MS shall resend a supervisory RR frame with C=1 and P=1. The SS does not answer to checkpointing. This is repeated N2 times.

After N2 retransmissions of the same RR frame (C=1, P=1), The MS shall reset or disconnect the RLP link by sending a SABM (C=1,P=1) or a DISC (C=1) frame. The SS answers with an UA (R=0) frame with F bit set to P bit received in SABM or DISC frame.

The MS is returned to the idle state by clearing of the call.

Maximum duration of test

1 minute.

Expected sequence

MS				SS
0	-------	XID	------>	
	<------	XID	-------	0'
1	-------	XID	------>	
	<------	XID	-------	1'
2	-------	SABM	------>	
	<------	UA	-------	2'
	<------	I+S	-------	3'
3	-------	RR	------>	
	<------	I+S	-------	4'
4	-------	RR	------>	
	<------	I+S	-------	5'
5	-------	RR	------>	
	<------	I+S	-------	6'
6	-------	REJ or SREJ	------>	
	<------	I+S	-------	7'
7	-------	RR	------>	
...		etc...		...
	<------	I+S	-------	i-1'
i-1	-------	RR	------>	
	<------	RR	-------	i'
i	-------	RR	------>	
...		etc...		...
	<------	RR	-------	j-1'
j-1	-------	RR	------>	
j	-------	I+S	------>	
	<------	RR	-------	j'
...		etc...		...
j+K_{MI}-1	-------	I+S	------>	
	<------	RR	-------	j+K_{MI}-1'
j+K_{MI}	-------	RR	------>	
	<------	RR	-------	j+K_{MI}'
j+K_{MI}+1	-------	RR	------>	
	<------	RR	-------	j+K_{MI}+1'
...		etc...		...
j+K_{MI}+N2	-------	RR	------>	
	<------	RR	-------	j+K_{MI}+N2'
j+K_{MI}+N2+1	-------	SABM / DISC	------>	
	<------	UA	-------	j+K_{MI}+N2+1'

The frame from the SS will be:

0': One XID frame containing: C=1, P=1.

1': One XID frame containing: R=0, F=1. The RLP parameters are changed by the SS, the sense of negotiation is correct. The final parameters are noted (T1, T2, N2, K_{IM}, K_{MI}).

2': One UA frame containing: R=0, F=1. Note: If SABM is received before one of the XID frames, the SS will answer to the XID after having established the ABM mode (i.e. after having sent the UA).

3': One I+S frame containing N(S)=N_{SS} mod(62), N(R)=N_{MS} mod (62).

4': One I+S frame containing N(S)=N_{SS}+K_{IM}+1 mod(62), N(R)=N_{MS} mod (62).

5': A delay D (T2<D<T1) after step 3', one I+S frame containing N(S)=N_{SS}+1 mod(62), N(R)=N_{MS} mod (62).

6': One I+S frame containing N(S)=N_{SS}+K_{IM}+1 mod(62), N(R)=N_{MS} mod (62).

If REJ frame is used by the MS:

7',..., K_{IM}+6': One I+S frame containing N(S)=N_{SS}+2, .., N_{SS}+K_{IM}+1 mod(62), N(R)=N_{MS} mod (62).

K_{IM}+7',...,i-1': One I+S frame containing N(S)=N_{SS}+K_{IM}+2,...,k-1 mod(62), N(R)=N_{MS} mod (62).

If SREJ frame is used by the MS:

7',..., K_{IM}+5': One I+S frame containing N(S)=N_{SS}+2, .., N_{SS}+K_{IM} mod(62), N(R)=N_{MS} mod (62).

K_{IM}+6',...,i-1': One I+S frame containing N(S)=N_{SS}+K_{IM}+2,...,k-1 mod(62), N(R)=N_{MS} mod (62).

The SS stops sending I+S frames.

i',...,j-1': One RR frame containing, N(R)=N_{MS} mod (62).

j',...,j+K_{MI}-1': One RR frame containing N(R)=N_{MS} mod (62).

j+K_{MI}',...,j+K_{MI}+N2': One RR (R=0, F=0) frame containing N(R)=N_{MS} mod (62).

j+K_{MI}+N2+1': One UA (R=0) frame with F bit set to P bit received in SABM or DISC frame.

29.3.3.3.5 Test requirements

Specific message content

The frame from the MS shall be:

0: One XID frame containing: C=1, P=1.

1: After T1(def) expiry, one XID frame containing: C=1, P=1.

NOTE: The MS may send an SABM frame before the 1st or the 2nd XID frame.

2: One SABM frame containing: C=1,P=1.

3: One RR frame containing N(R)=N_{SS}+1 mod (62) within T2.

4: One RR frame containing N(R)=N_{SS}+1 mod (62).

5: One RR frame containing N(R)=N_{SS}+2 mod (62).

6: One REJ or SREJ frame containing N(R)=N_{SS}+2 mod (62).

If REJ frame is used by the MS:

7,..., K_{IM}+6: One RR frame containing N(R)=N_{SS}+3, .., N_{SS}+K_{IM}+2 mod(62).

K_{IM}+7,...,i-1: One RR frame containing N(R)=N_{SS}+K_{IM}+3,...,k mod(62).

If SREJ frame is used by the MS:

7,..., KIM+4: One RR frame containing N(R)=NSS+3, ..., NSS+KIM mod(62).

KIM+5: One RR frame containing N(R)=NSS+KIM+2 mod(62).

KIM+6,...,i-1: One RR frame containing N(R)=NSS+KIM+3,...,k mod(62).

i,...,j-1: One RR frame containing, N(R)=k mod (62).

The MS starts sending data.

j,...,j+KMI-1: One I+S frame containing N(S)=NMS,...,NMS+KMI-1 mod(62), N(R)=k mod (62).

j+KMI: T1 after the last I+S frame sent, one supervisory RR (C=1, P=1) frame containing N(R)=k mod (62).

j+KMI+1,...,j+KMI+N2: At T1 expiry, one supervisory RR (C=1, P=1) frame containing N(R)=k mod (62).

j+KMI+N2+1: One SABM (C=1, P=1) or DISC (C=1) frame.

29.3.3.4 Loss of XID frames

29.3.3.4.1 Conformance requirements

The MS shall repeat an XID frame upon expiry of RLP timer T1 if the network has not acknowledged it by a correct XID frame.

References

3GPP TS 04.22 subclause 5.2.2.6.

29.3.3.4.2 Test purpose

To test that the MS repeats the XID frame if the SS does not answer correctly.

29.3.3.4.3 Test method

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use RLP parameters different from the default parameters (T1 different from T1(def)).

The MS is made to establish a MO non transparent data call. In initial conditions MS is in call state U10 ("Call Active") after having sent a CONN_ACK message.

Specific PICS statements:

-

PIXIT statements:

- Bearer services supported
- Characteristics of non-transparent services.

Foreseen final state of the MS

Idle.

Test procedure

The MS shall send an XID (C=1, P=1) frame containing a set of RLP parameters different from the default set. The SS sends a XID (R=0, F=0) command frame. The MS shall ignores this frame.

After a delay the MS shall resend the same XID that it has previously sent. The SS does not answer.

After a delay the MS shall resend the same XID that it has previously sent. The SS answers with XID (R=0, F=1) accepting the parameters chosen by the MS.

The MS established the ABM mode by sending a SABM (C=1, P=1) frame. The answer with a UA (R=0, F=1) frame. The SABM frame may be sent by the MS at any instant (i.e. just after having received an XID). In such a case, the SS answers to the XID after having established the ABM mode (i.e. after having sent the UA).

The MS is returned to the idle state by clearing of the call.

Maximum duration of test

1 minute.

Expected sequence

MS				SS
0	-------	XID	------>	
	<------	XID	-------	0'
1	-------	XID	------>	
2	-------	XID	------>	
	<------	XID	-------	2'
3	-------	SABM	------>	
	<------	UA	-------	3'

The frame from the SS will be:

0': One XID frame containing: R=0, F=0.

2': One XID frame containing: R=0, F=1. The RLP parameters are accepted by the SS.

3': One UA frame containing: R=0, F=1. Note: If SABM is received before the XID, the SS will answer to the XID after having established the ABM mode (i.e. after having sent the UA).

Specific message content

The frame from the MS shall be:

0: One XID frame containing: C=1, P=1.

1: After T1(def) expiry, one XID frame containing: C=1, P=1.

2: After T1(def) expiry, one XID frame containing: C=1, P=1.

3: One SABM frame containing: C=1,P=1.

NOTE: The MS may send the SABM frame before XID(s), at any moment.

29.3.3.5 Total loss of XID frames

29.3.3.5.1 Definition

The XID negotiation procedure allows RLP parameters to be negotiated between peer RLP entities. An unsuccsessful XID exchange shall be repeated on expiry of T1. After N2 times of unsuccessful repetition, the RLP link shall be disconnected.

29.3.3.5.2 Conformance requirements

The MS shall not repeat an unacknowledged XID frame more than N2 times. After N2 repetition it shall disconnect the RLP link if it had been connected earlier. 3GPP TS 04.22, subclause 5.2.2.6.

References

3GPP TS 04.22 subclause 5.2.2.6.

29.3.3.5.3 Test purpose

To test that the MS repeats the XID frame no more than N2 times, if the SS does not answer correctly.

29.3.3.5.4 Method of test

Initial Conditions

System Simulator:

The SS is configured to use default RLP parameters.

Mobile Station:

The MS is configured to use RLP parameters different from the default parameters.

The MS is made to establish a MO non transparent data call. In initial conditions MS is in call state U10 ("Call Active") after having sent a CONN_ACK message.

Specific PICS statements:

-

PIXIT statements:

- Bearer services supported
- Characteristics of non-transparent services.

Foreseen final state of the MS

Idle.

Test procedure

Case a: The MS sends an XID (C=1, P=1) frame in ADM mode

Case b: The MS enters the ABM mode and sends an XID (C=1, P=1) frame after optional status bits exchange between the MS and the SS.

The SS does not answer.

After a delay T1 (def), the MS shall resend the same XID that it has previously sent. The SS does not answer. This step is repeated N2 (def) times.

Case a: After N2 (def) retransmissions the SS waits for 2 * T1 to ensure that the XID frame is not repeated any more.

Case b: After N2 (def) retransmissions the link shall be disconnected. The MS shall send a DISC (C=1) frame, and the SS answers with a UA (R=0, F equal to the P bit received in the DISC).

The MS is returned to the idle state by clearing of the call.

Maximum duration of test

1 minute.

Expected sequence

MS				SS
Case a:				
1	-------	XID	------>	
2	-------	XID	------>	
...		etc...		...
N2(def) +1	-------	XID	------>	
				Wait for 2*T1
Case b:				
0	-------	SABM	------>	
	<------	UA	-------	0'
	(-------	I+S	------>)	Optional
	(<------	S	-------)	
1	-------	XID	------>	
2	-------	XID	------>	
...		etc...		...
N2(def)+1	-------	XID	------>	
N2(def)+2	-------	DISC	------>	
	<------	UA	------>	N2+2'

The frame from the SS will be:

0': One UA frame containing: R=0, F=1, if the MS sends a SABM.

N2+2': One UA frame containing: R=0, F equal to P bit received in DISC frame.

29.3.3.5.5 Test requirements

Specific message content

The frame from the MS shall be:

0: The MS may send a SABM frame containing: C=1,P=1. This frame may be sent at any instant. This is not verified.

1: One XID frame containing: C=1, P=1.

2,...,N2(def)+1: After T1 (def) expiry, one XID frame containing: C=1, P=1.

N2(def)+2: If the MS has previously established the ABM mode (SABM/UA exchange), it shall disconnect the link by sending a DISC (C=1) frame.

29.4 Facsimile tests for the transparent network support

29.4.1 General

According to ITU-T Recommendation T.30 a facsimile call can be divided into the following phases:

- Phase A - call establishment procedure;
- Phase B - pre-message procedure (identification and selection of required facilities);

- Phase C - message transmission according to ITU-T Recommendation T.4;
- Phase D - post-message procedure;
- Phase E - call release procedure.

For each phase a single test sequence was drafted, i.e. the verification of the basic procedures of a fax call will at least consist of 5 tests, in order to verify the above described phases.

In the IDLE state the fax adapter, originating or terminating, will send continuously SYNC frames containing the pattern specified in 3GPP TS 03.45 (CT105 (see note 2) and 109 (see note 2) are in OFF condition).

For the test of the facsimile data transmission, i.e. the phase C, test chart #2 according to ITU-T Recommendation T.21 should be used.

The T.4/30 messages marked with the '*' sign indicate that for the transmission across the radio interface in case of the BCS phase STATUS frames are used, and in case of the message phase the usage of DATA frames is implied.

Manufacturer-declared fax equipment should be connected to the MS, i.e. where possible a fax adapter and a fax machine Group 3. Measuring devices to monitor the T.4/T.30 protocol, the circuits and the SYNC, STATUS and DATA frames should be provided. Configurations, where no access to the interfaces to monitor the protocol and circuits is possible, might exist.

Abbreviations used:

BC-IE	Bearer Capability Information Element
BCS	Binary Coded Signalling
BCS-REC	BCS Reception State of the FA
BCS-TRA	BCS Transmission State of the FA
CED	Called Station Identification
CFR	Confirmation To Receive
CMM	Channel Mode Modify
CMM ACK	Channel Mode Modify Acknowledge
CNG	Calling Tone
DCD	Data Call Direction
DCS	Digital Command Signal
DIS	Digital Identification Signal
EOM	End Of Message
EOP	End Of Procedure
FA	Fax Adapter
Fax	Facsimile App. or PC-Fax (e.g. fax softw. running on a notebook)
ICM	In-Call Modification
IDLE	Idle State of the FA
MCF	Message Confirmation
MO	Mobile Originating
MPS	Multi Page Signal
MSG-REC	Message Reception State of the FA

MT	Mobile Terminating
RCSD-IE	Reverse Call Setup Direction Information Element
TCF	Training Check Frame
TCH	Traffic Channel
TS 61	Teleservice 61 (alternate speech/fax)
TS 62	Teleservice 62 (automatic fax)

29.4.2 Mobile originated call

29.4.2.1 Call establishment procedure

29.4.2.1.1 Alternate speech / facsimile

29.4.2.1.1.1 Definition

-29.4.2.1.1.2 Conformance requirement

An MS supporting transparent facsimile group 3 shall perform the ICM and shall support the frames and circuits at the Um-, R- and 2w-interface according to the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, 3GPP TS 07.01, ITU-T Recommendation T.30.

29.4.2.1.1.3 Test purpose

To verify the transition from speech to fax in case of an MS supporting TS 61 and that the circuit and tone handling of the MT and FA is correct.

29.4.2.1.1.4 Method of test

Initial conditions

A TS 61 s/f call is set up. The speech phase is active.

Test procedure

The transition from speech to fax is initiated by manual intervention at both ends of the connection. The data call direction DCD is mobile originated. Upon connection to line the FA turns on CT108.2 (see note 2) as a basic requirement for the transition from speech to fax. Now, within the next 3 seconds the FA has to detect the DCD, which is in this case is mobile originated, i.e. CT105 is set to ON (see note 2) condition. The following ICM procedure via the MODIFY message is carried out by the MT 3 seconds after circuit CT108.2 was set to ON (see note 2) condition. On completion of the ICM procedure the synchronization of the TCH begins and after its completion the MT has to set CT107 to ON (see note 2) condition and the FA has to send the CED tone (see note 2) towards the connected fax. When CT106/109 are set to ON (see note 2) phase A is completed. Then the call is cleared by manual intervention at the MT or the activity progress of the call proceeds to the next phase.

Expected sequence

MS: Step	Direction				SS:
1	MS-->SS	Fax:	Connect to line (see note 1)		Connect to line (see note 1)
		FA:	CT108.2 ON (see note 2) Detect DCD CT105 ON (see note 2)		
		MT:	Send MODIFY message 3 seconds after CT108.2 ON (see note 2)	------>	Receive MODIFY message
2	SS-->MS			<-----	Send MODIFY COMPLETE
3	MS<->SS		TCH Synchronization	<---->	TCH Synchronization
		MT:	CT107 ON (see note 2), when synchronized		
		FA:	Generate CED (see note 2)		
		Fax:	Detect CED (see note 2)		
4	SS-->MS			<-----	Set X and SB bit in V.110 frame
		MT:	CT106/109 ON (see note 2)		
		FA:	Enter BCS-TRA state		Enter BCS-REC state

29.4.2.1.1.5 Test requirements

1. The condition of CT108.2 and CT105 is verified (see note 2); CT106, 107, 109 have to be in OFF (see note 2) condition. The MODIFY message has to be sent 3 seconds after circuit CT108.2 has gone to ON condition (see note 2).

2. To be verified that the MT begins the synchronization phase by sending the pattern 1/OFF after the reception of the MODIFY COMPLETE message, that CT107 is turned on (see note 2) by the MT after successful synchronization and that the CED tone (see note 2) is transmitted by the FA after CT107 has gone to ON condition (see note 2).

3. To be verified that CT106 and CT109 are turned on (see note 2), when in the modified V.110 frames received from the SS the X and SB bits are set. The state of the FA shall be verified (-> BCS-TRA).

29.4.2.1.2 Automatic facsimile

29.4.2.1.2.1 Definition

-29.4.2.1.2.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the call setup procedure and shall support the frames and the circuits at the Um-,R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, 3GPP TS 07.01, ITU-T Recommendation T.30.

29.4.2.1.2.3 Test purpose

To verify that the circuit and tone handling of the MT and FA is correct.

29.4.2.1.2.4 Method of test

Initial conditions

The MS, configured for the TS 62 fax call, is updated. Then the call establishment phase A begins.

Test procedure

The FA sets CT108.2 to ON (see note 2) condition and passes the dialling information to the MT. A SETUP message is then sent by the MT towards the SS. When the TCH is available (indicated by the CONNECT message) the synchronization phase begins, i.e. both entities start sending the synchronization pattern 1/OFF. CT106, 107, 109 have to be in OFF condition (see note 2). Upon completion of the synchronization phase the MT sets CT107 to ON condition (see note 2) causing the FA to connect the fax to line. The SS sets CT106 and CT109 to ON at the MT by means of the

V.110 X and SB bits. The FA then generates the CED tone (see note 2), which completes phase A. Then the call is cleared by manual intervention at the MT or the activity progress of the call proceeds to the next phase.

Expected sequence

MS: Step	Direction			SS:
1	MS-->SS	Fax:	Dial	
	FA:	Pass dialling info, CT108.2 ON (see note 2)		
	MT:	Send SETUP message	------>	Receive SETUP message
2	SS-->MS		<-----	Send CONNECT message
3	MS<->SS	TCH Synchronization	<---->	TCH Synchronization
	MT:	CT107 ON (see note 2), when synchronized		
4	SS-->MS		<-----	Set X and SB bit in V.110 frame
		MT: CT106/109 ON (see note 2) FA: Generate CED (see note 2) Fax: Detect CED (see note 2)		
5		FA: Enter BCS-TRA state (see note 3)	Enter BCS-REC state	

29.4.2.1.2.5 Test requirements

1. The condition of CT108.2 (see note 2) is verified and the SETUP message should contain the BC-IE for TS 62.
2. To be verified that at the MT CT106, 107, 109 are in OFF (see note 2) condition, that the MT begins the synchronization phase by sending the pattern 1/OFF and that CT107 (see note 2) is turned on by the MT after successful synchronization.
3. To be verified that CT106 and CT109 are turned on (see note 2), when in the V.110 frames received from the SS the X and SB bits are set and that the FA sends the CED (see note 2) tone towards the fax machine.
4. The state of the FA shall be verified (-> BCS-TRA).

29.4.2.2 Pre-message procedure

29.4.2.2.1 Definition

-29.4.2.2.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the pre-message procedure and shall support the frames and the circuits at the Um-,R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, ITU-T Recommendation T.30.

29.4.2.2.3 Test purpose

To verify the correct handling of the T.30 DIS/DCS/TCF frames.

29.4.2.2.4 Method of test

Initial conditions

The activity progress of the fax call is brought to the beginning of Phase B.

Test procedure

After phase A the FA is in BCS-TRA state and sends SYNC frames. The SS being in BCS-REC state sends the T.30 DIS embedded in STATUS frames indicating its capabilities. The received DIS is checked, if necessary edited by the FA and sent to the fax. Then the FA returns to the idle state. The fax checks whether the indicated capabilities are in line with its own or not, and chooses the capabilities which are supported end-to-end by the connected fax machines by answering with the DCS frame preceded by the preamble. The FA enters the BCS-REC state and the BCS information is transmitted using the STATUS frames. Afterwards the FA returns to the idle state. Upon reception of the training sequence the FA enters the MSG-REC state without waiting for an acknowledge from the SS, i.e. the TCF is conveyed

by means of the DATA frames. The FA enters the idle state and sends at least 5 SYNC frames to indicate that the message phase is over. Then the CFR frame is received, i.e. the FA enters the BCS-TRA state and receives the CFR in STATUS frames. Now, phase B is completed and the data transfer phase C begins. Then the call is cleared by manual intervention at the MT or the activity progress of the call proceeds to the next phase.

Expected sequence

MS: Step	Direction				SS:
1	SS-->MS			<-----	Send preamble*,DIS*
		FA:	BCS-TRA Monitor DIS Generate preamble,DIS CT105 OFF (see note 2) IDLE		
		Fax:	Receive preamble,DIS		
2	MS-->SS	Fax:	Send preamble,DCS		
		FA:	CT109 ON (see note 2) BCS-REC Monitor DCS Send preamble*,DCS* CT109 OFF (see note 2) IDLE	----->	Receive preamble*,DCS*
3	MS-->SS	Fax:	Send training,TCF		
		FA:	CT109 ON (see note 2) MSG-REC Send TCF* CT109 OFF (see note 2)	----->	Receive TCF*
4	SS<--MS			<-----	Send preamble*,CFR*
		FA:	CT105 ON (see note 2) BCS-TRA Generate preamble, CFR CT105 OFF (see note 2) IDLE		
		Fax:	Receive preamble, CFR		

29.4.2.2.5 Test requirements

1. To be verified that SYNC frames are transmitted across the radio interface in BCS-TRA and in the IDLE state and that CT105 is set to OFF (see note 2). The correct generation of the T.30 BCS shall be verified (down-conversion to the BCS speed according to 3GPP TS 03.45).

2. The condition of CT109 shall be verified (see note 2); that the DCS is correctly inserted into the STATUS frames and that the IDENT octet contains the BCS-REC identifier. At CT109=OFF (see note 2), the FA returns to the idle state and sends SYNC frames (pattern according to 3GPP TS 03.45).

3. To be verified that the FA turns on CT109 (see note 2), enters the MSG-REC state and sends the TCF embedded in DATA frames without waiting for the confirmation that the SS has entered the MSG-TRA state. The ident octet has to be checked (-> MSG-REC). CT109 shall be in OFF condition (see note 2).

4. The condition of CT105 (see note 2) is to be verified. The correct generation of the T.30 BCS shall be checked. In IDLE state SYNC frames have to be sent.

29.4.2.3 Message procedure

29.4.2.3.1 Definition

-29.4.2.3.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the message procedure and shall support the frames and the circuits at the Um-,R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, ITU-T Recommendation T.30, ITU-T Recommendation T.4, ITU-T Recommendation T.21.

29.4.2.3.3 Test purpose

To verify the facsimile data transmission phase.

29.4.2.3.4 Method of test

Initial conditions

The activity progress of the fax call is brought to the beginning of Phase C. The ECM shall not be used.

Test procedure

The FA is in IDLE state. The connected fax starts transmitting the fax message. Upon reception of the training sequence the FA enters the MSG-REC state and sends STATUS frames, which contain the ident octet set to MSG-REC, interleaved with SYNC frames to the SS. When the SS has entered the MSG-TRA state, which is indicated to the FA by means of the ident octet set to MSG-TRA, the FA starts sending the fax coded data (received from the connected fax) embedded in DATA frames. When the transmission is finished the FA is again in the idle state for at least 5 SYNC frames to indicate that the message phase is over and Phase D begins. Then the call is cleared by manual intervention at the MT or the activity progress of the call proceeds to the next phase.

Expected sequence

MS: Step	Direction			SS:
1	MS-->SS	Fax:	Send training, fax message	
		FA:	CT109 ON (see note 2) MSG-REC Send STATUS frames (MSG-REC) interleaved with SYNC frames Wait for MSG-TRA indication from SS	
2	SS-->MS			<----- Send STATUS frames with MSG-TRA identifier
3	MS-->SS		Send fax message*	-----> Receive fax message*
			"	"
			"	"
			"	"
			CT109 OFF (see note 2) IDLE	
4	MS-->SS	FA:	Send at least 5 SYNC frames	-----> Receive SYNC frames

29.4.2.3.5 Test requirements

1. To be verified that the FA enters the MSG-REC state and inserts the correct ident octet in the STATUS frames interleaved with SYNC frames.
2. To be verified that the FA sends the fax message after the SS has sent the STATUS frames containing the MSG-TRA identifier.
3. At the end of the document transmission the condition of CT109 (see note 2) shall be checked.
4. It shall be verified that at least 5 SYNC frames are sent in order to indicate the end of phase C.

29.4.2.4 Post-message procedure

29.4.2.4.1 Definition

-29.4.2.4.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the post-message procedure and shall support the frames and the circuits at the Um-,R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, ITU-T Recommendation T.30.

29.4.2.4.3 Test purpose

To verify phase D of the facsimile transmission.

29.4.2.4.4 Method of test

Initial conditions

The activity progress of the fax call is brought to the beginning of Phase D. The ECM shall not be used.

Test procedure

The fax sends the preamble followed by the EOP frame. The FA then enters the BCS-REC state after having transmitted at least 5 SYNC frames since the last transition to the idle state and sends the EOP frame embedded in STATUS frames to the SS. The FA enters the idle state again. Upon detection of the BCS-REC identifier octet the BCS-TRA state is entered in order to receive the MCF frame issued by the SS. Then the preamble and the MCF frame are conveyed to the connected fax by the FA. The FA enters the idle state. Phase D of the fax transmission is completed. Then the call is cleared by manual intervention at the MT or the activity progress of the call proceeds to the next phase.

Expected sequence

MS: Step	Direction				SS:
1	MS-->SS	Fax:	Send preamble, EOP		
		FA:	CT109 ON (see note 2)		
			BCS-REC		
			Send preamble*, EOP*		
			CT109 OFF (see note 2)	----->	Receive preamble*, EOP*
			IDLE		
2	SS-->MS			<-----	Send preamble*, MCF*
		FA:	CT105 ON (see note 2)		
			BCS-TRA		
			Transmit preamble, MCF		
			CT105 OFF (see note 2)		
			IDLE		
		Fax:	Receive preamble, MCF		

29.4.2.4.5 Test requirements

1. To be verified that the FA enters the BCS-REC state and inserts the correct ident octet in the STATUS frames. The up-conversion to the message speed has to be checked.. The condition of CT109 has to be verified (see note 2). The contents of the SYNC frames shall be checked.

2. To be verified that the FA enters the BCS-TRA state upon detection of the BCS-REC identifier and that the correct T.30 message is conveyed to the connected fax machine (down-conversion to the BCS speed). The condition of CT105 should be checked (see note 2).

29.4.2.5 Call release procedure

29.4.2.5.1 Definition

-29.4.2.5.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the call release procedure and shall support the frames and the circuits at the Um-,R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, ITU-T Recommendation T.30.

29.4.2.5.3 Test purpose

To verify phase E of the facsimile transmission.

29.4.2.5.4 Method of test

Initial conditions

The activity progress of the fax call is brought to the beginning of Phase E.

Test procedure

The fax sends the preamble followed by the DCN frame. The FA then enters the BCS-REC state and sends the DCN frame embedded in STATUS frames to the SS. The FA enters the IDLE state again. CT108.2 will go OFF condition (see note 2) and after 200ms CT109 will go to OFF condition (see note 2) too. The MT then sends the DISC message and the call is cleared.

Expected sequence

MS:					SS:
Step	Direction				
1	MS-->SS	Fax:	Send preamble, DCN		
		FA:	CT109 ON (see note 2)		
			BCS-REC		
			CT108.2 OFF (see note 2)		
			Transmit preamble*, DCN*		
			CT109 OFF (see note 2)	----->	Receive preamble*, DCN*
			after 200 ms		
			IDLE		
		MT:	Send DISC message	----->	Receive DISC message

29.4.2.5.5 Test requirements

To be verified that CT108.2 is turned off (see note 2) and that CT109 is set to OFF (see note 2) 200ms after the DCN frame has been sent. The contents of the STATUS frames including the ident octet has to be checked (up-conversion to the message speed according to 3GPP TS 03.45). The MT shall send the DISC message.

29.4.2.6 CTC processing - 4th PPR for the same block

29.4.2.6.1 Definition

-29.4.2.6.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the CTC processing procedure and shall support the frames and the circuits at the Um-,R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, ITU-T Recommendation T.30.

29.4.2.6.3 Test purpose

To verify phase D of the facsimile transmission in case of a 4th PPR for the same block.

29.4.2.6.4 Method of test

Initial conditions

The activity progress of the fax call is brought to the beginning of Phase C. The ECM shall be used. The fax transmission shall start a speed of 9,6 kBit/s.

Test procedure

The fax sends the preamble followed by the PPS-NULL(0,0) frame. The FA then enters the BCS-REC state and sends the PPS* frame embedded in STATUS frames to the SS. The SS responds with the PPR* frame requesting corrupted frames to be retransmitted. This test sequence is repeated 4 times causing the fax machine to send the CTC frame which indicates the fallback bit rate of 7 200 kBit/s The FA sends the CTC* after recognizing the new message speed to the SS. The SS responds with the CTR* frame and the fax machine retransmits the corrupted frames which are inserted into DATA frames by the FA. After every third DATA frame the FA has to insert a SYNC frame. After the retransmission, the fax machine sends the PPS-NULL(0,0) which is answered by the SS with the MCF* frame. Phase D of the fax transmission is completed. Then the call is cleared by manual intervention at the MT or the activity progress of the call proceeds to the next phase.

Expected sequence

MS: Step	Direction			SS:	
1	MS-->SS	Fax:	Send training, fax message		
		FA:	CT109 ON (see note 2)		
			MSG-REC		
			Send fax message*	----->	Receive fax message*
			"		"
			"		"
			"		"
			CT109 OFF (see note 2)		
			IDLE		
2	MS-->SS	FA:	Send at least 5 SYNC frames	----->	Receive SYNC frames
3	MS-->SS	Fax:	Send preamble, PPS-NULL		
		FA:	CT109 ON (see note 2)		
			BCS-REC		
			Send preamble*, PPS-NULL*		
			CT109 OFF (see note 2)	----->	Receive preamble*, PPS-NULL*
			IDLE		
4	SS-->MS			<-----	Send preamble*, PPR*
		FA:	CT105 ON (see note 2)		
			BCS-TRA		
			Transmit preamble, PPR		
			CT105 OFF (see note 2)		
			IDLE		
		Fax:	Receive preamble, PPR		
5	Repeat steps 1 to 4 four times				
6	MS-->SS	Fax:	Send preamble, CTC		
		FA:	CT109 ON (see note 2)		
			BCS-REC		
			Monitor CTC		
			Send preamble*, CTC*	----->	Receive preamble*, CTC*
			CT109 OFF (see note 2)		
			IDLE		

7	SS-->MS			<-----	Send preamble*, CTR*
		FA:	CT105 ON (see note 2)		
			BCS-TRA		
			Transmit preamble, CTR		
			CT105 OFF (see note 2)		
			IDLE		
		Fax:	Receive preamble, CTR		
8	MS-->SS	Fax:	Send training, fax message		
		FA:	CT109 ON (see note 2)		
			MSG-REC		
			Send fax message*	----->	Receive fax message*
			"		"
			"		"
			"		"
			CT109 OFF (see note 2)		
			IDLE		
9	MS-->SS	FA:	Send at least	----->	Receive SYNC frames
			5 SYNC frames		
10	MS-->SS	Fax:	Send preamble, PPS-NULL		
		FA:	CT109 ON (see note 2)		
			BCS-REC		
			Send preamble*, PPS-NULL*		
			CT109 OFF (see note 2)	----->	Receive preamble*, PPS-NULL*
			IDLE		
11	SS-->MS			<-----	Send preamble*, MCF*
		FA:	CT105 ON (see note 2)		
			BCS-TRA		
			Transmit preamble, MCF		
			CT105 OFF (see note 2)		
			IDLE		
		Fax:	Receive preamble, MCF		

29.4.2.6.5 Test requirement

It shall be verified that the FA transmits 1 SYNC frame every 3 DATA frames.

29.4.2.7 Transition from Facsimile to Speech - Procedure interrupt generated by receiving station

29.4.2.7.1 Definition

-29.4.2.7.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the ICM procedure and shall support the frames and the circuits at the Um-,R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, ITU-T Recommendation T.30.

29.4.2.7.3 Test purpose

To verify the transition from fax to speech in case of an MS supporting TS 61.

29.4.2.7.4 Method of test

Initial conditions

The activity progress of the fax call is brought to phase C (message phase). The ECM shall not be used.

Test procedure

During the message phase a procedure interrupt is generated by the SS, which is executed as soon as phase D is entered. The SS then sends the PIP frame causing an alert at the mobile side. When the operator at the mobile side goes on line the PRI-Q frame is generated and results in an alarm at the SS side. The operator at this side going on line completes the PRI handshaking by causing the PIP frame to be sent. Upon completion of the PRI handshaking the MT executes the MODIFY procedure, which leads to the speech phase. Then the call is cleared by manual intervention at the MT or the facsimile phase maybe reselected.

Expected sequence

MS:					SS:
Step	Direction				
1	Message Procedure (as described above)				Operator intervention requested
2	MS-->SS	Fax:	Send preamble, EOP		
		FA:	CT109 ON (see note 2)		
			BCS-REC		
			Send preamble*, EOP*		
			CT109 OFF (see note 2)	----->	Receive preamble*, EOP*
			IDLE		
3	SS-->MS			<-----	Send preamble*, PIP*
		FA:	CT105 ON (see note 2)		
			BCS-TRA		
			Transmit preamble, PIP		
			CT105 OFF (see note 2)		
			IDLE		
		Fax:	Receive preamble, PIP		
			Alert operator		
4	MS-->SS	Operator goes on line			
		Fax:	Send preamble, PRI-EOP		
		FA:	CT109 ON (see note 2)		
			BCS-REC		
			Send preamble*, PRI-EOP*		
			CT109 OFF (see note 2)	----->	Receive preamble*, PRI-EOP*
			IDLE		Alert operator
		MT:	CT106/109 OFF (see note 2)		
5	SS-->MS				Operator goes on line
				<-----	Send preamble*, PIP*
		FA:	CT105 ON (see note 2)		
			BCS-TRA		
			Transmit preamble, PIP		
			CT105 OFF (see note 2)		
			IDLE		
		Fax:	Receive preamble, PIP		
6	MS-->SS	FA:	CT108.2 OFF (see note 2)		
		MT:	Send MODIFY message	----->	Receive MODIFY m.
				<-----	Send MODIFY COMPLETE
			CT107 OFF (see note 2)		

SPEECH PHASE

29.4.2.7.5 Test requirements

1. To be verified that CT106/109 are in OFF (see note 2) condition.

2. To be verified that CT108.2 goes to OFF (see note 2) upon completion of the PRI handshaking, that this transition to OFF triggers the MODIFY message to be sent and that the reception of the MODIFY COMPLETE message causes CT107 to be set to OFF (see note 2) condition by the MT. In addition the availability of the speech channel shall be checked.

29.4.2.8 Transition from Facsimile to Speech - Procedure interrupt generated by transmitting station

29.4.2.8.1 Definition

-29.4.2.8.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the ICM procedure and shall support the frames and the circuits at the Um-,R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, ITU-T Recommendation T.30.

29.4.2.8.3 Test purpose

To verify the transition from fax to speech in case of an MS supporting TS 61.

29.4.2.8.4 Method of test

Initial conditions

The activity progress of the fax call is brought to phase C (message phase). The ECM shall not be used.

Test procedure

During the message phase a procedure interrupt is generated at the MS side, which is executed as soon as phase D is entered. The fax then sends the PRI-EOP frame causing an alert at the SS side. When the operator at the SS side goes on line the PIP frame is generated and results in an alarm at the MS side. The operator at this side going on line completes the PRI handshaking by causing the PRI-EOP frame to be sent. Upon completion of the PRI handshaking the MT executes the MODIFY procedure, which leads to the speech phase. Then the call is cleared by manual intervention at the MT or the facsimile phase maybe reselected.

Expected sequence

MS: Step	Direction				SS:
1	Message Procedure (as described above) Operator intervention requested				
2	MS-->SS	Fax:	Send preamble, PRI-EOP		
		FA:	CT109 ON (see note 2)		
			BCS-REC		
			Send preamble*, PRI-EOP*		
			CT109 OFF (see note 2)	----->	Receive preamble*, PRI-EOP*
			IDLE		
3	SS-->MS			<-----	Send preamble*, PIP*
		FA:	CT105 ON (see note 2)		
			BCS-TRA		
			Transmit preamble, PIP		
			CT105 OFF (see note 2)		
			IDLE		
		Fax:	Receive preamble, PIP		
			Alert operator		
4	MS-->SS	Operator goes on line			
		MT:	CT106/109 OFF (see note 2)		
		Fax:	Send preamble, PRI-EOP		
		FA:	CT109 ON (see note 2)		
			BCS-REC		
			Send preamble*, PRI-EOP*		
			CT109 OFF (see note 2)	----->	Receive preamble*, PRI-EOP*
			IDLE		
5	MS-->SS	FA:	CT108.2 OFF (see note 2)		
		MT:	Send MODIFY message	----->	Receive MODIFY m.
				<-----	Send MODIFY COMPLETE
			CT107 OFF (see note 2)		
			SPEECH PHASE		

29.4.2.8.5 Test requirements

1. To be verified that CT106/109 are in OFF (see note 2) condition.
2. To be verified that CT108.2 goes to OFF (see note 2) upon completion of the PRI handshaking, that this transition to OFF triggers the MODIFY message to be sent and that the reception of the MODIFY COMPLETE message causes CT107 to be set to OFF (see note 2) condition by the MT. In addition the availability of the speech channel shall be checked.

29.4.2.9 Quality check

29.4.2.9.1 Definition

-29.4.2.9.2 Conformance requirement

The configuration supporting transparent facsimile group 3 shall decode the T.4 coding and shall generate a document.

Reference

3GPP TS 03.45, ITU-T Recommendation T.21, ITU-T Recommendation T.4.

29.4.2.9.3 Test purpose

To verify the quality of the received document.

29.4.2.9.4 Method of test

Initial conditions

The document has been received at the called side.

Test procedure

The quality of the received document at the SS side shall be checked.

29.4.2.9.5 Test requirement

The contents of the transmitted and the received document shall be the same.

29.4.3 Mobile terminated call

29.4.3.1 Call Establishment Procedure

29.4.3.1.1 Alternate Speech/Facsimile

29.4.3.1.1.1 DCD Mobile Terminated

29.4.3.1.1.1.1 Definition

-29.4.3.1.1.1.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the ICM procedure and shall support the frames and the circuits at the Um-,R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, ITU-T Recommendation T.30.

29.4.3.1.1.1.3 Test purpose

To verify the transition from speech to fax in case of an MS supporting TS 61 and that the circuit and tone handling of the MT and FA is correct in case of an MT DCD.

29.4.3.1.1.1.4 Method of test

Initial conditions

A TS 61 s/f call is set up. The speech phase is active.

Test procedure

The transition from speech to fax is initiated by manual intervention at both ends of the connection, i.e. the data call direction DCD is mobile terminated. Upon connection to line the FA turns on CT108.2 (see note 2) as a basic requirement for the transition from speech to fax. Now, within the next 3 seconds the FA has to detect the DCD, which is in this case mobile terminated, i.e. CT105 is set to OFF condition (see note 2). The following ICM procedure via the MODIFY message is carried out by the MT 3 seconds after circuit CT108.2 (see note 2) was set to ON condition. On completion of the ICM the synchronization of the TCH begins and after its completion the MT has to set CT107 to ON condition (see note 2). When CT106/109 are set to ON (see note 2) phase A is completed. Then the call is cleared by manual intervention at the MT or the activity progress of the call proceeds to the next phase.

Expected sequence

MS: Step	Direction				SS:
1	MS-->SS	Fax:	Connect to line (see note 1)	Connect to line (see note 1)	
		FA:	CT108.2 ON (see note 2)		
			Detect DCD		
			CT105 OFF (see note 2)		
		MT:	Send MODIFY message	------>	Receive MODIFY message
			3 seconds after CT108.2 ON (see note 2)		
2	SS-->MS			<-----	Send MODIFY COMPLETE
3	MS<->SS		TCH Synchronization	<---->	TCH Synchronization
		MT:	CT107 ON (see note 2), when synchronized		
4	SS-->MS			<-----	Set X and SB bit in V.110 frame
		MT:	CT106/109 ON (see note 2)		
		FA:	Enter BCS-REC state		Enter BCS-TRA state

29.4.3.1.1.5 Test requirements

1. The condition of CT108.2 and CT105 is verified (see note 2); CT106, 107, 109 have to be in OFF (see note 2) condition. The MODIFY message has to be sent 3 seconds ± 10% after circuit CT108.2 has gone to ON (see note 2) condition.

2. The RCSD-IE shall not be included in the MODIFY message.

3. To be verified that the MT begins the synchronization phase by sending the pattern 1/OFF after the reception of the MODIFY COMPLETE message, that CT107 is turned on (see note 2) by the MT after successful synchronization.

4. To be verified that CT106 and CT109 are turned on (see note 2), when in the V.110 frames received from the SS the X and SB bits are set. The state of the FA shall be verified (->BCS-REC).

29.4.3.1.1.2 DCD mobile originated

29.4.3.1.1.2.1 Definition

-29.4.3.1.1.2.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the ICM procedure and shall support the frames and the circuits at the Um-,R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, ITU-T Recommendation T.30.

29.4.3.1.1.2.3 Test purpose

To verify the transition from speech to fax in case of an MS supporting TS 61 and that the circuit and tone handling of the MT and FA is correct in case of an MO DCD.

29.4.3.1.1.2.4 Method of test

Initial conditions

A TS 61 s/f call is set up. The speech phase is active.

Test procedure

The transition from speech to fax is initiated by manual intervention at both ends of the connection, i.e. the data call direction DCD is mobile originated. Upon connection to line the FA turns on CT108.2 (see note 2) as a basic requirement for the transition from speech to fax. Now, within the next 3 seconds the FA has to detect the DCD, which is in this case mobile originated, i.e. CT105 is set to ON condition (see note 2), indicating that the MT has to include the RCSD-IE in the MODIFY message. The following ICM procedure via the MODIFY message is carried out by the MT 3 seconds after circuit CT108.2 (see note 2) was set to ON condition. On completion of the ICM the synchronization of

the TCH begins and after its completion the MT has to set CT107 to ON condition (see note 2). When CT106/109 are set to ON (see note 2), phase A is completed. Then the call is cleared by manual intervention at the MT or the activity progress of the call proceeds to the next phase.

Expected sequence

MS: Step	Direction				SS:
1	MS-->SS	Fax:	Connect to line (see note 1)		Connect to line (see note 1)
		FA:	CT108.2 ON (see note 2) Detect DCD CT105 ON (see note 2)		
		MT:	Send MODIFY message with RCSD-IE 3 seconds after CT108.2 ON (see note 2)	------>	Receive MODIFY message
2	SS-->MS			<-----	Send MODIFY COMPLETE with RCSD-IE
3	MS<->SS		TCH Synchronization	<---->	TCH Synchronization
		MT:	CT107 ON (see note 2), when synchronized		
		FA:	Generate CED (see note 2)		
		Fax:	Detect CED (see note 2)		
4	SS-->MS			<-----	Set X and SB bit in modified V.110 frame
		MT:	CT106/109 ON (see note 2)		
		FA:	Enter BCS-TRA state		Enter BCS-REC state

29.4.3.1.1.2.5 Test requirements

1. The condition of CT108.2 and CT105 is verified (see note 2); CT106, 107, 109 have to be in OFF (see note 2) condition.
2. The MODIFY message containing the RCSD-IE has to be sent 3 seconds ± 10% after circuit CT108.2 has gone to ON (see note 2) condition.
3. To be verified that the MT begins the synchronization phase by sending the pattern 1/OFF after the reception of the MODIFY COMPLETE message, that CT107 is turned on (see note 2) by the MT after successful synchronization. The CED (see note 2) tone has to be transmitted by the FA.
4. To be verified that CT106 and CT109 are turned on (see note 2), when in the modified V.110 frames received from the SS the X and SB bits are set. The state of the FA shall be verified (-> BCS-TRA).

29.4.3.1.2 Automatic facsimile

29.4.3.1.2.1 Definition

-29.4.3.1.2.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the call setup procedure and shall support the frames and the circuits at the Um-,R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, 3GPP TS 07.01, ITU-T Recommendation T.30.

29.4.3.1.2.3 Test purpose

To verify that the circuit and tone handling of the MT and FA is correct.

29.4.3.1.2.4 Method of test

Initial conditions

The MS, configured for the fax call, is updated. Then the call establishment phase begins.

Test procedure

The SS will send the SETUP message causing CT125 (see note 2) going to ON condition at the MT. The FA then sends ring current (see note 2) to the fax machine, which will connect to line. The FA sets CT108.2 (see note 2) to ON condition which causes the MT to send the CONNECT message towards the SS. When the TCH is available (indicated by the CONNECT ACK message) the synchronization phase begins, i.e. both entities start sending the synchronization pattern 1/OFF. CT106, 107, 109 have to be in OFF (see note 2) condition. Upon completion of the synchronization phase the MT sets CT107 (see note 2) to ON condition causing the FA to send the CNG tone (see note 2) while the SS turns on CT108.2 causing the CED tone to be sent. Then the SS sets CT106 and 109 to ON (see note 2) at the MT by means of the modified V.110 X and SB bits, which completes Phase A. Then the call is cleared by manual intervention at the MT or the activity progress of the call proceeds to the next phase.

Expected sequence

MS:					SS:
Step	Direction				
1	SS-->MS			<-----	Send SETUP message
		MT:	CT125 ON (see note 2)		
		FA:	Cause ring current to flow (see note 2)		
2	MS-->SS	Fax:	Connect to line (see note 1)		
		FA:	CT108.2 ON (see note 2)		
		MT:	Send CONNECT message	------>	Receive CONNECT message
3	SS-->MS				Send CONN ACK message
4	MS<->SS		TCH Synchronization	<---->	TCH Synchronization
		MT:	CT107 ON (see note 2), when completed		
		FA:	Generate CNG (see note 2)		
		Fax:	Receive CNG (see note 2)		
5	SS-->MS			<-----	Set X and SB bit in modified V.110 frame
		MT:	CT106/109 ON (see note 2)		
6		FA:	Enter BCS-REC state		Enter BCS-TRA state

29.4.3.1.2.5 Test requirements

1. The condition of CT125 (see note 2) shall be verified.
2. CT108.2 to be verified (see note 2) and the CONNECT message has to be sent by the MT.
3. To be verified that at the MT CT106, 107, 109 are in OFF (see note 2) condition, that the MT begins the synchronization phase by sending the pattern 1/OFF, that CT107 is turned on (see note 2) by the MT after successful synchronization and that the CNG tone (see note 2) is sent.
4. It shall be verified that CT106 and CT109 are turned on (see note 2), when in the modified V.110 frames received from the SS the X and SB bits are set.
5. The state of the FA shall be verified (-> BCS-REC).

29.4.3.2 Pre-message procedure

29.4.3.2.1 Definition

-29.4.3.2.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the pre-message procedure and shall support the frames and the circuits at the Um-,R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, ITU-T Recommendation T.30.

29.4.3.2.3 Test purpose

To verify the correct handling of the T.30 DIS/DCS/TCF frames.

29.4.3.2.4 Method of test

Initial conditions

The activity progress of the fax call is brought to the beginning of Phase B. The fax transmission shall start using a speed of 9,6 kBit/s.

Test procedure

After phase A the FA being in BCS-REC state, sends the DIS* frame in order to indicate the capabilities of the connected fax and the FA and returns to the idle state. The SS's answer to the DIS is the DCS*. Upon detection of the BCS-REC identifier the FA enters the BCS-TRA state, receives the DCS* and transmits the DCS to the fax. After being for 75 ± 20 ms in IDLE state the FA autonomously enters the MSG-TRA state and begins transmitting the training sequence towards the fax without being triggered by the remote FA/SS. Meanwhile the SS sends the TCF*, which is buffered by the FA. When the training is done the FA transmits the buffered TCF towards the fax. Then the CFR* frame is transmitted to the SS. Now, phase B is completed and the data transfer phase C begins. Then the call is cleared by manual intervention at the MT or the call activity progress proceeds to the next phase.

Expected sequence

MS: Step	Direction				SS:
1	MS-->SS	Fax:	Send preamble,DIS		
		FA:	BCS-REC		
			Filter DIS		
			Send preamble*,DIS*	----->	Receive preamble*,DIS*
			CT109 OFF (see note 2)		
			IDLE		
2	SS-->MS			<-----	Send preamble*,DCS*
		FA:	CT105 ON (see note 2)		
			BCS-TRA		
			Monitor DCS		
			Transmit preamble,DCS		
			CT105 OFF (see note 2)		
			IDLE		
		Fax:	Receive preamble,DCS		
3	SS-->MS			<-----	Send TCF*
		FA:	CT105 ON (see note 2)		
			MSG-TRA		
			Initiate training after 75 ms +-20 ms in IDLE		
			Transmit TCF		
			CT105 OFF (see note 2)		
			IDLE		
		Fax:	Receive training,TCF		
4	MS-->SSFax:		Send preamble, CFR		
		FA:	CT109 ON (see note 2)		
			BCS-REC		
			Send preamble*,CFR*		
			CT109 OFF (see note 2)	----->	Receive preamble*,CFR*
			IDLE		

29.4.3.2.5 Test requirements

1. To be verified that the DIS is filtered and that the correct up-conversion to the message speed is applied. CT109 should go to OFF (see note 2).

2. The DCS shall indicate a message speed of 7 200 bit/s and the down-conversion to the BCS speed shall be verified.

3. The FA, after the reception of the DCS, sends SYNC frames for 75 ± 20 ms and changes to the MSG-TRA state without being triggered by the SS. When the training is over the TCF is transmitted to the fax.

4.The condition of CT109 (see note 2), the ident octet of the STATUS frames and the up-conversion to the message speed shall be verified.

29.4.3.3 Message procedure

29.4.3.3.1 Definition

-29.4.3.3.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the message procedure and shall support the frames and the circuits at the Um-, R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, ITU-T Recommendation T.30, ITU-T Recommendation T.4, ITU-T Recommendation T.21.

29.4.3.3.3 Test purpose

To verify the facsimile data transmission phase.

29.4.3.3.4 Method of test

Initial conditions

The activity progress of the faxcall is brought to the beginning of Phase C. The ECM shall not be used.

Test procedure

The FA is in idle state. Upon reception of the MSG-REC identifier the FA enters the MSG-TRA state, sends the MSG-TRA identifier and initiates the training. While the training is in progress data being received is buffered and conveyed to the connected faxupon end of training. When the transmission is finished the FA is again in the IDLE state and Phase D begins. Then the call is cleared by manual intervention at the MT or the activity progress of the call will proceed to the next phase.

Expected sequence

MS: Step	Direction				SS:
1	SS-->MS			<-----	Transmit STATUS interleaved with SYNC frames
2	MS-->SS	FA:	CT105 ON (see note 2) MSG-TRA Initiate training Send STATUS interleaved with SYNC frames	----->	
3	SS-->MS			<-----	Send fax message*
		FA:	Buffer received data during training Receive fax message*		
			"		"
			"		"
			"		"
			CT105 OFF (see note 2) IDLE		
		Fax:	Receive training, fax message		

29.4.3.3.5 Test requirements

1. To be verified that the FA enters the MSG-TRA state and inserts the correct ident octet in the STATUS frames. Training has to be initiated (see note 2). STATUS frames have to be sent interleaved with SYNC frames.

2. The condition of CT105 (see note 2) shall be checked.

29.4.3.4 Post-message procedure

29.4.3.4.1 Definition

-29.4.3.4.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the post-message procedure and shall support the frames and the circuits at the Um-,R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, ITU-T Recommendation T.30

29.4.3.4.3 Test purpose

To verify phase D of the facsimile transmission.

29.4.3.4.4 Method of test

Initial conditions

The activity progress of the fax call is brought to the beginning of Phase D. The ECM shall not be used.

Test procedure

The SS sends the EOP* frame. The FA then enters the BCS-TRA state and conveys the EOP frame to the fax machine. The fax answers the EOP with the MCF frame. The FA will enter the BCS-REC state, transmit the BCS-REC identifier and will convey the MCF* frame to the SS. Afterwards the FA enters the IDLE state. Phase D of the fax transmission is completed. Then the call is cleared by manual intervention at the MT or the activity progress of the call will proceed to the next phase.

Expected sequence

MS: Step	Direction				SS:
1	SS-->MS			<-----	Send preamble*, EOP*
		FA:	CT105 ON (see note 2) BCS-TRA Transmit preamble, EOP CT105 OFF (see note 2) IDLE		
		Fax:	Receive preamble, EOP		
2	MS-->SS	Fax:	Send preamble, MCF		
		FA:	CT109 ON (see note 2) BCS-REC Send preamble*, MCF* CT109 OFF (see note 2) IDLE	----->	Receive preamble*, MCF*

29.4.3.4.5 Test requirements

1. To be verified that the FA enters the BCS-TRA state upon detection of the BCS-REC identifier and that the correct T.30 message (down conversion to the message speed) is conveyed to the connected fax.

2. To be verified that the FA enters the BCS-REC state and that the correct STATUS frames are sent (up-conversion to the message speed).

29.4.3.5 Call release procedure

29.4.3.5.1 Definition

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29.4.3.5.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the call release procedure and shall support the frames and the circuits at the Um-,R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, ITU-T Recommendation T.30.

29.4.3.5.3 Test purpose

To verify phase E of the facsimile transmission.

29.4.3.5.4 Method of test

Initial conditions

The activity progress of the faxcall is brought to the beginning of Phase E.

Test procedure

The SS sends the preamble followed by the DCN frame. The FA then enters the BCS-TRA state and sends the DCN frame to the fax terminal. The FA enters the idle state again. CT108.2 (see note 2) will go OFF condition. The MT then sends the DISC message and the call is cleared.

Expected sequence

MS:					SS:
Step	Direction				
1	SS-->MS			<-----	Send preamble*, DCN*
		FA:	CT105 ON (see note 2) BCS-TRA CT108.2 OFF (see note 2) Generate preamble, DCN CT105 OFF (see note 2) IDLE		
		Fax:	Receive preamble, DCN		
		MT:	Send DISC message	----->	Receive DISC message

29.4.3.5.5 Test requirements

To be verified that CT108.2 is turned off (see note 2) and that the correct down-conversion to the BCS speed is applied. The MT shall send the DISC message.

29.4.3.6 Speed conversion factor

29.4.3.6.1 Definition

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29.4.3.6.2 Conformance requirement

The MS supporting transparent facsimile group 3 shall perform the up- and down-conversion procedure and shall support the frames and the circuits at the Um-,R- and 2w-interface according the specifications referred to in the subclause "Reference".

Reference

3GPP TS 03.45, ITU-T Recommendation T.30.

29.4.3.6.3 Test purpose

To verify the correct speed conversion for the BCS phases.

29.4.3.6.4 Method of test

Initial conditions

The activity progress of the fax call is brought to the beginning of Phase B. The ECM shall not be used.

Test procedure

The following test sequence is repeated 5 times with 5 different DCS frames indicating a message speed of 9,6/7,2/4,8/2,4 and 9,6 kBit/s. This test is done to verify that the FA detects a change of the TCH access rate and due to this updates the speed conversion factor, which is used for the up-conversion of the BCS signalling to the message speed and vice versa. Then the call is cleared by manual intervention at the MT or the activity progress of the call proceeds to the next phase.

Expected sequence

MS: Step	Direction				SS:
1	MS-->SS	Fax:	Send preamble,DIS		
		FA:	BCS-REC		
			Monitor DIS		
			Send preamble*,DIS*	----->	Receive preamble*,DIS*
			CT109 OFF (see note 2)		
			IDLE		
2	SS-->MS			<-----	Send preamble*,DCS*
		FA:	CT105 ON (see note 2)		
			BCS-TRA		
			Monitor DCS		
			Transmit preamble,DCS		
			CT105 OFF (see note 2)		
			IDLE		
		Fax:	Receive preamble,DCS		
3	SS<->MS	Execution of the CMM procedure **): The SS sends the CMM message 150 ms after the DCS has been sent and the MT completes the procedure by sending the CMM ACK message			
4	SS-->MS			<-----	Send TCF*
		FA:	CT105 ON (see note 2)		
			MSG-TRA		
			Initiate training after 75 ms ± 20 ms in idle		
			Generate TCF		
			CT105 OFF (see note 2)		
			IDLE		
		Fax:	Receive training,TCF		
5	MS-->SS	Fax:	Send preamble, CFR		
		FA:	CT109 ON (see note 2)		
			BCS-REC		
			Send preamble*,CFR*		
			CT109 OFF (see note 2)	----->	Receive preamble*,CFR*
			IDLE		
6	SS-->MS			<-----	Send fax message*
		FA:	CT105 ON (see note 2)		
			MSG-TRA		
			Initiate training		
			Buffer received data during training		
			Receive fax message*		
			"		"
			"		"
			"		"
			CT105 OFF (see note 2)		
			IDLE		
		Fax:	Receive training, fax message		
7	SS-->MS			<-----	Send preamble*, EOM*
		FA:	CT105 ON (see note 2)		
			BCS-TRA		
			Transmit preamble, EOM		
			CT105 OFF (see note 2)		
			IDLE		
		Fax:	Receive preamble, EOM		
8	MS-->SS	Fax:	Send preamble, MCF		
		FA:	CT109 ON (see note 2)		
			BCS-REC		
			Send preamble*, MCF*		
			CT109 OFF (see note 2)	----->	Receive preamble*, MCF*
			IDLE		
9	Repeat steps 2 to 8 four times				

**) only if the requested rate in the DCS differs from the existing radio channel rate (when the radio channel rate equals 9 600 kbit/s and the DCS requests 7 200 kbit/s no CMM will be executed)

29.4.3.6.5 Test requirements

1. The MT shall send the CMM ACK message.
2. For 7,2/9,6 kBit/s:

   The correct up- and down-conversion shall be verified (4 STATUS frames for 1 BCS octet)

   For 4,8 kBit/s:

   The correct up- and down-conversion shall be verified (2 STATUS frames for 1 BCS octet)

   For 2,4 kBit/s:

   The correct up- and down-conversion shall be verified (1 STATUS frame for 1 BCS octet)

   The IDENT octet shall be set to BCS-REC in case of the up-conversion.

29.4.3.7 Quality Check

29.4.3.7.1 Definition

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29.4.3.7.2 Conformance requirement

The configuration supporting transparent facsimile group 3 shall decode the T.4 coding and shall generate a document.

Reference

3GPP TS 03.45, ITU-T Recommendation T.21, ITU-T Recommendation T.4.

29.4.3.7.3 Test purpose

To verify the quality of the received document.

29.4.3.7.4 Method of test

Initial conditions

The document has been received at the called side.

Test procedure

The quality of the document at the receiving side shall be checked.

29.4.3.7.5 Test requirements

The contents of the transmitted and the received document shall be the same.

29.4.4 Notes

The following notes apply throughout the subclause 29.4.

NOTE 1: By pressing the START button on the facsimile apparatus or in case of PC fax by selecting the appropriate software menu point or automatically.

NOTE 2: Or equivalent function/means having the same result.

NOTE 3: Tested by monitoring the contents of the STATUS frame ident octet identifier.

NOTE 4: If no access is available to the 2w interface, this requirement cannot always be verified.

30 Speech teleservices

When an artificial ear is required, the ITU-T Recommendation P.57 [108] Type 1 artificial ear may be used for up to release 4 handsets. See below for details.

If requested by the terminal supplier, the ITU-T Recommendation P.57 [108] Type 3.2 artificial ear shall be used. In this case the following shall apply:

- either the low leakage option or the high leakage option of Type 3.2 artificial ear may be adopted;
- the force against the ear shall be as specified in ITU-T Recommendation P.57 [108];
- sound pressure measurements shall be referred to the ERP as specified in ITU-T Recommendation P.57 [108] or DRP according to the Terminal Supplier's request;
- no leakage correction shall be made in the calculation of RLR (i.e. L_E=0).

If requested by the terminal supplier, the ITU-T Recommendation P.57 [108] Type 3.4 artificial ear may be used for Release 9 6 MS or later. The positioning is defined in ITU-T Recommendation P.64.

If requested by the terminal supplier, the ITU-T Recommendation P.57 [108] Type 3.3 artificial ear may be used for Release 9 6 MS or later. The positioning is defined in ITU-T Recommendation P.64.

Note that for measurement of STMR in release 4 or later MS as specified in 3GPP TS 26.132, the 3.2 ear with the low leakage option, or 3.3 ear or 3.4 ear shall be used. For release 4 it is also possible to use the type 1 ear.

The manufacturer declares in the IXIT statement which type of artificial ear will be used for teleservices speech testings.

The manufacturer declares in PICS TSPC_MS_AUDIO_RELEASE the acoustic implementation according to a given release. For release 4 or later MS the MS shall be tested against the latest version of the corresponding release of 3GPP TS 26.131 and 3GPP TS 26.132 if a reference to these specifications is indicated in the Test Case.

NOTE 1: An MS may be either a handset MS, a handsfree MS or a combined handset and handsfree MS. The test description for handsfree operation, however, at the moment only covers the stability margin as no test method could be defined for the other parameter.

NOTE 2: Frequency settings in the following tests are taken from ISO 3, R10 series or R40 series or from table 2 of ITU-T Recommendation P.79. A departure from the nominal frequencies of +5 % below 240 Hz and +2 % at 240 Hz and above is accepted. Any sub-multiple of the sampling frequency of 8 kHz shall be avoided. In the case of 4 kHz the departure is restricted to -2 %.

NOTE 3: The measurement accuracy for signal level is ±0,2 dB and for sound pressure ±0,6 dB.

NOTE 4: The digital test signals shall be generated as 8 bit A-law companded PCM signals, which internally in the SS are expanded according to ITU-T Recommendation G.721 (Law=1) to 13 bit linear before being applied to the MS via the DAI.

NOTE 5: When measuring signal levels on the DAI, a digital measuring instrument is connected to the 64 kbit/s output of the A-law compression equipment in the SS, which is in turn connected to the DAI in the MS.

NOTE 6: Measurements shall be possible with and without psophometric weighting according to ITU-T Recommendation G.223, table 4.

30.1 Sending sensitivity/frequency response

30.1.1 Definition

The sending sensitivity frequency response is, as a function of the input test signal frequency, the ratio expressed in dB between the output level at the Digital Audio Interface (DAI) or at the audio output of the reference speech decoder of the SS and the input sound pressure in the artificial mouth required to obtain this.

30.1.2 Conformance requirement

The sending sensitivity frequency response shall be within the mask given in 3GPP TS 03.50.

3GPP TS 03.50; subclause 3.8.1.1, table 1.

30.1.3 Test purpose

To verify that the sending sensitivity frequency response is within the mask given in 3GPP TS 03.50, subclause 3.8.1.1, table 1.

30.1.4 Method of test

30.1.4.1 Initial conditions

When measured at the DAI:

a) The handset is mounted in the LRGP (see annex A of ITU-T Recommendation P.76). The earpiece is sealed to the knife-edge of the artificial ear.

b) A pure tone with a sound pressure of -4,7 dBPa (in accordance with ITU-T Recommendation P.64) is applied at the mouth reference point (MRP) as described in ITU-T Recommendation P.64 using an artificial mouth conforming to ITU-T Recommendation P.51.

c) A digital measuring instrument, or high quality digital decoder followed by an analogue level measuring set, is connected to the Digital Audio Interface (DAI). The DAI is set to the operating mode "Test of acoustic devices and A/D & D/A".

When measured at the output of the reference speech decoder of the SS:

a) The handset is mounted in the LRGP and the earpiece is sealed to the knife-edge of an artificial ear.

b) A full rate speech call is set up between the MS and the SS.

c) Artificial speech conforming to ITU-T Recommendation P.50, shall be applied to the MRP, at a wideband sound pressure level of -4,7 dBPa. This implementation could be a real time algorithm producing the artificial speech or a pre-recorded tape of the artificial speech.

d) The artificial speech shall comprise of a concatenation of three 10 s intervals of "male" and "female" voice. The first 10 s interval is not used for measurement purposes but allows any noise/echo cancelling devices in the MS to adapt. The second and third 10 s intervals consist of separately "male" and "female" artificial voice.

30.1.4.2 Procedure

When measured at the DAI:

The SS measures the output level represented by the PCM bit stream at the DAI (pin 23) at one-twelfth-octave intervals as given by the R40 series of preferred numbers in ISO 3 for frequencies from 100 Hz to 4 000 Hz inclusive.

When measured at the output of the reference speech decoder of the SS:

The 1/3 octave filtered long-term average spectrum of the signal is measured at the analogue or digital output of the reference speech decoder of the SS and an average for the "male" and "female" voices is obtained. The sending sensitivity/frequency response is calculated as the difference between the 1/3 octave input power and the 1/3 octave output power.

30.1.5 Test requirement

The sending sensitivity/frequency response shall be within a mask given in table 30.1. The mask can be drawn with straight lines between the breaking points in the table on a logarithmic (frequency) vs linear (dB sensitivity) scale.

All sensitivity levels are dB on an arbitrary scale.

Table 30.1

Frequency (Hz)	Upper Limit (dB)	Lower Limit (dB)
100	-12	
200	0	
300	0	-12
1 000	0	-6
2 000	4	-6
3 000	4	-6
3 400	4	-9
4 000	0	

30.2 Sending loudness rating

30.2.1 Definition

The Sending Loudness Rating (SLR) is a means of expressing the sending frequency response based on objective measurements in a way which relates to how a speech signal would be perceived by a listener.

30.2.2 Conformance requirement

The Sending Loudness Rating (SLR) shall be 8 ± 3 dB.

3GPP TS 03.50; subclause 3.1.1.

30.2.3 Test Purpose

To verify that the Sending Loudness Rating (SLR) is 8 ± 3 dB.

30.2.4 Method of test

30.2.4.1 Initial conditions

When measured at the DAI:

- The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A".

When measured at the output of the reference speech decoder of the SS:

- A full rate speech call is set up between the MS and the SS.

30.2.4.2 Procedure

When measured at the DAI:

a) The sending sensitivity is measured at each of the 14 frequencies given in table 2 of ITU-T P.79, bands 4 to 17.

b) The sensitivity is expressed in terms of dBV/Pa and the SLR is calculated according to ITU-T Recommendation P.79 formula 4.19 b of ITU-T Recommendation P.79, over bands 4 to 17, using the sending weighting factors from ITU-T Recommendation P.79 table 2, adjusted according to table 3 of ITU-T Recommendation P.79.

When measured at the output of the reference speech decoder of the SS:

a) The sending sensitivity from the MRP to the analogue or digital output of the reference speech decoder of the SS is determined according to subclauses 30.1.4.1 and 30.1.4.2.

b) The sensitivity is expressed in terms of dBV/Pa and the SLR shall be calculated according to ITU-T Recommendation P.79 formula 2.1, over bands 4 to 17, and using m = 0,175 and the sending weighting factors from ITU-T Recommendation P.79 table 1.

30.2.5 Test requirement

The SLR shall be 8 ± 3 dB.

30.3 Receiving sensitivity/frequency response

30.3.1 Definition

The receiving sensitivity frequency response is, as a function of the input test signal frequency, the ratio expressed in dB between the output sound pressure in the artificial ear and the input level, represented by the PCM bit stream at the Digital Audio Interface (DAI) or the level at the SS audio input, required to obtain this.

30.3.2 Conformance requirement

The receiving sensitivity frequency response shall be within the mask given in 3GPP TS 03.50.

3GPP TS 03.50; subclause 3.8.1.2, table 2.

30.3.3 Test purpose

To verify that the receiving sensitivity frequency response is within the mask given in 3GPP TS 03.50; subclause 3.8.1.2, table 2.

30.3.4 Method of test

30.3.4.1 Initial conditions

When measured from the DAI:

a) The handset is mounted in the LRGP and the earpiece is sealed to the knife-edge of the artificial ear.

b) A digital signal generator is connected at the digital interface delivering a signal equivalent to a pure tone level of -16 dBm0, see ITU-T Recommendation P.64.

c) The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A".

When measured from the input of the reference speech encoder of the SS:

a) The handset is mounted in the LRGP and the earpiece is sealed to the knife-edge of the artificial ear.

b) A full rate speech call is set up between the MS and the SS.

c) Artificial speech conforming to ITU-T Recommendation P.50, shall be applied to the analogue or digital input of the reference speech encoder of the SS, at a wideband level of -16 dBm0. This implementation could be a real time algorithm producing the artificial speech or a pre-recorded tape of the artificial speech.

d) The artificial speech shall comprise of a concatenation of three 10 s intervals of "male" and "female" voice. The first 10 s interval is not used for measurement purposes but allows any echo cancellation devices in the MS to adapt. The second and third 10 s intervals consist of separately "male" and "female" artificial voice.

30.3.4.2 Procedure

When measured from the DAI:

- Measurements are made at one twelfth-octave intervals as given in the R.40 series of preferred numbers in ISO 3 for frequencies from 100 Hz to 4 kHz inclusive. At each frequency, the sound pressure in the artificial ear is measured by connecting a suitable measuring set to the artificial ear.

When measured from the input of the reference speech encoder of the SS:

- The 1/3 octave filtered long-term average spectrum of the signal is measured and an average for the "male" and "female" voices is obtained. The receiving sensitivity/frequency response is calculated as the difference between the 1/3 octave input power and the 1/3 octave output power.

30.3.5 Test requirement

The receiving sensitivity/frequency response shall be within the mask given by table 30.2. The mask can be drawn with straight lines between the breaking points in the following table on a logarithmic (frequency) vs linear (dB sensitivity) scale.

All sensitivity levels are dB on an arbitrary scale.

Table 30.2

Frequency (Hz)	Upper Limit (dB)	Lower Limit (dB)
100	-12	
200	0	
300	2	-7
500	see note	-5
1 000	0	-5
3 000	2	-5
3 400	2	-10
4 000	2	
NOTE: The limit at intermediate frequencies lies on a straight line drawn between the given values on a log (frequency) vs linear (dB) scale.		

30.4 Receiving loudness rating

30.4.1 Definition

The Receiving Loudness Rating (RLR) is a means of expressing the receiving frequency response based on objective measurements in a way which relates to how a speech signal would be perceived by a listener.

30.4.2 Conformance requirement

1) The nominal Receiving Loudness Rating (RLR) shall be 2 ± 3 dB.

   If a user controlled receive volume control is provided the equipment shall meet this nominal value for at least one setting of the control.

   3GPP TS 03.50; subclause 3.1.1.

2) If a user controlled receive volume control is provided the Receive Loudness Rating (RLR) shall not be less than -13 dB when the control is set to maximum.

   3GPP TS 03.50; subclause 3.1.1.

30.4.3 Test purpose

1) To verify that the nominal Receiving Loudness Rating (RLR) is 2 ± 3 dB.

2) To verify that if a user controlled receive volume control is provided the Receive Loudness Rating (RLR) is not less than -13 dB when the control is set to maximum.

30.4.4 Method of test

30.4.4.1 Initial conditions

When measured at the DAI:

- The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A".

When measured at the output of the reference speech decoder of the SS:

- A full rate speech call is set up between the MS and the SS.

30.4.4.2 Procedure

When measured at the DAI:

a) The receiving sensitivity is measured at each of the 14 frequencies listed in table 2 of ITU-T Recommendation P.79, bands 4 to 17.

b) The sensitivity is expressed in terms of dBPa/V and the RLR is calculated according to ITU-T Recommendation P.79 formula 4.19 c, over bands 4 to 17, using the receiving weighting factors from table 2 of ITU-T Recommendation P.79, adjusted according to table 3 of ITU-T Recommendation P.79.

c) The artificial ear sensitivity must be corrected according to the real ear correction of table 4 of ITU-T Recommendation P.79.

NOTE: The values of real ear correction in ITU-T Recommendation P.79 table 4 were derived for one type of handset conforming to the shape defined in ITU-T Recommendation P.35.

These values are used in the present document because there is no measurement method agreed for the real ear correction. If a method of measurement is agreed, it is intended to change the present document to use the values appropriate to each handset.

When measured from the input of the reference speech encoder of the SS:

a) The receiving sensitivity from the analogue or digital input of the reference speech encoder of the SS to the output of the artificial ear is determined according to subclauses 30.3.4.1 and 30.3.4.2.

b) The sensitivity is expressed in terms of dBPa/V and the RLR shall be calculated according to ITU-T Recommendation P.79 formula 2.1, over bands 4 to 17, using m = 0,175 and the receiving weighting factors from table 1 of ITU-T Recommendation P.79.

30.4.5 Test requirement

If no user controlled receive volume control is provided, the RLR shall be 2 ± 3 dB.

If a user controlled receive volume control is provided, the RLR shall meet this nominal value for (at least) one setting of the receive volume control.

When the receive volume control is set to maximum the RLR shall not be less than (i.e. louder than) -13 dB.

30.5 Side tones

30.5.1 Side Tone Masking Rating (STMR)

30.5.1.1 Definition

The sidetone loudness ratings are a means of expressing the path loss from the artificial mouth to the artificial ear based on objective single tone measurements in a way that relates to how a speaker will perceive his own voice when speaking (talker sidetone, expressed by the sidetone masking rating - STMR), or how a listener will perceive the background noise picked up by the microphone (listener sidetone rating - LSTR).

30.5.1.2 Conformance requirement

The nominal value of the Side Tone Masking Rating (STMR) shall be 13 ± 5 dB. Where a user controlled receiving volume control is provided the STMR shall meet the requirement at the setting where the RLR is equal to the nominal value.

3GPP TS 03.50; subclause 3.10.1.

30.5.1.3 Test purpose

1) To verify that the Side Tone Masking Rating (STMR) is 13 ± 5 dB.

2) To verify that is a user controlled receiving volume control is provided, the STMR is 13 ± 5 dB at the setting where the RLR is equal to the nominal value.

30.5.1.4 Method of test

30.5.1.4.1 Initial conditions

a) The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A".

b) The handset is mounted in the LRGP (see annex 1 of ITU-T Recommendation P.76) and the earpiece is sealed to the knife-edge of the artificial ear conforming to ITU-T Recommendation P.51.

30.5.1.4.2 Procedure

a) The SS sends a PCM bit stream coded with the value No 1 over the DAI (pin 25). Or alternatively the activation of the A/D and D/A converters is performed via a call setup, in which case the DAI connection between the MS and SS, and the PCM bit stream are optional.

NOTE: The idle channel noise in the receiving direction is the acoustic sound pressure in the artificial ear when the digital input signal at the DAI is the PCM coded value No. 1.

b) The SS applies a pure tone with a sound pressure of -4,7 dBPa at the mouth reference point as described in ITU-T P.64 using an artificial mouth conforming to ITU-T Recommendation P 51.

c) For each frequency given in table 2 of ITU-T Recommendation P.79, bands 4 to 17, the sound pressure in the artificial ear is measured.

d) The sidetone path loss (LmeST) is expressed in dB and the STMR (in dB) is calculated from the formula 8.4 of ITU-T Recommendation P.79, using the weighting factors of column (3) in table 6 of ITU-T Recommendation P.79 (unsealed), and values of LE in accordance with table 4 of ITU-T Recommendation P.79.

30.5.1.5 Test requirement

The STMR shall be 13 ± 5 dB.

Where a user controlled receive volume control is provided, the STMR shall meet the requirement given above at the setting where the RLR is equal to the nominal value.

30.5.2 Listener Side Tone Rating (LSTR)

30.5.2.1 Definition

The Listener Sidetone Rating (LSTR) is considered a major parameter affecting the user perception of the system.

30.5.2.2 Conformance requirement

The value of the Listener Sidetone Rating (LSTR) shall not be less than 15 dB.

3GPP TS 03.50, subclause 3.10.1.

30.5.2.3 Test purpose

To verify that the value of LSTR is not less than 15 dB.

30.5.2.4 Method of test

30.5.2.4.1 Initial conditions

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A".

The SS sends a PCM bit stream coded with the value No. 1 over the DAI (pin 25) to the MS.

30.5.2.4.2 Procedure

a) The sound field is calibrated in the absence of any local obstacles. The averaged field shall be uniform to within +4 dB/-2 dB within a radius of 0,15 m of the MRP, when measured in one-third octave bands from 100 Hz to 8 kHz (bands 1 to 20).

b) A calibrated half-inch microphone is mounted at MRP. The sound field is measured in one-third octave bands. The spectrum shall be "Pink noise" as described in ITU-T recommendation P.64 annex B to within ±1 dB and the level shall be adjusted to 70 dBA (-24 dBPa(A)). The tolerance on this level is ±1 dB.

c) The artificial mouth and ear are placed in the correct position relative to MRP, the handset is mounted at LRGP and the earpiece is sealed to the knife-edge of the artificial ear.

d) Measurements are made in one-third octave bands for the 14 bands centred at 200 Hz to 4 kHz (bands 4 to 17). For each band the sound pressure in the artificial ear shall be measured by connecting a suitable measuring set to the artificial ear.

e) The listener sidetone path loss is expressed in dB and the LSTR shall be calculated from the ITU-T Recommendation P.79 formula 8-4, using the weighting factors in column (3) in table 6 of the Recommendation, and the values of LE; in accordance with table 4 of the Recommendation.

30.5.2.5 Test requirement

The LSTR shall not be less than 15 dB.

30.6 Telephone Acoustic coupling Loss (TAL)

30.6.1 Echo Loss (EL)

30.6.1.1 Definition

The echo loss is the path loss from the input of the reference speech encoder of the SS to the output of the reference speech decoder of the SS.

30.6.1.2 Conformance requirement

The echo loss from the input to the output of the reference speech codec in the SS shall be at least 46 dB.

3GPP TS 03.50; subclause 3.4.3.2.

30.6.1.3 Test purpose

To verify that the echo loss from the input to the output of the reference speech codec in the SS is at least 46 dB.

30.6.1.4 Method of test

30.6.1.4.1 Initial conditions

The DAI of the MS is connected to the SS and is set to the operating mode "Normal operation".

The SS sets up a speech call according to the generic call set up procedure.

The handset is mounted in the LRGP (see annex 1 of ITU-T Recommendation P.76) and the earpiece is sealed to the knife-edge of the artificial ear conforming to ITU-T Recommendation P.51.

Where a user controlled volume control is provided it is set to maximum.

30.6.1.4.2 Procedure

An implementation of the ITU-T P.50 artificial speech is connected to the analogue or digital input of the reference speech encoder of the SS. This implementation is either a real time algorithm producing the artificial speech or a pre-recorded tape of artificial speech. Both "male" and "female" artificial speech is required.

A ten second segment of the "male" artificial speech is applied to the analogue or digital input of the reference speech encoder of the SS. The third octave power of the input signal is measured. The echo loss signal is not measured at this stage as the first ten second segment is used to allow any acoustic echo cancellation devices within the MS to adapt to the echo path.

Immediately after a second ten second segment of the "male" artificial speech is applied to the analogue or digital input of the reference speech encoder of the SS. The third octave power of the echo signal is measured at the analogue or digital output of the reference speech decoder of the SS.

The difference between the third octave input power and the third octave output power is entered into the ITU-T G.122 TCL algorithm and the acoustic echo loss calculated.

The test is repeated with the "female" artificial speech and the results of both "male" and "female" averaged to give the final result.

30.6.1.5 Test requirement

The echo loss from the input to the output of the reference speech codec in the SS shall be at least 46 dB.

30.6.2 Stability margin

30.6.2.1 Definition

The receive-transmit stability margin is a measure of the gain that would have to be inserted between the go and return paths of the reference speech coder in the SS for oscillation to occur.

30.6.2.2 Conformance requirement

The stability margin shall be at least 6 dB.

3GPP TS 03.50; subclause 3.2.

30.6.2.3 Test purpose

To verify that the stability margin is at least 6 dB.

30.6.2.4 Method of test

30.6.2.4.1 Initial conditions

For handset operation the handset is placed on a hard plane surface with the transducers facing the surface.

For handsfree operation the test setup is shown in ITU-T Recommendation P.34 (figure 3), but omitting the test table.

Where a user controlled volume control is provided it is set to maximum.

30.6.2.4.2 Procedure

a) A gain equivalent to the minimum stability margin is inserted in the loop between the go and return paths of the reference speech coder in the SS and any acoustic echo control is enabled.

b) A test signal according to ITU-T Recommendation O.131 is injected into the loop at the analogue or digital input of the reference speech codec of the SS and the stability is measured. The test signal has a level of -10 dBm0 and a duration of 1 s.

30.6.2.5 Test requirement

The minimum stability margin shall be 6 dB and no audible oscillation shall be detected.

30.7 Distortion

30.7.1 Sending

30.7.1.1 Definition

The transmit signal to total distortion ratio is a measure of the linearity of the transmitter equipment.

30.7.1.2 Conformance requirement

The ratio of signal to total distortion power in the sending direction measured with a psophometric filter at the DAI of the MS or at the output of the reference speech decoder of the SS shall be above the limits given in 3GPP TS 03.50; subclause 3.9.1, table 3, unless the sound pressure at MRP exceeds +10 dBPa.

3GPP TS 03.50; subclause 3.9.1.

30.7.1.3 Test purpose

To verify that the ratio of signal to total distortion power in the sending direction measured with psophometric filter is above the limits given in 3GPP TS 03.50;subclause 3.9.1, table 3.

30.7.1.4 Method of test

30.7.1.4.1 Initial conditions

The handset is mounted in the LRGP (see annex 1 of ITU-T Recommendation P.76) and the earpiece is sealed to the knife-edge of the artificial ear conforming to ITU-T Recommendation P.51.

When measured at the DAI:

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A".

When measured at the output of the reference speech decoder of the SS:

A full rate speech call is set up between the MS and the SS.

30.7.1.4.2 Procedure

a) A sine-wave signal with a frequency in the range 1 004 Hz to 1 025 Hz is applied to the MRP. The level of this signal is adjusted until the level at the DAI output (pin 23) of the MS or at the analogue or digital output of the reference speech decoder of the SS corresponds to -10 dBm0. The level of the signal at the MRP is then the acoustic reference level (ARL).

b) The test signal is applied at the following levels: -35 dB, -30 dB, -25 dB, -20 dB, -15 dB, -10 dB, -5 dB, 0 dB, 5 dB, 10 dB relative to the ARL.

c) The ratio of signal to total distortion power is measured at the DAI of the MS or at the analogue or digital output of the reference speech decoder of the SS with the psophometric noise weighting (see ITU-T Recommendations G.714 and O.132) at each signal level.

NOTE: The measurement is not to be carried out at sound pressures exceeding +10 dBPa.

30.7.1.5 Test requirement

The ratio of signal to total distortion power measured with the psophometric noise weighting (see table 4/ ITU-T G.223) shall be above the limits given in table 30.3.

Table 30.3

dB relative to ARL	Level ratio
-35 dB	17,5 dB
-30 dB	22,5 dB
-20 dB	30,7 dB
-10 dB	33,3 dB
0 dB	33,7 dB
7 dB	31,7 dB
10 dB	25,5 dB

Limits for the signal to total distortion ratio (sending) when using the sine wave method.

Limits for intermediate levels are found by drawing a straight line between breaking points in a linear (dB signal level) vs linear (dB ratio) scale.

30.7.2 Receiving

30.7.2.1 Definition

The receive signal to total distortion ratio is a measure of the linearity in the receive equipment (excluding the speech decoder).

30.7.2.2 Conformance requirement

The ratio of signal to total distortion power in the receiving direction measured at the ERP or DRP according to the Terminal Supplier's request with psophometric filter shall be above the limits given in 3GPP TS 03.50; subclause 3.9.2, table 5.

3GPP TS 03.50; subclause 3.9.2.

30.7.2.3 Test purpose

To verify that the ratio of signal to total distortion power in the receiving direction measured at the ERP or DRP according to the Terminal Supplier's request with psophometric filter is above the limits given in 3GPP TS 03.50; subclause 3.9.2, table 5.

30.7.2.4 Method of test

30.7.2.4.1 Initial conditions

The handset is mounted in the LRGP (see annex 1 of ITU-T Recommendation P.76) and the earpiece is sealed to the knife-edge of the artificial ear conforming to ITU-T Recommendation P.51.

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A".

30.7.2.4.2 Procedure

a) The SS sends, via the DAI (Pin 25), a PCM bit stream simulating a sine-wave signal with a frequency in the range 1 004 Hz to 1 025 Hz corresponding to ITU-T O.132 at the following levels: -45 dBm0, -40 dBm0, -35 dBm0, -30 dBm0, -25 dBm0, -20 dBm0, -15 dBm0, -10 dBm0, -5 dBm0, 0 dBm0.

b) The ratio of signal to total distortion power is measured with the psophometric noise weighting in the artificial ear (see ITU-T Recommendations G.714 and O.132) at each signal level.

c) The measurement is only carried out at sound pressures between -50 dBPa and +10 dBPa.

30.7.2.5 Test requirement

The ratio of signal to total distortion power measured at the artificial ear with the psophometric noise weighting (see table 4/ ITU-T Recommendation G.223) shall be above the limits given in table 30.4.

Table 30.4

Level at the digital audio interface	Level ratio
-45 dBm0	17,5 dB
-40 dBm0	22,5 dB
-30 dBm0	30,5 dB
-20 dBm0	33,0 dB
-10 dBm0	33,5 dB
-3 dBm0	31,2 dB
0 dBm0	25,5 dB

Limits for the signal to total distortion ratio (receiving) when using the sine wave method.

Limits for intermediate levels are found by drawing a straight line between breaking points in a linear (dB signal level) vs linear (dB ratio) scale.

30.8 Sidetone distortion

30.8.1 Definition

The sidetone distortion expresses the linearity of the sidetone path in the handset.

30.8.2 Conformance requirement

The third harmonic distortion of the sidetone shall not be greater than 10 %.

3GPP TS 03.50; subclause 3.10.2.

30.8.3 Test purpose

To verify that the third harmonic distortion of the sidetone is not greater than 10 %.

30.8.4 Method of test

30.8.4.1 Initial conditions

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A".

The handset is mounted in the LRGP (see annex 1 of ITU-T Recommendation P.76) and the earpiece is sealed to the knife-edge of the artificial ear conforming to ITU-T Recommendation P.51.

30.8.4.2 Procedure

a) The SS sends the PCM bit stream coded with the value No 1 over the DAI (pin 25) to the MS.

b) An instrument capable of measuring the third harmonic distortion of signals with fundamental frequencies in the range 315 Hz to 1 000 Hz is connected to the artificial ear.

c) A pure-tone signal of -4,7 dBPa is applied at the mouth reference point at frequencies of 315 Hz, 500 Hz, and 1 000 Hz. For each frequency the third harmonic distortion is measured in the artificial ear.

30.8.5 Test requirement

The third harmonic distortion generated shall not be greater than 10 %.

30.9 Out-of-band signals

30.9.1 Sending

30.9.1.1 Definition

The discrimination against out-of-band input signals in the sending direction is a requirement on the in-band image frequencies created by any out-of-band input signals.

30.9.1.2 Conformance requirement

With any sine wave signal above 4,6 kHz and up to 8 kHz applied at the MRP at a level of -4,7 dBPa, the level of any image frequency produced at the digital interface shall be below a reference level obtained at 1 kHz (-4,7 dBPa at MRP) by at least the amount (in dB) specified in 3GPP TS 03.50; subclause 3.11.1, table 7.

3GPP TS 03.50; subclause 3.11.1.

30.9.1.3 Test purpose

To verify that the conformance requirement is met for input signals with frequencies of 4,65 kHz, 5 kHz, 6 kHz, 6,5 kHz, 7 kHz and 7,5 kHz.

30.9.1.4 Method of test

30.9.1.4.1 Initial conditions

The handset is mounted in the LRGP (see annex 1 of ITU-T Recommendation P.76) and the earpiece is sealed to the knife-edge of the artificial ear conforming to ITU-T Recommendation P.51.

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A".

30.9.1.4.2 Procedure

a) A pure tone with a sound pressure of -4,7 dBPa is applied at the mouth reference point as described in ITU-T Recommendation P.64 using an artificial mouth conforming to ITU-T Recommendation P 51.

b) For input signals at frequencies of 4,65 kHz, 5 kHz, 6 kHz, 6,5 kHz, 7 kHz, and 7,5 kHz, the level represented by the PCM bit stream at the DAI (Pin 23) of any image frequency is measured.

30.9.1.5 Test requirement

The level of any image frequency shall be below a reference obtained at 1 kHz by at least the amount as specified in table 30.5.

Table 30.5

Applied sine-wave frequency	Limit (minimum)
4,6 kHz	30 dB
8 kHz	40 dB

Limits for the image frequency discrimination.

The limit at intermediate frequencies lies on a straight line drawn between the given values on a log(frequency) vs linear(dB) scale.

30.9.2 Receiving

30.9.2.1 Definition

The discrimination against out-of-band signals in the receiving direction is a requirement on the out-of-band signals generated in the artificial ear from in-band input signals.

30.9.2.2 Conformance requirement

With a digitally simulated sine wave signal in the frequency range of 300 Hz to 3,4 kHz and at a level of 0 dBm applied at the digital interface, the level of spurious out-of-band image signals in the frequency range of 4,6 to 8 kHz measured selectively in the artificial ear shall be lower than the in-band acoustic level produced by a digital signal at 1 kHz set at the level specified in 3GPP TS 03.50; subclause 3.11.2, table 8.

3GPP TS 03.50; subclause 3.11.2.

30.9.2.3 Test purpose

To verify that the conformance requirement is met for input signals at the nominal frequencies 500 Hz, 1 000 Hz, 2 000 Hz and 3 350 Hz.

30.9.2.4 Method of test

30.9.2.4.1 Initial conditions

The handset is mounted in the LRGP (see annex 1 of ITU-T Recommendation P.76) and the earpiece is sealed to the knife-edge of the artificial ear conforming to ITU-T Recommendation P.51.

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A".

30.9.2.4.2 Procedure

a) The SS sends over the DAI (pin 25) a PCM bit stream simulating a sine-wave signal with a level of 0 dBm0.

b) For input signals at the nominal frequencies 500 Hz, 1 000 Hz, 2 000 Hz and 3 350 Hz (bearing in mind the restriction on sub-multiples of the sampling frequency) the level of any out-of-band signals at frequencies up to 8 kHz is measured in the artificial ear.

30.9.2.5 Test requirement

The level of out-of-band signals shall be lower than the in-band acoustic level obtained by a digital signal at 1 kHz set at the level specified in table 30.6.

Table 30.6

Image signal frequency	Equivalent input signal level
4,6 kHz	-35 dBm0
8 kHz	-45 dBm0

Limits for the image frequency discrimination.

The limit at intermediate frequencies lies on a straight line drawn between the given values on a log(frequency) vs linear(dB) scale.

30.10 Idle channel noise

30.10.1 Sending

30.10.1.1 Definition

The idle channel noise in the sending direction is the equivalent noise level produced at the DAI, when the mouth reference point is in a quiet environment.

30.10.1.2 Conformance requirement

The idle noise in the sending direction shall not exceed - 64 dBm0p at the UPCMI under silent conditions.

3GPP TS 03.50; subclause 3.6.1.

30.10.1.3 Test purpose

To verify that the idle noise in the sending direction does not exceed -64 dBm0p at the UPCMI under silent conditions.

30.10.1.4 Method of test

30.10.1.4.1 Initial conditions

The handset is mounted in the LRGP (see annex 1 of ITU-T Recommendation P.76) and the earpiece is sealed to the knife-edge of the artificial ear conforming to ITU-T Recommendation P.51 in a quiet environment (ambient noise less than 30 dBA).

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A".

30.10.1.4.2 Procedure

The noise level represented by the PCM bit stream output at the DAI (pin 23) is measured with psophometric weighting according to ITU-T Recommendation G.223, table 4.

NOTE: The ambient noise criterion should be met if the ambient noise does not exceed NR20.

30.10.1.5 Test requirement

The noise produced by the MS in the sending direction shall not exceed -64 dBm0p.

30.10.2 Receiving

30.10.2.1 Definition

The idle channel noise in the receiving direction is the acoustic sound pressure in the artificial ear when the digital input signal at the DAI, is the PCM coded value No 1.

30.10.2.2 Conformance requirement

1. If no user controlled receiving volume control is provided, or if it is provided, at the setting of the user controlled receiving volume at which the RLR is equal to the nominal value, the noise measured in the artificial ear contributed by the receiving equipment alone shall not exceed -57 dBPa (A) when driven by a PCM signal corresponding to the decoder output value No. 1.

   3GPP TS 03.50; subclause 3.6.2.

2. Where a volume control is provided, the measured noise shall not exceed -54 dBPa(A) at the maximum setting of the volume control.

   3GPP TS 03.50; subclause 3.6.2.

30.10.2.3 Test purpose

1. To verify that the idle noise in the receiving direction does not exceed -57 dBPa (A). If a user controlled receive volume control is provided it shall be set to the position where RLR is equal to the nominal value.

2. To verify that if a user controlled receive volume control is provided, the idle noise in the receiving direction does not exceed -54 dBPa(A) when the control is set to maximum.

30.10.2.4 Method of test

30.10.2.4.1 Initial conditions

The handset is mounted in the LRGP (see annex 1 of ITU-T Recommendation P.76) and the earpiece is sealed to the knife-edge of the artificial ear conforming to ITU-T Recommendation P.51.

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A".

30.10.2.4.2 Procedure

a) The SS sends a PCM bit stream coded with the value No 1 over the DAI (Pin 25) to the MS.

b) The level of the noise is measured in the artificial ear with any volume control set at the position at which the RLR is equal to the nominal value.

c) Where a volume control is provided, the level of the noise is measured in the artificial ear with the volume control set to maximum.

30.10.2.5 Test requirement

In step b) the measured noise generated by the MS shall not exceed -57 dBPa (A).

In step c) the measured noise shall not exceed -54 dBPa (A).

30.11 Ambient Noise Rejection

30.11.1 Definition

An MS that supports speech will typically be operated within an area of high ambient acoustic noise. A level of noise rejection will therefore be required.

30.11.2 Conformance Requirement

Compliance shall be checked by calculating the single figure DELSM (SFDELSM) according to the following formula, the SFDELSM shall be ≥ 0 dB.

$$SFDELSM = -4/5 \times \sum_{n=1}^{14} Del_n \times 10^{(-0.0175 \times Wm)}$$

where:

n = the third octave band centre frequencies from 160 Hz to 3 150 Hz inclusive.

Deln = is the 1/3 octave band pressure level centered on the n^{th} frequency.

Wm = is the SLR weighting for the nth 1/3 octave band centre frequency.

3GPP TS 03.50; subclause 3.14.1.

30.11.3 Test Purpose

To verify that ambient noise calculated as SFDELSM shall be rejected, by verifying that SFDELSM ≥ 0 dB.

30.11.4 Method of Test

30.11.4.1 Initial Conditions

A 1/2 inch pressure microphone is calibrated using a known sound source and mounted at the MRP, without the LRGP head present. A frequency analyser is calibrated to enable the sound pressure levels at the microphone to be determined in $1/3^{rd}$ octave bands.

Flood the room in which the measurement is to be made with the selected noise file, and adjust the level such that the noise level at the MRP is 70 dBA. A single noise file of real noise, covering the various noise environments that the MS could be subjected to, is used. This file is three minutes long and also commences with a three minute signal. Once this tone has been adjusted to a level of 70 dBA, the average level of the noise will be 70 dBA. The resulting sound spectrum is Prn dBPa, measured in 1/3rd octave bands.

To ensure that the sound field is diffuse enough, the following apply:

- The diffuse sound field is calibrated in the absence of any local obstacles. The averaged field shall be uniform to within ±3 dB within a radius of 0,15 m of the MRP, when measured in one-third octave bands from 100 Hz to 3,15 Khz.

- Where more than one loudspeaker is used to produce the desired sound field, the loudspeakers may require to be fed with non-coherent signals to eliminate standing waves and other interference effects.

- Position an LRGP in the correct relative position to the MRP and mount the MS under test. Recalibrate the 1/3rd octave frequency analyser using a known voltage source to facilitate the analysis of the Voltage Vrn, where Vrn is the voltage at the audio output of the System Simulator (SS) due to the noise spectrum input.

30.11.4.2 Procedure

Set up a full rate speech path between the MS and the SS.

The SS determines, as a function of frequency, using the frequency analyser, in 1/3rd octave bands, the electrical output Vrn, (expressed as dB rel 1V) at the audio output of the SS for the applied acoustic pressure Prn (expressed as dB rel 1Pa) at the MRP. Since, the MS sending sensitivity is not defined above 3,4 kHz and below 300 Hz the measurement shall be cut off at 3,4 kHz and for the bands below 300 Hz. The noise level shall be referenced to the speech level at 300 Hz to yield the DELSM.

The room noise sensitivity is defined as:

- Smj_{rn} = Vrn (dBV) - Prn (dBPa).

The ambient noise send sensitivity has now been determined.

The MS speech send sensitivity is now required. The required sensitivity is defined as the electrical output from the MS, measured at the audio output of the SS, as a function of the free field sound pressure at the MRP of the artificial mouth.

The measurment is made using an artificial speech source at the MRP of the artificial mouth. The 1/2 inch pressure microphone is calibrated using a known sound source. The frequency analyser is calibrated to measure in 1/3rd octave bands. The artificial mouth output shall be in accordance with the ITU-T Recommendation P.50 male artificial voice. Whilst maintaining the ITU-T Recommendation P.50 'male' spectrum, the total signal level is adjusted to -4,7 dBPa. The resulting sound spectrum is P_0dBpa, measured in 1/3rd octave bands. The 1/3rd octave frequency analyser shall be re-calibrated, using a known voltage source, to facilitate the analysis of the voltage V_j. Where V_j is the voltage at the audio output of the SS due to the speech spectrum input. A speech path is setup between the MS and the SS. The function of the frequency is determined using the frequency analyser, and in 1/3rd octave bands, the electrical output V_j, (expressed as dB rel. 1V), at the audio output of the SS for the applied acoustic pressure, P_0, (expressed as dB rel. 1Pa/V), at the MRP.

The sending sensitivity is expressed as:

$$S_{mjs}(dB) = V_j(dBV) - P_o(dBPa)dBrel1V / Pa$$

The D_{SM} for the MS is determined as:

$$D_{SM} = Smj_{rn} - S_{mjs} (dB).$$

30.11.5 Test Requirement

The MS ambient noise rejection, calculated as a single figure DELSM (SFDELSM) shall be greater than or equal to 0 dB.

30.12 Sending sensitivity/frequency response

30.12.1 Definition

The sending sensitivity frequency response is, as a function of the input test signal frequency, the ratio expressed in dB between the output level at the Digital Audio Interface (DAI) or at the audio output of the reference speech decoder of the SS and the input sound pressure in the artificial mouth required to obtain this.

30.12.2 Conformance requirement

The sending sensitivity frequency response shall be within the mask given in 3GPP TS 26.131.

3GPP TS 26.131, subclause 5.4.1, table 1

30.12.3 Test purpose

To verify that the sending sensitivity frequency response is conforming to the specification in 3GPP TS 26.131.

30.12.4 Method of test

30.12.5 Test requirement

The sending sensitivity frequency response shall be within the mask specified in 3GPP TS 26.131.

30.13 Sending loudness rating

30.13.1 Definition

The Sending Loudness Rating (SLR) is a means of expressing the sending frequency response based on objective measurements in a way which relates to how a speech signal would be perceived by a listener.

30.13.2 Conformance requirement

The conformance requirement shall be as specified in 3GPP TS 26.131.

3GPP TS 26.131; subclause 5.2.2.

30.13.3 Test Purpose

To verify that the Sending Loudness Rating (SLR) is conforming to the specification in 3GPP TS 26.131.

30.13.4 Method of test

30.13.5 Test requirement

The Sending Loudness Rating (SLR) shall be within the limits specified in 3GPP TS 26.131.

30.14 Receiving sensitivity/frequency response

30.14.1 Definition

The receiving sensitivity frequency response is, as a function of the input test signal frequency, the ratio expressed in dB between the output sound pressure in the artificial ear and the input level, represented by the PCM bit stream at the Digital Audio Interface (DAI) or the level at the SS audio input, required to obtain this.

30.14.2 Conformance requirement

When measured with the type 1 artificial ear (only release 4 handsets) the receiving sensitivity frequency response shall be within the mask given in 3GPP TS 43.050.

3GPP TS 43.050; subclause 6.8.1.2, table 2.

When measured with 3.x artificial ear (release 4 and later handsets) the receiving sensitivity frequency response shall be within the mask given in 3GPP TS 26.131.

3GPP TS 26.131; subclause 5.4.2, table 2

30.14.3 Test purpose

To verify that the receiving sensitivity frequency response is within the mask given in 3GPP TS 43.050; subclause 3.8.1.2, table 2 when measured with the type 1 artificial ear (release 4 hansets only) or within the mask given in 3GPP TS 26.131; subclause 5.4.2, table 2 when measured with a type 3.x artificial ear.

30.14.4 Method of test

30.14.4.1 Initial conditions

When measured from the DAI:

a) The handset is mounted in the LRGP and the earpiece is sealed to the knife-edge of the artificial ear.

b) A digital signal generator is connected at the digital interface delivering a signal equivalent to a pure tone level of -16 dBm0, see ITU-T Recommendation P.64.

c) The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A".

When measured from the input of the reference speech encoder of the SS:

a) The handset is mounted as specified in 3GPP TS 26.132 section 7.4.2.

b) A full rate speech call is set up between the MS and the SS.

30.14.4.2 Procedure

When measured from the DAI:

- Measurements are made at one twelfth-octave intervals as given in the R.40 series of preferred numbers in ISO 3 for frequencies from 100 Hz to 4 kHz inclusive. At each frequency, the sound pressure in the artificial ear is measured by connecting a suitable measuring set to the artificial ear.

When measured from the input of the reference speech encoder of the SS:

- The test shall be performed according to the test specification as described in 3GPP TS 26.132.

30.14.5 Test requirement

When measured in the type 1 artificial ear (allowed for release 4 handsets only) the receiving sensitivity/frequency response shall be within the mask given by table 30.8. The mask can be drawn with straight lines between the breaking points in the following table on a logarithmic (frequency) vs linear (dB sensitivity) scale.

All sensitivity levels are dB on an arbitrary scale.

Table 30.8

Frequency (Hz)	Upper Limit (dB)	Lower Limit (dB)
100	-12	
200	0	
300	2	-7
500	see note	-5
1 000	0	-5
3 000	2	-5
3 400	2	-10
4 000	2	
Note: The limit at intermediate frequencies lies on a straight line drawn between the given values on a log (frequency) vs linear (dB) scale.		

When measured in a type 3.x artificial ear, the receiving sensitivity/frequency response shall be within the mask specified in 3GPP TS 26.131.

30.15 Receiving loudness rating

30.15.1 Definition

The Receiving Loudness Rating (RLR) is a means of expressing the receiving frequency response based on objective measurements in a way which relates to how a speech signal would be perceived by a listener.

30.15.2 Conformance requirement

3GPP TS 26.131; subclause 5.2.2.

30.15.3 Test purpose

To verify that the Receiving Loudness Rating (RLR) is conforming to the specification in 3GPP TS 26.131.

30.15.4 Method of test

The test method shall be as specified in 3GPP TS 26.132 section 7.2.2.2.

30.15.5 Test requirement

The Receiving Loudness Rating (RLR) shall be within the limits specified in 3GPP TS 26.131.

30.16 Side Tone Masking Rating (STMR) LRGP

30.16.1 Definition

The sidetone loudness ratings are a means of expressing the path loss from the artificial mouth to the artificial ear based on objective single tone measurements in a way that relates to how a speaker will perceive his own voice when speaking (talker sidetone, expressed by the sidetone masking rating - STMR), or how a listener will perceive the background noise picked up by the microphone (listener sidetone rating - LSTR).

30.16.2 Conformance requirement

The conformance requirement is specified in 3GPP TS 26.131.

3GPP TS 26.131; subclause 5.5.1.

30.16.3 Test purpose

To verify that the requirement for STMR stated in TS 26.131 is met.

30.16.4 Method of test

The test method shall be as specified in 3GPP TS 26.132 section 7.5.1.

30.16.5 Test requirement

The STMR shall be within the limits specified in 3GPP TS 26.131.

30.17 Telephone Acoustic coupling Loss (TAL)

30.17.1 Echo Loss (EL)

30.17.1.1 Definition

The echo loss is the path loss from the input of the reference speech encoder of the SS to the output of the reference speech decoder of the SS.

30.17.1.2 Conformance requirement

The echo loss from the input to the output of the reference speech codec in the SS shall be as specified in 3GPP TS 26.131.

30.17.1.3 Test purpose

To verify that the echo loss from the input to the output of the reference speech codec in the SS is as specified in 3GPP TS 26.131.

30.17.1.4 Method of test

The method of test shall be as specified in 3GPP TS 26.132.

30.17.1.5 Test requirement

The echo loss from the input to the output of the reference speech codec in the SS shall be as specified in 3GPP TS 26.131.

30.17.2 Stability margin

30.17.2.1 Definition

The receive-transmit stability margin is a measure of the gain that would have to be inserted between the go and return paths of the reference speech coder in the SS for oscillation to occur.

30.17.2.2 Conformance requirement

The stability margin shall be as specified in 3GPP TS 26.131.

30.17.2.3 Test purpose

To verify that the stability margin is as specified in 3GPP TS 26.131.

30.17.2.4 Method of test

The method of test shall be as specified in 3GPP TS 26.132.

30.17.2.5 Test requirement

The minimum stability margin shall be as specified in 3GPP TS 26.131.

30.18 Sending Distortion

30.18.1 Definition

The transmit signal to total distortion ratio is a measure of the linearity of the transmitter equipment.

30.18.2 Conformance requirement

Distortion shall be measured between MRP and the SS audio output (output of the reference speech decoder of the SS). The ratio of signal to total distortion power measured with the proper noise weighting (see table 4 of ITU T Recommendation G.223) shall be above the limits given in table 7.

3GPP TS 03.50; subclause 5.8.1.

30.18.3 Test purpose

To verify that the ratio of signal to total distortion power in the sending direction measured with psophometric noise weighting is as specified in 3GPP TS 26.131.

30.18.4 Method of test

30.18.5 Test requirement

The ratio of signal to total distortion power in the sending direction measured with psophometric noise weighting shall be as specified in 3GPP TS 26.131.

30.19 Ambient Noise Rejection

30.19.1 Definition

An MS that supports speech will typically be operated within an area of high ambient acoustic noise. A level of noise rejection will therefore be required.

30.19.2 Conformance Requirement

The conformance requirement shall be as specified in 3GPP TS 26.131.

30.19.3 Test Purpose

To verify that ambient noise rejection is conforming to the specification in 3GPP TS 26.131.

30.19.4 Method of Test

The test method shall be as specified in 3GPP TS 26.132.

30.19.5 Test Requirement

The MS ambient noise rejection shall be as specified in 3GPP TS 26.132.

30.20 Side Tone Masking Rating (STMR) HATS

30.20.1 Definition

The sidetone loudness ratings are a means of expressing the path loss from the artificial mouth to the artificial ear based on objective single tone measurements in a way that relates to how a speaker will perceive his own voice when speaking (talker sidetone, expressed by the sidetone masking rating - STMR), or how a listener will perceive the background noise picked up by the microphone (listener sidetone rating - LSTR).

30.20.2 Conformance requirement

The conformance requirement is specified in 3GPP TS 26.131.

30.20.3 Test purpose

To verify that the requirement for STMR stated in TS 26.131 is met.

30.20.4 Method of test

The method of test shall be as specified in 3GPP TS 26.132 section 7.5.1.2.

30.20.5 Test requirement

The STMR shall be within the limits specified in 3GPP TS 26.131.