7   Test Methods and Design Considerations

7.1   Channel Mapping

Figure 7.1 shows the channel type mapping that is used for the configuration of the SS. In layer 2 test cases non default channel mapping can be applied on SS, as explained in clause 4.2.1.
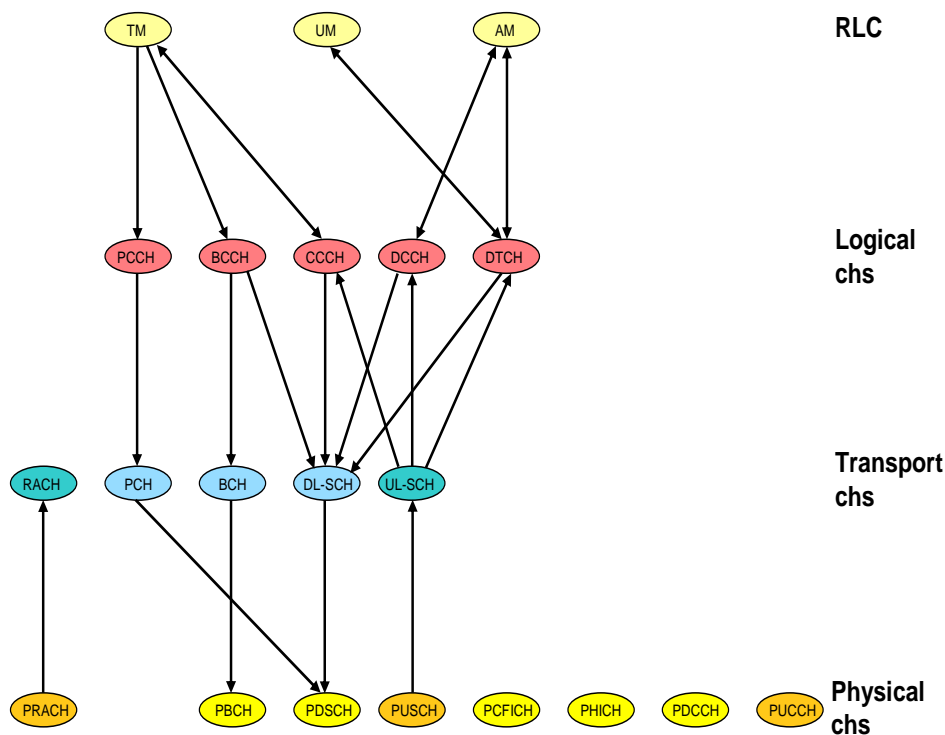

Figure 7.1-1: Channel type mapping for the default configuration of the SS

7.1.1   PDCCH Candidate Selection

In this clause following abbreviations are used:

-    Common search Space Aggregation: CS_Agr.

-    UE-Specific Search Space Aggregation: UE_Agr.

-    Total number of CCEs available in a subframe: Max_CCE.

SS shall apply defined rules below in a DL subframe for PDCCH candidates' selection.

-    Scheduled transmissions on SI-RNTI / P-RNTI / RA-RNTI/M-RNTI, use Common Search Space. UL and DL Scheduled transmissions on C-RNTI/ SPS C-RNTI, and DL Scheduled transmissions on Temp. C-RNTI, use UE-Specific Search Space. Transmissions on TPC-PUCCH-RNTI / TPC-PUSCH-RNTI and UL Scheduled transmissions on Temp. C-RNTI is not considered for default CCE management.

-    If a transmission on SI-RNTI is scheduled, PDCCH candidate corresponding to CCEs between 0 and (CS_Agr-1) is used. For FDD, this PDCCH candidate is reserved for SI-RNTI, and left vacant if no SI-RNTI transmission is scheduled. For TDD the default UL/DL configuration type 1, this PDCCH candidate is reserved forS I-RNTI in subframes 0 & 5 (i.e. subframes where PDCCH for UL grant for C-RNTI/SPS-RNTI is not scheduled).

-    PDCCH candidates corresponding to CCEs between CS_Agr and (2*CS_Agr-1) can be used for the transmission on P-RNTI,RA-RNTI or M-RNTI. In conformance test cases with single UE, there is no requirement for

transmissions scheduled for more than one of P-RNTI,RA-RNTI or M-RNTI in one DL subframe. As per 36.331[19] clause5.8.1.3, the MCCH change notification indicator shall be transmitted on MBSFN subframes only.

For FDD:

- For DL transmission for C-RNTI/SPS-RNTI/Temp C-RNTI the lowest value of m =m' which has a PDCCH available from CCEs between 2*CS_Agr and (Max_CCE-1) shall be used. 'm' is defined in TS 36.213 [30], clause 9.1.1.

- For UL transmission for C-RNTI/SPS-RNTI the lowest value of m =m">m' which has a PDCCH available from CCEs between 2*CS_Agr and (Max_CCE-1) shall be used, irrespective of PDCCH candidate corresponding to m' is used or not.

For TDD:

- For DL transmission, for C-RNTI/SPS-RNTI/Temp C-RNTI the lowest value of m =m' which has a PDCCH available from CCEs between 2*CS_Agr and (Max_CCE-1) shall be used. 'm' is defined in TS 36.213 [30] clause 9.1.1.

- For UL transmission, for C-RNTI/SPS-RNTI the lowest value of m =m">m' which has a PDCCH available from CCEs between 2*CS_Agr and (Max_CCE-1) shall be used, irrespective of PDCCH candidate corresponding to m' is used or not.

NOTE: If m' or m" cannot be allocated in any TTI, it is a TTCN error due to X-RNTI not properly allocated. The error shall be reported to TTCN. The TTCN will exit the test case assigning an inconclusive verdict.

7.1.1.1 FDD candidates selection

Table 7.1.1.1-1 gives the CCE resources utilized for m' and m" for default values of common search space aggregation level =4, UE-specific search space aggregation L=2 resulting in 6 PDCCH candidates m=0..5 and channel Bandwidth of 5 MHz. This give Max_CCE =20 for FDD. The table also gives the corresponding CCE start indices of PDCCH candidates for m' and m".

Table 7.1.1.1-1: CCE Start indices(m' & m" to be used for various C-RNTIs (5 MHz)

C-RNTI	Value		SF0	SF1	SF2	SF3	SF4	SF5	SF6	SF7	SF8	SF9
tsc_C_RNTI_Def	'1001'H 4097	m'	0	1	0	0	0	3	4	0	0	0
		CCE_St_Ind'	12	8	14	8	12	8	8	8	14	10
		m"	1	2	1	1	1	4	5	1	1	1
		CCE_St_Ind"	14	10	16	10	14	10	10	10	16	12
tsc_C_RNTI_Def2	'1034'H 4148	m'	0	0	2	0	0	4	4	1	0	0
		CCE_St_Ind'	12	16	8	14	10	8	8	8	18	16
		m"	1	1	3	1	1	5	5	2	5	1
		CCE_St_Ind"	14	18	10	16	12	10	10	10	8	18
tsc_C_RNTI_Def3	'1111'H 4369	m'	0	0	0	2	3	0	0	0	0	4
		CCE_St_Ind'	16	10	14	8	8	10	14	8	18	8
		m"	1	1	1	3	4	1	1	1	5	5
		CCE_St_Ind"	18	12	16	10	10	12	16	10	8	10
tsc_C_RNTI_Def4	'1FF1'H 8177	m'	0	0	0	0	3	0	0	0	2	4
		CCE_St_Ind'	12	12	18	16	8	18	18	18	8	8
		m"	1	1	5	1	4	5	5	5	3	5
		CCE_St_Ind"	14	14	8	18	10	8	8	8	10	10
tsc_C_RNTI_Def5	'04D2'H 1234	m'	0	2	0	4	0	2	3	0	1	0
		CCE_St_Ind'	10	8	10	8	14	8	8	14	8	10
		m"	1	3	1	5	1	3	4	1	2	1
		CCE_St_Ind"	12	10	12	10	16	10	10	16	10	12
tsc_C_RNTI_Def6	'0929'H 2345	m'	4	0	4	0	0	1	3	3	4	2
		CCE_St_Ind'	8	10	8	12	14	8	8	8	8	8
		m"	5	1	5	1	1	2	4	4	5	3
		CCE_St_Ind"	10	12	10	14	16	10	10	10	10	10
tsc_C_RNTI_Def7	'0D80'H 3456	m'	2	0	2	0	0	0	3	0	0	2
		CCE_St_Ind'	8	16	8	18	14	14	8	16	14	8
		m"	3	1	3	5	1	1	4	1	1	3
		CCE_St_Ind"	10	18	10	8	16	16	10	18	16	10
tsc_C_RNTI_Def8	'11D7'H 4567	m'	0	0	0	2	0	0	3	2	0	2
		CCE_St_Ind'	8	16	8	8	14	16	8	8	8	8
		m"	1	1	1	3	1	1	4	3	1	3
		CCE_St_Ind"	10	18	10	10	16	18	10	10	10	10
tsc_C_RNTI_Def9	'162E'H 5678	m'	0	3	0	0	0	2	0	0	3	2
		CCE_St_Ind'	12	8	12	16	8	8	16	18	8	8
		m"	1	4	1	1	1	3	1	5	4	3
		CCE_St_Ind"	14	10	14	18	10	10	18	8	10	10
tsc_C_RNTI_Def10	'1A85'H 6789	m'	0	0	0	3	0	1	0	1	3	2
		CCE_St_Ind'	16	8	16	8	8	8	16	8	8	8
		m"	1	1	1	4	1	2	1	2	4	3
		CCE_St_Ind"	18	10	18	10	10	10	18	10	10	10

Tables 7.1.1.1-2, 7.1.1.1-3 and 7.1.1.1-4 give the CCE resources utilized for m' and m" for default values of common search space aggregation level =4, UE-specific search space aggregation L=2 resulting in 6 PDCCH candidates m=0..5 and bandwidths of 10/15/20 MHz respectively. This gives Max_CCE =25(10 MHz)/37(15 MHz)/50(20 MHz) for FDD. The tables also give the corresponding CCE start indices of PDCCH candidates for m' and m". These are in general to be applied in MAC Transport block size test cases defined in clause 7.1.7 of TS 36.523-1 [1].

Table 7.1.1.1-2: CCE Start indices (m' & m") to be used for default C-RNTI (10 MHz)

C-RNTI	Value		SF0	SF1	SF2	SF3	SF4	SF5	SF6	SF7	SF8	SF9
tsc_C_RNTI_Def	'1001'H 4097	m'	0	3	3	0	0	0	0	0	0	0
		CCE_St_Ind'	12	8	8	20	16	18	16	8	14	18
		m"	1	4	4	1	1	1	1	1	1	1
		CCE_St_Ind"	14	10	10	22	18	20	18	10	16	20
tsc_C_RNTI_Def2	'1034'H 4148	m'	0	4	0	0	0	4	0	0	0	0
		CCE_St_Ind'	8	8	20	10	14	8	20	22	18	8
		m"	1	5	1	1	1	5	1	5	1	1
		CCE_St_Ind"	10	10	22	12	16	10	22	8	20	10
tsc_C_RNTI_Def3	'1111'H 4369	m'	0	0	0	4	0	0	0	2	0	0
		CCE_St_Ind'	16	10	10	8	22	22	22	8	10	16
		m"	1	1	1	5	5	5	5	3	1	1
		CCE_St_Ind"	18	12	12	10	8	8	8	10	12	18
tsc_C_RNTI_Def4	'1FF1'H 8177	m'	2	0	0	4	0	0	3	0	2	0
		CCE_St_Ind'	8	20	14	8	10	18	8	22	8	12
		m"	3	1	1	5	1	1	4	5	3	1
		CCE_St_Ind"	10	22	16	10	12	20	10	8	10	14
tsc_C_RNTI_Def5	'04D2'H 1234	m'	3	0	0	0	0	2	3	3	1	0
		CCE_St_Ind'	8	16	22	12	22	8	8	8	8	22
		m"	4	1	5	1	5	3	4	4	2	5
		CCE_St_Ind"	10	18	8	14	8	10	10	10	10	8
tsc_C_RNTI_Def6	'0929'H 2345	m'	0	0	2	2	0	1	0	0	0	2
		CCE_St_Ind'	20	18	8	8	18	8	18	22	12	8
		m"	1	1	3	3	1	2	1	5	1	3
		CCE_St_Ind"	22	20	10	10	20	10	20	8	14	10
tsc_C_RNTI_Def7	'0D80'H 3456	m'	4	0	0	1	0	0	0	0	0	4
		CCE_St_Ind'	8	20	20	8	14	22	10	8	18	8
		m"	5	1	1	2	1	5	1	1	1	5
		CCE_St_Ind"	10	22	22	10	16	8	12	10	20	10
tsc_C_RNTI_Def8	'11D7'H 4567	m'	2	0	0	0	0	4	3	2	4	0
		CCE_St_Ind'	8	8	12	8	10	8	8	8	8	20
		m"	3	1	1	1	1	5	4	3	5	1
		CCE_St_Ind"	10	10	14	10	12	10	10	10	10	22
tsc_C_RNTI_Def9	'162E'H 5678	m'	0	0	2	4	0	0	2	0	1	0
		CCE_St_Ind'	8	10	8	8	16	16	8	14	8	16
		m"	1	1	3	5	1	1	3	1	2	1
		CCE_St_Ind"	10	12	10	10	18	18	10	16	10	18
tsc_C_RNTI_Def10	'1A85'H 6789	m'	0	0	0	3	0	0	0	0	3	0
		CCE_St_Ind'	12	12	20	8	12	18	20	10	8	12
		m"	1	1	1	4	1	1	1	1	4	1
		CCE_St_Ind"	14	14	22	10	14	20	22	12	10	14

Table 7.1.1.1-3: CCE Start indices (m' & m") to be used for default C-RNTI (15 MHz)

C-RNTI	Value		SF0	SF1	SF2	SF3	SF4	SF5	SF6	SF7	SF8	SF9
tsc_C_RNTI_Def	'1001'H 4097	m'	4	0	0	0	0	0	0	0	0	0
		CCE_St_Ind'	8	14	14	20	16	18	28	20	26	30
		m"	5	1	1	1	1	1	1	1	1	1
		CCE_St_Ind"	10	16	16	22	18	20	30	22	28	32

Table 7.1.1.1-4: CCE Start indices (m' & m") to be used for default C-RNTI (20 MHz)

C-RNTI	Value		SF0	SF1	SF2	SF3	SF4	SF5	SF6	SF7	SF8	SF9
tsc_C_RNTI_Def	'1001'H 4097	m'	3	0	0	0	0	0	0	0	2	0
		CCE_St_Ind'	8	36	34	38	42	22	10	8	8	20
		m"	4	1	1	1	1	1	1	1	3	1
		CCE_St_Ind"	10	38	36	40	44	24	12	10	10	22

7.1.1.2 TDD candidates selection

The default TDD subframe configuration 1 is applied to this clause.

Considering that each TDD subframe having different PHICH group number, and only two symbols being present for PDCCH in the special subframes 1 and 6 for bandwidth of 5 MHz, two symbols for PDCCH in all subframes for bandwidth of 10/15/20 MHz (TS 36.508 [3]), each subframe has, therefore, different number of MAX_CCE.

Table 7.1.1.2-1 gives the PDCCH candidates of m' and m'' for default values of common search space aggregation level =8, UE-specific search space aggregation L=8 resulting in 2 PDCCH candidates m=0,1 and the corresponding CCE start indices for channel bandwidth of 5MHz. SF0 and SF5 cannot be used for UL grant. SF1 and SF6 are not used for DL assignment. SF2, SF3, SF7 and SF8 are not applicable to PDCCH CCE allocation since they are uplink subframes.

Table 7.1.1.2-1: CCE Start indices (m' & m'') to be used for various C-RNTIs (5 MHz)

C-RNTI	Value		SF0	SF1	SF2	SF3	SF4	SF5	SF6	SF7	SF8	SF9
		Max_CCE	21	12	-	-	20	21	12	-	-	20
tsc_C_RNTI_Def	'1001'H 4097	m'	1	-	-	-	1	0	-	-	-	0
		CCE_St_Ind'	8	-	-	-	8	8	-	-	-	8
		m''	-	0	-	-	0	-	0	-	-	1
		CCE_St_Ind''	-	0	-	-	0	-	0	-	-	0
tsc_C_RNTI_Def2	'1034'H 4148	m'	1	-	-	-	0	1	-	-	-	1
		CCE_St_Ind'	8	-	-	-	8	8	-	-	-	8
		m''	-	0	-	-	1	-	0	-	-	0
		CCE_St_Ind''	-	0	-	-	0	-	0	-	-	0
tsc_C_RNTI_Def3	'1111'H 4369	m'	1	-	-	-	0	0	-	-	-	1
		CCE_St_Ind'	8	-	-	-	8	8	-	-	-	8
		m''	-	0	-	-	1	-	0	-	-	0
		CCE_St_Ind''	-	0	-	-	0	-	0	-	-	0
tsc_C_RNTI_Def4	'1FF1'H 8177	m'	1	-	-	-	0	0	-	-	-	1
		CCE_St_Ind'	8	-	-	-	8	8	-	-	-	8
		m''	-	0	-	-	1	-	0	-	-	0
		CCE_St_Ind''	-	0	-	-	0	-	0	-	-	0
tsc_C_RNTI_Def5	'04D2'H 1234	m'	0	-	-	-	0	1	-	-	-	0
		CCE_St_Ind'	8	-	-	-	8	8	-	-	-	8
		m''	-	0	-	-	1	-	0	-	-	1
		CCE_St_Ind''	-	0	-	-	0	-	0	-	-	0
tsc_C_RNTI_Def6	'0929'H 2345	m'	1	-	-	-	0	0	-	-	-	1
		CCE_St_Ind'	8	-	-	-	8	8	-	-	-	8
		m''	-	0	-	-	1	-	0	-	-	0
		CCE_St_Ind''	-	0	-	-	0	-	10	-	-	0
tsc_C_RNTI_Def7	'0D80'H 3456	m'	1	-	-	-	0	0	-	-	-	1
		CCE_St_Ind'	8	-	-	-	8	8	-	-	-	8
		m''	-	0	-	-	1	-	0	-	-	0
		CCE_St_Ind''	-	0	-	-	0	-	0	-	-	0
tsc_C_RNTI_Def8	'11D7'H 4567	m'	1	-	-	-	0	0	-	-	-	1
		CCE_St_Ind'	8	-	-	-	8	8	-	-	-	8
		m''	-	0	-	-	1	-	0	-	-	0
		CCE_St_Ind''	-	0	-	-	0	-	0	-	-	0
tsc_C_RNTI_Def9	'162E'H 5678	m'	1	-	-	-	0	0	-	-	-	1
		CCE_St_Ind'	8	-	-	-	8	8	-	-	-	8
		m''	-	0	-	-	1	-	0	-	-	0
		CCE_St_Ind''	-	0	-	-	0	-	0	-	-	0
tsc_C_RNTI_Def10	'1A85'H 6789	m'	1	-	-	-	0	0	-	-	-	1
		CCE_St_Ind'	8	-	-	-	8	8	-	-	-	8
		m''	-	0	-	-	1	-	0	-	-	0
		CCE_St_Ind''	-	0	-	-	0	-	0	-	-	0

Tables 7.1.1.2-2, 7.1.1.2-3 and 7.1.1.2-4 give the PDCCH candidates of m' and m'' for default values of common search space aggregation level =8, UE-specific search space aggregation L=8 resulting in 2 PDCCH candidates m=0,1 and the corresponding CCE start indices for bandwidths of 10/15/20 MHz respectively, with the different Max_CCE number for each subframe.

Table 7.1.1.2-2: CCE Start indices (m' & m") to be used for default C-RNTI (10 MHz)

C-RNTI	Value		SF0	SF1	SF2	SF3	SF4	SF5	SF6	SF7	SF8	SF9
		Max_CCE	27	25	-	-	25	27	25	-	-	25
tsc_C_RNTI_Def	'1001'H 4097	m'	1	-	-	-	0	1	-	-	-	1
		CCE_St_Ind'	8	-	-	-	16	8	-	-	-	8
		m"	-	0	-	-	1	-	0	-	-	0
		CCE_St_Ind"	-	8	-	-	0	-	16	-	-	0

Table 7.1.1.2-3: CCE Start indices (m' & m") to be used for default C-RNTI (15 MHz)

C-RNTI	Value		SF0	SF1	SF2	SF3	SF4	SF5	SF6	SF7	SF8	SF9
		Max_CCE	41	37	-	-	37	41	37	-	-	37
tsc_C_RNTI_Def	'1001'H 4097	m'	0	-	-	-	1	0	-	-	-	0
		CCE_St_Ind'	8	-	-	-	8	8	-	-	-	8
		m"	-	0	-	-	0	-	0	-	-	1
		CCE_St_Ind"	-	8	-	-	0	-	0	-	-	16

Table 7.1.1.2-4: CCE Start indices (m' & m") to be used for default C-RNTI (20 MHz)

C-RNTI	Value		SF0	SF1	SF2	SF3	SF4	SF5	SF6	SF7	SF8	SF9
		Max_CCE	55	50	-	-	50	55	50	-	-	50
tsc_C_RNTI_Def	'1001'H 4097	m'	1	-	-	-	0	0		-	-	0
		CCE_St_Ind'	8	-	-	-	16	24		-	-	24
		m"	-	0	-	-	1		0	-	-	1
		CCE_St_Ind"	-	8	-	-	24		16	-	-	32
tsc_C_RNTI_Def 2	'1034'H 4148	m'	0	-	-	-	0	1	-	-	-	0
		CCE_St_Ind'	32	-	-	-	8	8	-	-	-	32
		m"	-	0	-	-	1	-	0	-	-	1
		CCE_St_Ind"	-	0	-	-	16	-	32	-	-	40
tsc_C_RNTI_Def 3	'1111'H 4369	m'	0	-	-	-	0	0	-	-	-	0
		CCE_St_Ind'	16	-	-	-	40	40	-	-	-	16
		m"	-	0	-	-	1	-	0	-	-	1
		CCE_St_Ind"	-	40	-	-	0	-	40	-	-	24
tsc_C_RNTI_Def 4	'1FF1'H 8177	m'	0	-	-	-	0	0	-	-	-	1
		CCE_St_Ind'	16	-	-	-	40	24	-	-	-	8
		m"	-	0	-	-	1	-	0	-	-	0
		CCE_St_Ind"	-	32	-	-	0	-	8	-	-	0
tsc_C_RNTI_Def 5	'04D2'H 1234	m'	0	-	-	-	0	0	-	-	-	0
		CCE_St_Ind'	8	-	-	-	40	16	-	-	-	40
		m"	-	0	-	-	1	-	0	-	-	1
		CCE_St_Ind"	-	16	-	-	0	-	8	-	-	0
tsc_C_RNTI_Def 6	'0929'H 2345	m'	0	-	-	-	0	0	-	-	-	0
		CCE_St_Ind'	32	-	-	-	24	24	-	-	-	16
		m"	-	0	-	-	1	-	0	-	-	1
		CCE_St_Ind"	-	24	-	-	32	-	24	-	-	24
tsc_C_RNTI_Def 7	'0D80'H 3456	m'	1	-	-	-	0	0	-	-	-	1
		CCE_St_Ind'	8	-	-	-	8	40	-	-	-	8
		m"	-	0	-	-	1	-	0	-	-	0
		CCE_St_Ind"	-	32	-	-	16	-	40	-	-	0
tsc_C_RNTI_Def 8	'11D7'H 4567	m'	0	-	-	-	0	1	-	-	-	0
		CCE_St_Ind'	16	-	-	-	40	8	-	-	-	32
		m"	-	0	-	-	1	-	0	-	-	1
		CCE_St_Ind"	-	32	-	-	0	-	8	-	-	40
tsc_C_RNTI_Def 9	'162E'H 5678	m'	0	-	-	-	0	0	-	-	-	0
		CCE_St_Ind'	32	-	-	-	16	16	-	-	-	16
		m"	-	0	-	-	1	-	0	-	-	1
		CCE_St_Ind"	-	40	-	-	24	-	16	-	-	24
tsc_C_RNTI_Def 10	'1A85'H 6789	m'	1	-	-	-	1	0	-	-	-	1
		CCE_St_Ind'	8	-	-	-	8	24	-	-	-	8
		m"	-	0	-	-	0	-	0	-	-	0
		CCE_St_Ind"	-	0	-	-	0	-	32	-	-	0

7.2　Uplink Grant

The Network/SS informs the UE if it is allowed to make Uplink Data transmission by transmitting 'DCI format 0' on PDCCH. The UE shall transmit (4 TTI later for FDD or variable for TDD) a Transport block of exactly the same size as specified in DCI format 0. The UE has no control of its own on TB size, and has to merely follow the network, even if that means lots of MAC padding or resource starving.

The UE has the following means to communicate if it has UL data ready for transmission and subsequently the estimate of quantity of data to be transmitted.

RACH procedure: UE in idle mode, handed over to a new cell or connected mode but PUCCH is unsynchronized (sometimes referred to as PUCCH is not configured) will trigger RACH procedure on data ready for transmission in UL.

Scheduling Request: UE in connected mode, no grant configured, PUCCH is synchronized and has data ready for transmission in UL, will transmit a scheduling request on PUCCH.

Buffer Status Reports: UE in connected mode, PUCCH synchronized, has a configured grant for current TTI, but grant is not sufficient to transmit all the data will include MAC control element BSR in the UL MAC PDU.

RACH and SR indicate on data availability and BSR provides an estimate of data available for transmission.

CQI/PMI/RI feedback from the UE which indicates the channel conditions and recommended number of layers.

Hence to determine the exact need of the grant requirement of the UE a network/SS needs to act on all four of the above. This eventually complicates the SS implementation and hence the grant allocation procedure is simplified such that SS needs only to react on reception of SR and grant allocation configured from the TTCN.

The SS disables aperiodic CQI/PMI/RI feedback from the UE by setting the 'CQI request field' to 0 in DCI format 0/RAR grant.

When request for periodic CQI/PMI/RI feedback is requested due to TTCN configuration, the SS does not react on periodic CQI/PMI/RI feedback received and still allocates grants as configured from TTCN.

The SS, if configured for maintaining PUCCH synchronization at UE, shall periodically transmit automatically MAC PDUs containing the MAC control element 'Timing Advance'. The period as configured by the TTCN is set to 80 % of the 'Time Alignment Timer' default value (750 ms) configured at UE.

Additionally the SS can be configured to automatically transmit a 'configured' UL grant at every reception of a Scheduling Request. This grant should be selected under the following restrictions:

- All UE categories can handle this i.e. (TBS <= 5160).

- It is sufficiently large that most of uplink signalling messages can be transmitted. In case the grant is not sufficient to fit the whole UL data, the UE will have to wait for the expiry of RETX_BSR_TIMER and retransmit a SR. And hence the procedure is repeated.

The following 4 types of grant allocation configurations are possible. Grant allocation Types 1 to 3 are applicable, when the UE is in connected state. Grant allocation Type 4 is applicable when UE is establishing /re-establishing the RRC Connection, or during handover or in connected state but PUCCH is not synchronised.

Grant Allocation Type 1:

- SS is configured to maintain PUCCH Synch.

- SS is configured to send an automatically 'configured Grant' (in terms of I_{MCS} and N_{PRB}) to the UE on every reception of a Scheduling Request, within 10 subframes. The default configured grant is $I_{MCS} = 9$ and $N_{PRB} = 25$, unless explicitly specified in test cases.

- By default this type of grant allocation is applied. The majority of Idle mode, RRC and NAS test cases, the preambles of all tests and the postambles of those tests for which UE is still PUCCH synchronised at the end of test body. A few Layer 2 tests also use this type of grant.

Grant Allocation Type 2:

- Configure SS to maintain PUCCH Synch.

- Configure SS to periodically transmit a grant (I_{MCS} and N_{PRB}). Number of grants (1 or more) and period (in ms) configured by TTCN.

- The first grant transmitted is as specified in the explicit timing information. If timing information is "now" the SS selects the first suitable subframe for UL transmission.

- The grant allocation period for TDD shall be assigned without conflict with the allowed UL subframes in the TDD subframe configurations. As example of allocation period, the TDD UL Grant allocation can be assigned as in multiples of 5 ms.

- This type of grant allocation is applicable to the majority of RLC, PDCP and a few MAC test cases.

- No additional grant is allocated on reception of any SRs.

Grant Allocation Type 3:

- SS may or may not be configured to maintain PUCCH Synch.

- Configure SS to transmit a one time grant (I_{MCS} and N_{PRB}) in the time requested by TTCN. The one time transmission is achieved by setting Number of grants=1 and period =Only once

- This type of grant allocation is suitable for MAC and DRB tests when UE is in UL Synchronised state

Grant Allocation Type 4 (RACH configuration):

- In addition to the 3 types of UL grant allocations, a fourth type of grant allocation during the RACH procedure is also possible, where the SS behaves as per the RACH procedure configured and allocates the configured grant during the RACH procedure. This UL Grant type is used in the configuration for the preamble in many situations, basically in MAC test cases. This type of grant is further used when UE is establishing/re-establishing the RRC connection or during handover, or when the UE is not PUCCH synchronised;

All the UL grant allocation methods define grant allocation in terms of I_{MCS} and N_{PRB} to be used. The SS shall allocate RBs corresponding to PRB indices 0..(N_{PRB}-1).

7.2.1 Exception TC list

This clause contains the exception test case list where the explicit uplink grant types other than UL grant type 1 are specified.

Table 7.2.1-1: Exception test case list with explicit uplink grant types other than UL grant type 1

Group	Test Case	Uplink Grant Type 2	Uplink Grant Type 3
RLC	7.2.2.6	X	
	7.2.2.7	X	
	7.2.3.1		X
	7.2.3.2	X	
	7.2.3.4		X
	7.2.3.5		X
	7.2.3.6	X	
	7.2.3.7	X	
	7.2.3.9	X	
	7.2.3.10	X	X
	7.2.3.13	X	X
	7.2.3.15	X	
	7.2.3.17	X	
	7.2.3.18		X
	7.2.3.21		X
MAC	7.1.4.1	X	
	7.1.4.2		X
	7.1.4.3	X	
	7.1.4.4		X
	7.1.4.7		X
	7.1.4.8	X	X
	7.1.4.10		X
	7.1.4.11		X
	7.1.4.14		X
	7.1.4.15	X	
	7.1.4.16	X	
	7.1.5.1	X	
	7.1.5.2	X	
	7.1.5.3	X	
	7.1.5.4	X	
	7.1.5.5	X	
	7.1.6.1		X
PDCP	7.3.5.4		X
RRC	8.2.1.5	X	
NAS	9.2.1.1.24		X
DRB	12.1.1		X
	12.1.2		X

7.3 Downlink Resource Allocation

The DL resource allocation is an SS emulation function. In order to ensure similar DL behaviours (within defined tolerances) on the different SS platforms in the timing stringent requirements, all downlink resource allocation schemes specified in the present clause shall be supported by the SS.

When the DL data is to be sent with a specific scheduling requirement, for instance, in a TTI in advance rather than "now", the TTCN shall ensure that the data is scheduled at least 100 ms in advance. The 100 ms time in general covers all time delays, from the time DL data is sent by the TTCN at the EUTRA PTC to the completion of the transmission at the SS (TTCN delays, codec delays, adaptor delays and SS processing delays at various protocol Layers). In the case of more than one NAS PDU is piggy-backed in a scheduled RRC PDU, 20ms shall be added per additional NAS PDU: 100ms + ((NoOfNASPDUs − 1) * 20ms; this calculation is based on the assumption that there are not more than 7 piggy-backed NAS messages; this is valid for LTE.

NOTE: The DL data means DL signalling and/or data in the present clause.

7.3.1 PDCCH DCI default formats

Two types of DCI combinations are identified as default formats for the signalling and protocol test.

DCI combination 1 uses:

- DCI format 1A, resource allocation type 2 localised, for all DL scheduling types.

DCI combination 2 uses:

- DCI format 1C, resource allocation type 2 distributed, for scheduling of PCCH/BCCH/RAR; and

- DCI format 1 resource allocation type 0, for UE dedicated scheduling.

7.3.1.1 Default DCI Format to be used in test cases configuring MIMO

Transmission mode 3 will be used in MIMO test cases configuring 2 Transmit antenna SS environment. As per 36.213 Table 7.1-5, in Transmission mode 3, UE is expected to decode only DCI formats 2A and 1A. Similarly for Transmission mode 4, UE is expected to decode only DCI formats 2 and 1A. Hence for all test cases configuring 2TX (2 antenna ports) at SS, DCI combination 1 is the default DCI combination to be applied. This allows DCI format 1A to be used as default DL scheduling scheme for test sequences not explicitly specified to use DCI formats 2A or 2(i.e. preamble, postamble etc.)

7.3.2 Radio parameters configured

The SS shall support DL QPSK, 16QAM and 64QAM modulation schemes. The configured radio parameters, including DCI format, resource allocation types, maximum allowed modulation scheme, first virtual / physical resource block to be used, maximum available resource blocks and redundancy version, are provided to the SS.

In the normal signalling test condition, DL RLC and HARQ retransmissions are rare. The redundancy version is provided to allow the occasional HARQ retransmissions. For those MAC, RLC tests contained in table 7.3.2-1 where timing requirements are involved the DL or UL HARQ retransmissions are not tolerable. Table 7.3.2-2 lists the RLC tests where timing requirements are involved, only one DL or UL HARQ retransmission per transport block is tolerable. Unless otherwise specified, if HARQ retransmissions occur in the test cases contained in table 7.3.2-1 or more than one HARQ retransmission occurs in the test cases of table 7.3.2-2, the test cases will be terminated with verdict inconclusive.

NOTE: If the test is expecting the reporting of UL ACK/NACK for the DL MAC PDUs, or is configuring the PHICH in a certain mode, HARQ retransmissions other than those that are already specified in the prose will have an impact on the test sequence. If test cases perform scheduling of data transmissions and/or receptions, or the testing timers in the test cases are less than 900 ms (i.e. the tolerance for 90 ms), HARQ retransmissions will make it difficult to continue testing.

Table 7.3.2-1: TC list intolerable of HARQ retransmissions

Test case	Comment
MAC	
7.1.3.1, 7.1.3.2, 7.1.3.4, 7.1.3.5, 7.1.3.6, 7.1.3.9, 7.1.6.1, 7.1.6.2	HARQ feedback reporting enabled or DL CRC errors introduced; DL HARQ unspecified (re)transmissions will result in 'Fail' in test body, UL HARQ retransmissions are allowed;
7.1.4.8	Strict relationship between grant and UL data
7.1.4.3	Up to 104 PDUs to be sent in DL every TTI;
7.1.4.2, 7.1.4.11, 7.1.4.12, 7.1.4.14, 7.1.5.4	HARQ feedback transmission specified or PHICH errors introduced
7.1.4.15, 7.1.4.16	Periodic UL grants
RLC	
7.2.2.6, 7.2.2.7, 7.2.2.8, 7.2.2.10, 7.2.3.1, 7.2.3.2, 7.2.3.4, 7.2.3.5, 7.2.3.10, 7.2.3.13, 7.2.3.14, 7.2.3.15, 7.2.3.18	Tolerating HARQ retransmissions is not feasible due to rigid timing and scheduling conditions. Testing timer < 900 ms

Table 7.3.2-2: TC list intolerable of more than one HARQ retransmission per transport block

Test case	Comment
RLC	
7.2.3.6, 7.2.3.7, 7.2.3.8, 7.2.3.9, 7.2.3.17	Tolerating more than one HARQ retransmission is not feasible due to rigid timing and scheduling conditions. Testing timer < 900 ms

7.3.2.1 HARQ Retransmission when MIMO is configured

For test cases configuring MIMO, if in a TTI more than one transport blocks are scheduled (DCI format 2/ 2A/2B), the HARQ retransmission is handled independently for each transport block by SS. In case UE ACKs one Transport block and NACKs the other and there is no fresh data scheduled for transmission, SS only schedules the NACKed transport block for retransmission, using same I_{mcs} as used in initial transmission, mapped to codeword 0. Acked Transport block (and hence codeword 1) is disabled by setting corresponding $I_{MCS} = 0$ and $rv_{idx} = 1$. Resource allocation (Nprb) used in retransmission is same as in initial transmission.

It is assumed that retransmission and fresh data scheduled in one TTI will not happen.

7.3.3 General DL scheduling scheme

The rules in the present clause, unless particularly specified, are applied to both default DCI combinations.

The bandwidth of 5/10/20 MHz makes 25/50/100 available physical resource blocks respectively. The 25/50/100 resource blocks are divided into three distinct sets. Exact set sizes and the elements contained in the individual sets depend upon the DCI combination to be applied.

- The first set is reserved for BCCH mapped to DL-SCH (SI-RNTI).

- The second set is reserved for PCCH mapped to DL-SCH (P-RNTI).

- The third set is used for one of mutually exclusive transmissions of:

  - 'Random Access Response' mapped to DL-SCH (RA-RNTI); or

  - UE-dedicated scheduling mapped to DL-SCH (C-RNTI/ SPS C-RNTI/ Temp C-RNTI).

For each subframe for which data of one or more types is scheduled, the SS shall select a Transport Block Size (TBS), independently for each type of data scheduled, such that:

- All the scheduled data is transmitted respecting the timing information. More details on the timing information can be found in clause 7.8.

- Not more than MaxRbCnt resource blocks are used, for DCI format 1C, $N_{PRB} = MaxRbCnt$.

- Minimum MAC Padding is performed.

- If all scheduled Data cannot be transmitted in the indicated subframe, for example due to TDD and half duplex configuration, it shall be transmitted in the next available subframe.

7.3.3.1 Additional rules for BCCH scheduling scheme

This scheme is applicable for Data transmission on logical channel BCCH mapped to DL-SCH, PDCCH scrambled by SI-RNTI. For both DCI combinations 4 physical resource blocks are reserved for BCCH transmission. The maximum modulation scheme is restricted to QPSK.

Following additional rules are applied for TBS selection:

- The MaxTBS, the maximum TBS allowed for the scheduling scheme, is restricted to 600. (nearest value achievable for $I_{TBS} = 9$ and $N_{PRB} = 4$, as per table 7.1.7.2.1-1 of TS 36.213 [30]).

- If the scheduled Data cannot fit into a TBS smaller or equal to MaxTBS, SS generates an error (it's a TTCN error). TTCN should gracefully exit the test case as a fatal error, assigning inconclusive verdict.

- Rules in clause 7.3.3.1.1 for DCI combination 1 and in clause 7.3.3.1.2 for DCI combination 2 shall be applied.

7.3.3.1.1 BCCH with DCI combination 1

TS 36.213 [30], table 7.1.7.2.1-1, rows with $I_{TBS} = 0..26$ and columns with $N_{PRB} = 2$ (corresponding to TPC LSB =0) and $N_{PRB} = 3$ (corresponding to TPC LSB =1), TBS <=MaxTBS are applicable.

Distinct TBSs and all (TPC LSB, I_{TBS}) combinations for each distinct TBS are listed in the sheet.

If a TBS can have two (TPC LSB, I_{TBS}) combinations, the combination with TPC LSB =0 is selected.

RIV indicates 4 PRBs with index 0..3 allocated.

7.3.3.1.2 BCCH with DCI combination 2

TS 36.213 [30], table 7.1.7.2.3-1 , $I_{TBS} = 0..17$ with TBS ≤MaxTBS are applicable.

RIV indicates 4 virtual RBs with index 0..3 allocated. These virtual RBs correspond to the physical RBs

- with index 0, 6, 12, 18 in even slots and 12, 18, 0, 6 in odd slots for 5 MHz bandwidth;

- with index 0, 12, 27, 39 in even slots and 27, 39, 0, 12 in odd slots for 10 MHz bandwidth;

- with index 0, 24, 48, 72 in even slots and 48, 72, 0, 24 in odd slots for 20 MHz bandwidth.

7.3.3.2 Additional rules for PCCH specific scheduling scheme

This scheme is applicable for Data transmission on logical channel PCCH mapped to DL-SCH, PDCCH scrambled by P-RNTI. For DCI combination 1, one physical resource block is reserved. For DCI combination 2, two physical resource blocks are reserved for 5 MHz bandwidth, and four physical resource blocks are reserved for 10 MHz or 20 MHz bandwidth. The maximum modulation scheme is restricted to QPSK.

Following additional rules are applied for TBS selection:

- If the scheduled Data cannot fit into MaxTBS, SS generates an error (it's a TTCN error). TTCN should gracefully exit the test case as a fatal error, assigning inconclusive verdict.

- Rules in clause 7.3.3.2.1 for DCI combination 1 and clause 7.3.3.2.2 for DCI combination 2 shall be applied.

7.3.3.2.1 PCCH with DCI combination 1

TS 36.213 [30], table 7.1.7.2.1-1, rows with $I_{TBS} = 0..26$ and columns with $N_{PRB} = 2$ (corresponding to TPC LSB =0) and $N_{PRB} = 3$ (corresponding to TPC LSB =1) TBS < =MaxTBS are applicable.

The MaxTBS is restricted to 120 (nearest value achievable for $I_{TBS} = 9$ and $N_{PRB} = 1$, as per table 7.1.7.2.1-1 of TS 36.213 [30]).

Distinct TBSs and all (TPC LSB, I_{TBS}) combinations for each distinct TBS are listed in the sheet.

If a TBS can have two (TPC LSB, I_{TBS}) combinations, the combination with TPC LSB =0 is selected.

RIV indicates 1 PRBs with index 4 allocated.

7.3.3.2.2 PCCH with DCI combination 2

TS 36.213 [30], table 7.1.7.2.3-1, $I_{TBS} = 0..11$ for 5 MHz/ $I_{TBS} = 0..17$ for 10 or 20 MHz with TBS ≤ MaxTBS are applicable.

The MaxTBS is restricted to

296 bits (nearest value achievable for $I_{TBS} = 9$ and $N_{PRB} = 2$) for 5 MHz bandwidth,

600 bits (nearest value achievable for $I_{TBS} = 9$ and $N_{PRB} = 4$) for 10 or 20 MHz bandwidth.

RIV indicates either two virtual RBs with index 4 and 5 allocated, or four virtual RBs with index 4 to 7 allocated. These virtual RBs correspond to physical RBs:

with index 1 and 7 in even slots and 13 and 19 in odd slots for 5 MHz bandwidth;

with index 1, 13, 28, 40 in even slots and 28, 40, 1, 13 in odd slots for 10 MHz bandwidth;

with index 1, 25, 49, 73 in even slots and 49, 73, 1, 25 in odd slots for 20 MHz bandwidth.

7.3.3.3 Additional rules for RAR specific scheduling scheme

This scheme is applicable for transmission of Random Access Response mapped to DL-SCH, PDCCH scrambled by RA-RNTI. For both DCI combinations four physical resource blocks are reserved. The maximum modulation scheme is restricted to QPSK.

Following additional rules are applied for TBS selection:

- The Max TBS is restricted to 600 bits (nearest value achievable for $I_{TBS} = 9$ and $N_{PRB} = 4$, as per table 7.1.7.2.1-1 of TS 36.213 [30]).

- If the scheduled Data cannot fit into Max TBS, SS generates an error (it's a TTCN error). TTCN should gracefully exit the test case as a fatal error, assigning inconclusive verdict.

- Rules in clause 7.3.3.3.1 for DCI combination 1 and clause 7.3.3.3.2 for DCI combination 2 shall be applied.

7.3.3.3.1 RAR with DCI combination 1

TS 36.213 [30], table 7.1.7.2.1-1, rows with $I_{TBS} = 0..26$ and columns with $N_{PRB} = 2$ (corresponding to TPC LSB = 0) and 3 (corresponding to TPC LSB = 1) TBS ≤ Max TBS are applicable

Distinct TBSs and all (TPC LSB, I_{TBS}) combinations for each distinct TBS are listed in the sheet.

If a TBS can have two (TPC LSB, I_{TBS}) combinations, the combination with TPC LSB = 0 is selected.

RIV indicates 4 PRBs with index 5..8 allocated.

7.3.3.3.2 RAR with DCI combination 2

TS 36.213 [30], table 7.1.7.2.3-1, $I_{TBS} = 0..17$ with TBS <= Max TBS are applicable.

RIV indicates 4 virtual RBs are allocated. These corresponds to physical RB

with index 13, 19, 2, 8 in even slots and 1, 7, 14, 20 in odd slots for 5 MHz bandwidth;

with index 2, 14, 29, 41 in even slots and 29, 41, 2, 14 in odd slots for 10 MHz bandwidth;

with index 2, 26, 50, 74 in even slots and 50, 74, 2, 26 in odd slots for 20 MHz bandwidth.

7.3.3.4 Additional rules for UE-dedicated scheduling scheme in normal mode

The UE-dedicated DL scheduling can work in the normal mode or in the explicit mode. The two resource allocation schemes shall be reconfigurable from each other when the UE and SS are not sending and receiving data, for instance, at end of the test preamble and before the beginning of the test body.

The present clause is specified for the use of the normal mode. The explicit mode is referred to clause 7.3.3.6.

The scheme specified in the present clause is applicable for transmission of data dedicated to a UE in a DL subframe, mapped to DL-SCH, PDCCH scrambled by C-RNTI/ SPS C-RNTI/ Temp C-RNTI when spatial multiplexing MIMO mode is not configured. The maximum modulation scheme is restricted to 64QAM. For the DCI combination 1, 20 physical resource blocks (5 to 24), and for the DCI combination 2, 17 physical resource blocks are reserved. In the case when three intra frequency cells are applied to the test in the DCI combination 1, for the purpose of interference reduction, only 9 PRBs (16 to 24) are reserved.

In TDD normal TBS selection mode, no data is transmitted in DwPTS of the special subframe. For FDD, data can be transmitted in any subframe.

The following additional rules are applied for TBS selection:

- Multiple ASPs can also carry same explicit timing information; indicating different ASP payloads, eventually needs to be transmitted in 1 TTI.

- The Max TBS is restricted to 10296 bits (Max supported by UE category type 1).

For 5 MHz bandwidth and the DCI combination 1 with 20 PRBs or DCI combination 2, the TBS 8248, 8760, and 9528 are blocked as they result in coding rates higher than 0.93.

For 5 MHz bandwidth and special DCI combination 1 with 9 PRBs, the TBS 2216, 5992 and 6712 are blocked as they result in coding rates higher than 0.93.

For 10 MHz and 20 MHz bandwidths none of TBSs are blocked as no TBS combination result in coding rates higher than 0.93.

The blocked TBS are considered to be not available for selection.

- Data pending for transmission in a given sub-frame consists of (listed in transmission priority order):

    - MAC Control Elements that the SS needs to send.

    - AMD STATUS PDU(s) that the SS needs to send.

    - Data not sent in previous subframe(s).

    - Fresh Data scheduled for transmission in this subframe for all logical channels.

- Distinct TBSs and all (N_{PRB}, I_{TBS}) combinations for each distinct TBS are listed in the sheet.

- If a TBS size can be achieved with more than one combination of I_{MCS} (I_{TBS}) and N_{PRB}:

    - Select combination with lowest delta between N_{PRB} and I_{MCS}.

    - If still more than one combination remain, select combination with highest N_{PRB}.

- Not more than one RLC Data PDU shall be placed in a MAC PDU per logical channel (i.e. minimize RLC segmentation).

- In a subframe, in case there is data pending for transmission from more than one logical channel, for each type of data pending for transmission as defined above, priority shall be given to the logical channel with the lowest logical channel priority value. In case of more than one logical channel with the same logical channel priority value, these logical channels should be served equally. Data pending for transmission from more than one logical channel will rarely happen for the signalling and protocol test.

- Data not transmitted within a subframe is scheduled as pending for transmission in the next available subframe according to the priorities given above. Pending data for transmission will rarely happen for the signalling and protocol test.

- TBS selected in a context by various platforms shall be within an allowed deterministic tolerance of:

    - 2 bytes for potential Timing Advance Command MAC Control Element (1 byte data + 1 byte MAC sub header).

    - 4 bytes each for AMD STATUS PDU (2 bytes data + 2 bytes MAC subheader).

- Therefore in the worst case the SS may add up to $(2 + 4 \times N_{\text{AMRB}})$ bytes to the data scheduled for transmission in a certain subframe, where N_{AMRB} is the number of AM radio bearers (SRB or DRB) actively sending DL data in the test, in any subframe.

- For DCI combination 1 RIV is calculated based on physical resource blocks corresponding to N_{PRB} of the selected TBS and $(N_{\text{PRB}}, I_{TBS})$ combination. The physical resource blocks that can be allocated are the first N_{PRB} resources of index range

  - 5..24 for 5 MHz bandwidth,

  - 28..49 for 10 MHz bandwidth,

  - 9..30 for 20 MHz bandwidth. Also in preamble/postamble phase of MAC TBS test cases with 15 MHz bandwidth configured.

- For DCI combination 2, RBG assignment is calculated based on physical resource blocks corresponding to N_{PRB} of the selected TBS and $(N_{\text{PRB}}, I_{TBS})$ combination. The size of RBG is 2 for 5 MHz, 3 for 10 MHz and 4 for 20 MHz. The available physical resource blocks for allocation are:

  - For 5 MHz bandwidth, RBG1(2,3), RBG2(4,5), RBG4(8,9), RBG5(10,11), RBG7(14,15), RBG8(16,17), RBG10(20,21), RBG11(22,23) and RBG12(24). If N_{PRB} is even, the first N_{PRB} /2 available RBGs are allocated. If N_{PRB} is odd, then first $(N_{\text{PRB}} -1)$/2 RBGs and RBG 12 are allocated.

  - For 10 MHz bandwidth, RBG1(3,4,5), RBG2(6,7,8), RBG3(9,10,11), RBG5(15,16,17), RBG6(18,19,20), RBG10(30,31,32), RBG11(33,34,35), RBG12(36,37,38) and RBG16(48,49). If N_{PRB} mod 3 is 0, the first N_{PRB} /3 RBGs are allocated. If mod 3 is 2, then first $(N_{\text{PRB}} -2)$/3 available RBGs and RBG 16 are allocated.

  - For 20 MHz bandwidth, RBG1(4,5,6,7), RBG2(8,9,10,11), RBG3(12,13,14,15), RBG4(16,17,18,19), RBG5(20,21,22,23), RBG7(28,29,30,31), RBG8(32,33,34,35), RBG9(36,37,38,39), RBG10(40,41,42,43), RBG14(56,57,58,59), RBG15(60,61,62,63), RBG16(64,65,66,67), RBG17(68,69,70,71), RBG19(76.77.78.79) and RBG20(80,81,82,83). The first N_{PRB} /4 RBGs are allocated.

7.3.3.5 DL Resource allocation bitmaps

7.3.3.5.1 DCI combination 1

Table 7.3.3.5.1-1: Physical resource allocation bitmap
for DCI combination 1 (5 MHz) with 20 PRBs

N_{PRB}	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
BCCH	▓	▓	▓	▓																					
PCCH					▓																				
RAR						▓	▓	▓	▓																
UE-Dedicated						▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓

Table 7.3.3.5.1-2: Physical resource allocation bitmap
for DCI combination 1 (5 MHz) with 9 PRBs

N_{PRB}	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
BCCH	▓	▓	▓	▓																					
PCCH					▓																				
RAR						▓	▓	▓	▓																
UE-Dedicated																	▓	▓	▓	▓	▓	▓	▓	▓	▓

Table 7.3.3.5.1-3 (columns 0–34): Physical resource allocation bitmap for DCI combination 1 (10 MHz)

N_{PRB}	0	1	2	3	4	5	6	7	8	9..22	23..27	28	29	30	31	32	33	34
BCCH	■	■	■	■						Not Used	Used for PBCH and other common signals							
PCCH					■													
RAR						■	■	■	■									
UE-Specific												■	■	■	■	■	■	■

Table 7.3.3.5.1-3 (columns 35–49): Physical resource allocation bitmap for DCI combination 1 (10 MHz)

N_{PRB}	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
BCCH															
PCCH															
RAR															
UE-Specific	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Table 7.3.3.5.1-4 (columns 0–20): Physical resource allocation bitmap for DCI combination 1 (20 MHz)

N_{PRB}	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BCCH	■	■	■	■																	
PCCH					■																
RAR						■	■	■	■												
UE-Specific										■	■	■	■	■	■	■	■	■	■	■	■

Table 7.3.3.5.1-5 (columns 21-30): Physical resource allocation bitmap for DCI combination 1 (20 MHz)

N_{PRB}	21	22	23	24	25	26	27	28	29	30	31..46	47..52	53..99
BCCH											Not Used	Used for PBCH and other common signals	Not Used
PCCH													
RAR													
UE-Specific	■	■	■	■	■	■	■	■	■	■			

NOTE: In preamble/postamble phase of MAC TBS test cases with 15 MHz bandwidth configured, bitmap with columns 1-74 is applicable.

7.3.3.5.2 DCI combination 2

Table 7.3.3.5.2-1: Physical resource allocation bitmap for DCI combination 2 (5 MHz)

N_{PRB}	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
BCCH-Even	0						1						2						3						
BCCH-Odd	2						3						0						1						
PCCH-Even		4						5																	
PCCH-Odd														4						5					
RAR-Even			8						9					6							7				
RAR-Odd		6						7							8							9			
UE-Dedicated			■	■	■	■		■	■	■	■	■		■	■	■	■	■		■	■	■	■	■	

**Table 7.3.3.5.2-2 (columns 0-20): Physical resource allocation bitmap
for DCI combination 2 (10 MHz)**

N_{PRB}	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BCCH-Even	0												1								
BCCH-Odd	2												3								
PCCH-Even		4												5							
PCCH-Odd		6												7							
RAR-Even			8												9						
RAR-Odd			10												11						
UE-Specific	x	x											x	x							
RBGs	0			1			2			3			4			5			6		

**Table 7.3.3.5.2-2 (columns 21-41): Physical resource allocation bitmap
for DCI combination 2 (10 MHz)**

N_{PRB}	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
BCCH-Even							2												3		
BCCH-Odd							0												1		
PCCH-Even								6												7	
PCCH-Odd								4												5	
RAR-Even									10												11
RAR-Odd									8												9
UE-Specific		x	x	x	x	x	x	x											x	x	
RBGs	7			8			9			10			11			12			13		

**Table 7.3.3.5.2-2 (columns 42-49): Physical resource allocation bitmap
for DCI combination 2 (10 MHz)**

N_{PRB}	42	43	44	45	46	47	48	49
BCCH-Even								
BCCH-Odd								
PCCH-Even					Not Used			
PCCH-Odd								
RAR-Even								
RAR-Odd								
UE-Specific								
RBG's	14			15			16	

**Table 7.3.3.5.2-3 (columns 0-19): Physical resource allocation bitmap
for DCI combination 2 (20 MHz)**

N_{PRB}	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
BCCH-Even	0																			
BCCH-Odd	2																			
PCCH-Even		4																		
PCCH-Odd		6																		
RAR-Even			8																	
RAR-Odd			10																	
UE-Specific	x	x																		
RBGs	0				1				2				3				4			

Table 7.3.3.5.2-3 (columns 20-39): Physical resource allocation bitmap for DCI combination 2 (20 MHz)

N_{PRB}	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
BCCH-Even					1															
BCCH-Odd					3															
PCCH-Even						5														
PCCH-Odd						7														
RAR-Even							9													
RAR-Odd							11													
UE-Specific					x	x														
RBGs		5				6				7				8				9		

Table 7.3.3.5.2-3 (columns 40-59): Physical resource allocation bitmap for DCI combination 2 (20 MHz)

N_{PRB}	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
BCCH-Even									2											
BCCH-Odd									0											
PCCH-Even										6										
PCCH-Odd										4										
RAR-Even											10									
RAR-Odd											8									
UE-Specific																				
RBG's		10				11				12				13				14		

Table 7.3.3.5.2-3 (columns 60-79): Physical resource allocation bitmap for DCI combination 2 (20 MHz)

N_{PRB}	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
BCCH-Even													3							
BCCH-Odd													1							
PCCH-Even														7						
PCCH-Odd														5						
RAR-Even															11					
RAR-Odd															9					
UE-Specific													x	x						
RBGs		15				16				17				18				19		

Table 7.3.3.5.2-3 (columns 80-99): Physical resource allocation bitmap for DCI combination 2 (20 MHz)

N_{PRB}	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
BCCH-Even																				
BCCH-Odd																				
PCCH-Even																	Not Used			
PCCH-Odd																				
RAR-Even																				
RAR-Odd																				
UE-Specific																				
RBGs		20				21				22				23				24		

NOTE: Odd and even refer to slots.

7.3.3.6 UE-dedicated scheduling scheme in explicit mode

This scheme applies to:

1. *spatial multiplexing* MIMO configurations or

2. *transmit diversity MIMO configurations* and non-MIMO configuration where the normal mode scheduling scheme is inappropriate.

SS is configured with an exact TBS (modulation and coding scheme, I_{mcs}, and number of resource blocks, N_{prb}) to use. Other parameters, such as the HARQ process number and redundancy version to use for each transmission, are also configured by the TTCN. SS shall use TBS sheets with matching DCI format and Resource allocation Type. If the parameter 'FirstRbIndex' is configured different than specified in respective TBS sheet, the resource block bit maps in TBS sheets are shifted by 'FirstRbIndex' and applied, with an exception for Resource allocation type 0 where only the full size 'Resource block groups' are shifted by 'FirstRbIndex'; if the last Resource block group is not full size, and is part of resource block bitmap, it is applied without any shift.

All data scheduled for a certain subframe shall be transmitted in the single indicated subframe, using configured parameters. The TTCN shall ensure that the configured parameters are consistent, in particular that the scheduled data size and the configured TBS match each other. Data scheduled by the prose, and hence also by the TTCN, provides possible space for the Timing Advance MAC control element and the RLC Status PDU. The SS shall include one of these if so triggered, else the bits reserved for these are filled by MAC padding.

Additionally, in the case of MIMO data scheduled for transmission in a given sub-frame, this consists of (listed in transmission priority order):

- MAC Control Elements that the SS needs to send (if triggered).

- AMD STATUS PDU(s) that the SS needs to send (if triggered).

- Fresh data scheduled for transmission in this subframe for one or more logical channels, as per logical channel priority [lower value = higher priority]; if data is available for more than one logical channel with the same priority, then the logical channel corresponding to the DRB-ID with the lower value has the higher priority.

- MAC padding.

The following additional rules need to be applied on data scheduled for transmission to be mapped on two transport blocks corresponding to two code words:

- Higher priority data (as stated above) maps on to Transport Block 1 and lower priority data maps on Transport Block 2 (if Transport Block 1 gets full); and

- Minimum MAC padding is performed in Transport Block 1; and

- If data from one logical channel needs to be mapped on to two transport blocks, the PDCP PDUs with lower PDCP sequence numbers get mapped on to Transport Block 1.

7.3.3.6.1 DL Scheduling in Transport Block Size Selection Test Cases

The MAC transport block size selection test cases defined in clause 7.1.7 of TS 36.523-1 [1], use bandwidths of 10/15/20MHz. For the preamble and post amble in these tests, the default scheduling rules defined in clauses 7.3.3.1 to 7.3.3.4 for 10/10/20 MHz and DCI combination 1A are applied respectively. During the test body, when the actual TB sizes with appropriate DCI and resource allocation formats needed are to be tested, the SS is configured in explicit mode for UE-dedicated scheduling.

7.3.3.7 Resource allocation sheets

Attached with this Technical Specification, the DL resource allocation tables can be found, providing physical resource allocations for various transport block sizes, developed as per rules specified in clause 7.3.3, in Microsoft Excel format. Each individual sheet in the workbook represents various scheduling schemes as per table 7.3.3.7-1.

Table 7.3.3.7-1: DL resource allocation sheets

S. No	Sheet Name	Description
1	DCI-1A-PCCH	DL Resource scheduling for DCI format 1A and PDCCH is scrambled by P-RNTI (5 **MHz**, 10 **MHz**, 15 **MHz and** 20 MHz)
2	DCI-1A-BCCH	DL Resource scheduling for DCI format 1A and PDCCH is scrambled by SI-RNTI (5 **MHz**, 10 **MHz**, 15 **MHz and** 20 MHz)
3	DCI-1A-RAR	DL Resource scheduling for DCI format 1A and PDCCH is scrambled by RA-RNTI (5 **MHz**, 10 **MHz**, 15 **MHz and** 20 MHz)

S. No	Sheet Name	Description
4	DCI-1A-UE-Specific	DL Resource scheduling for DCI format 1A and PDCCH is scrambled by C-RNTI/ SPS C-RNTI/ Temp C-RNTI (5 MHz)
5	DCI-1A-3-IntraFreq-UE-Specific	DL Resource scheduling for DCI format 1A and PDCCH is scrambled by C-RNTI/ SPS C-RNTI/ Temp C-RNTI and three Intra Freq cells are configured (5 MHz)
6	DCI-1A-UE-Specific-10MHz	DL Resource scheduling for DCI format 1A and PDCCH is scrambled by C-RNTI/ SPS C-RNTI/ Temp C-RNTI (10 MHz)
7	DCI-1A-UE-Specific-20MHz	DL Resource scheduling for DCI format 1A and PDCCH is scrambled by C-RNTI/ SPS C-RNTI/ Temp C-RNTI (20 MHz) Also in preamble/postamble phase of MAC TBS test cases with 15 MHz bandwidth configured
8	DCI-1C-PCCH	DL Resource scheduling for DCI format 1C and PDCCH is scrambled by P-RNTI (5 MHz)
9	DCI-1C-BCCH	DL Resource scheduling for DCI format 1C and PDCCH is scrambled by SI-RNTI (5 MHz)
10	DCI-1C-RAR	DL Resource scheduling for DCI format 1C and PDCCH is scrambled by RA-RNTI (5 MHz)
11	DCI-1-UE-Specific	DL Resource scheduling for DCI format 1, Resource allocation 0 and PDCCH is scrambled by C-RNTI/ SPS C-RNTI/ Temp C-RNTI (5 MHz)
12	DCI-1C-PCCH-10MHz-Gap1	DL Resource scheduling for DCI format 1C and PDCCH is scrambled by P-RNTI (10 MHz)
13	DCI-1C-BCCH-10MHz-Gap1	DL Resource scheduling for DCI format 1C and PDCCH is scrambled by SI-RNTI (10 MHz)
14	DCI-1C-RAR-10MHz-Gap1	DL Resource scheduling for DCI format 1C and PDCCH is scrambled by RA-RNTI (10 MHz)
15	DCI-1-UE-Specific-10MHz-Gap1	DL Resource scheduling for DCI format 1, Resource allocation 0 and PDCCH is scrambled by C-RNTI/ SPS C-RNTI/ Temp C-RNTI (10 MHz)
16	DCI-1C-PCCH-20MHz-Gap1	DL Resource scheduling for DCI format 1C and PDCCH is scrambled by P-RNTI (20 MHz)
17	DCI-1C-BCCH-20MHz-Gap1	DL Resource scheduling for DCI format 1C and PDCCH is scrambled by SI-RNTI (20 MHz)
18	DCI-1C-RAR-20MHz-Gap1	DL Resource scheduling for DCI format 1C and PDCCH is scrambled by RA-RNTI (20 MHz)
19	DCI-1-UE-Specific-20MHz-Gap1	DL Resource scheduling for DCI format 1, Resource allocation 0 and PDCCH is scrambled by C-RNTI/ SPS C-RNTI/ Temp C-RNTI (20 MHz)
20	DCI-1-RA0-ExplicitConfig	DL Resource scheduling for DCI format 1, Resource allocation 0 and PDCCH is scrambled by C-RNTI
21	DCI-1-RA1-ExplicitConfig	DL Resource scheduling for DCI format 1, Resource allocation 1 and PDCCH is scrambled by C-RNTI
22	DCI1A-ExplicitConfig	DL Resource scheduling for DCI format 1A, Resource allocation 2(localised & distributed) and PDCCH is scrambled by C-RNTI
23	DCI-2A-RA0-ExplicitConfig	DL Resource scheduling for DCI format 2A, Resource allocation 0 and PDCCH is scrambled by C-RNTI
24	DCI-2A-RA1-ExplicitConfig	DL Resource scheduling for DCI format 2A, Resource allocation 1 and PDCCH is scrambled by C-RNTI

7.4 Cell Configurations

7.4.1 Cell Configuration Types

Three cell configurations are defined in TS 36.508 [3] clause 6.3.3: Full Cell, Minimum Uplink Cell and Broadcast Only Cell; however the TTCN always considers all cells as Full Cells, and thus always provides the complete cell configuration parameters.

The SS may:

- always configure a cell as a 'Full Cell' based on the complete information; or

- configure the cell based on the 'CellConfig_Type' flag taking only the required configuration parameters and ignoring the others.

For a given value of the 'CellConfig_Type' flag, the TTCN shall:

- For Full Cell Configuration:

  - expect normal SS behaviour.

- For Minimum Uplink Cell Configuration:

  - Configure the SS to report Preamble detection.

  - Assign verdicts based on the PRACH Preamble Indications.

  - Consume any uplink SRB0 messages (if the SS is configured as a Full Cell).

- For Broadcast Only Cell Configuration:

  - Not configure the SS to report Preamble detection.

  - Consume any uplink SRB0 messages (if the SS is configured as a Full Cell).

7.4.2 Cell Power Change

To set and adjust the cell power at the two test ports, Reference Power and Attenuation, are provided in the record Reference Power.

The field Reference Power is only set when the cell is created and is not updated during the test case execution. The SS applies the Reference Power when the cell is fully configured.

To adjust the power level in the test case, the field Attenuation is used. After initial configuration of a cell the attenuation corresponds to the value "off". When the power is changed for more than one cell, the power changes must happen at the same time for all the cells according to the time instances for power level changes specified in TS 36.523-1 [1]. The time it takes to complete the power change for all the cells shall be done:

- within a maximum of 700 ms when changing the power of a cell from "off" to a certain value; or

- within a maximum of 100 ms (10 frames) otherwise.

When adjusting the power level in the test case, separate templates will be used in order to improve code readability.

The SS shall ensure the power level at the test ports conform to the required downlink signal levels specified in clause 6.2.2.1 of TS 36.508 [3].

7.4.3 E-UTRAN cell identity

7.4.3.1 Timing parameters of cells

For RRC and Idle mode test, the timing parameters in table 7.4.3.1-1 are applied. The specification of Cell 1 - Cell 30 can be found in TS 36.508 [3].

Table 7.4.3.1-1: Timing parameters of simulated cells

cell ID	SFN offset	FDD Tcell (*Ts*)	TDD Tcell (*Ts*)	
			Synchronous	Non synchronous
Cell 1	0	0	0	0
Cell 2	124	30720	154	30720
Cell 3	257	150897	77	150897
Cell 4	1000	61440	307	61440
Cell 6	657	524	77	524
Cell 10	129	43658	77	43658
Cell 11	957	92160	154	92160
Cell 12	1015	181617	154	181617
Cell 13	890	31244	154	31244
Cell 14	680	300501	77	300501
Cell 23	383	212337	154	212337
Cell 28	890	31244	154	31244
Cell 29	680	300501	77	300501
Cell 30	1015	181617	154	181617
NOTE:	For TDD, synchronous Tcell values are applied unless specified otherwise in the test cases.			

Table 7.4.3.1-2 is applied to the NAS test when more than one PLMN exists in a test case. Further cell parameters can be found in TS 36.508 [3], table 6.3.2.2-3.

Table 7.4.3.1-2: Timing parameters of simulated cells for NAS TCs in different PLMNs

cell ID	SFN offset	FDD Tcell (*Ts*)	TDD Tcell (*Ts*)	
			Synchronous	Non synchronous
Cell A	0	0	0	0
Cell B	124	30720	154	30720
Cell C	257	61440	307	61440
Cell D	1000	92160	154	92160
Cell E	752	32047	77	32047
Cell F	NA	NA	NA	NA
Cell G	957	631	77	631
Cell H	1015	31351	154	31351
Cell I	890	127200	77	127200
Cell J	680	1327	77	1327
Cell K	383	157920	154	157920
Cell L	562	188640	307	188640
Cell M	471	122880	307	122880
NOTE:	For TDD, synchronous Tcell values are applied unless specified otherwise in the test cases.			

Figure 7.4.3.1-1 illustrates shifting DL transmission timing offset by Tcell = 1 subframe, between multiple NAS FDD cells on the same frequency (table 7.4.3.1-2) in the same PLMN.
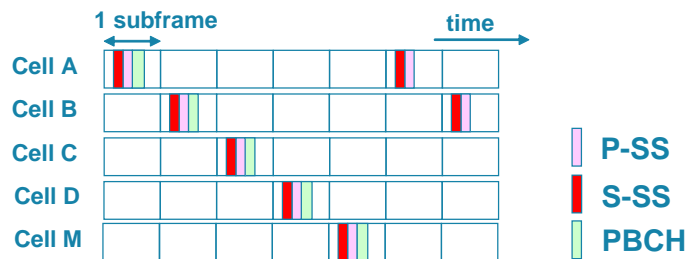
Figure 7.4.3.1-1: Timing offset between FDD cells on the same frequency

Figure 7.4.3.1-2 illustrates shifting DL transmission timing offset for three TDD cells operated on the same frequency (table 7.4.3.1-1) in the same PLMN.

Timing shift between synchronous Cell 0 and Cell 1: Tcell = 154 Ts (5 μs)

Timing shift between synchronous Cell 0 and Cell 2: Tcell = 307 Ts (10 μs)

Table 7.4.3.1-2 is applied to the NAS test when all NAS cells in a test case belong to the same PLMN. Further cell parameters can be found in TS 36.508 [3], table 6.3.2.2-2.

Table 7.4.3.1-2: Timing parameters of simulated cells for NAS TCs in same PLMN

cell ID	SFN offset	FDD Tcell (*Ts*)	TDD Tcell (*Ts*)	
			Synchronous	Non synchronous
Cell A	0	0	0	0
Cell B	124	30720	154	30720
Cell C	257	150897	77	150897
Cell D	1000	61440	307	61440
Cell E	NA	NA	NA	NA
Cell F	NA	NA	NA	NA
Cell G	NA	NA	NA	NA
Cell H	NA	NA	NA	NA
Cell I	NA	NA	NA	NA
Cell J	NA	NA	NA	NA
Cell K	NA	NA	NA	NA
Cell L	NA	NA	NA	NA
Cell M	471	31244	154	31244
NOTE:	For TDD, synchronous Tcell values are applied unless specified otherwise in the test cases.			

Shifting radio frame transmission timing can eliminate the following interference between intra frequency cells:

- P-SS/S-SS to P-SS/S-SS, RS, PBCH, PCFICH, PDCCH and PHICH.

- PBCH to PBCH.

- PBCH to PCFICH, PDCCH and PHICH.

- PDSCH to PCFICH, PDCCH, PHICH.

As TDD UL and DL are on same frequency, to avoid interference between DL and UL, the Random Access Response Timing Advance (RAR TA) is related to the Tcell:

For TDD cells

```
RAR TA = FLOOR ((Tcell) mod 30720 / 16)
```

For FDD, the Random Access Response Timing Advance is set to 0.

In Carrier Aggregation signalling test cases, the SFN offset and Tcell of configured cells has to be same.

Editors note: More clarification in terms of tables representing configured cells may be needed. Cell 1, Cell 2, Cell3, Cell12 & Cell 6 are configured in CA test cases.

7.4.4 Cell configurations for NAS test cases

The default cell identifiers for NAS cells are defined in 36.508[3] clause 6.3.2.2.

The allocation of Physical layer cell identifiers to the individual cells is according to (*PCI mode 6*) being differential for the cells working on the same radio frequency. The way of PCI allocation can reduce the interference between the intra-frequency cells for reference signal to reference signal, PCFICH to PCFICH and PHICH to PHICH. The definition of Cell A - Cell M can be found in TS 36.508 [3].

7.4.5 Configuration of Multi-Cell Environment

When there is more than one EUTRA cell in a test case the following rules are applied in TTCN:

- At the beginning of the preamble, before initial attachment of the UE, all EUTRA cells are configured but switched off.

- In the preamble only the serving cell is switched on; all other cells remain switched off.

- At the end of the preamble the cells are configured according to the initial power level settings (T0) of the test case.

The mapping of cells to physical resources and management of the physical resources are out of TTCN scope. The following principles can be applied to the system simulator:

- Cells being switched off need not to be mapped to physical resources.

- When a cell is switched off mapping to a physical resource may be kept and reused when the cell is switched on again.

- When a cell is switched on it can either already been mapped to a physical resource or it needs to be mapped to a free resource.

- When there are less physical resources than cells it is up to SS implementation to find strategies to dynamically map the cells to the resources.

Independent from the strategies being used the system simulator shall obey timing restrictions for changing power-levels of one or several cells as stated in clause 7.4.2.

7.5 TDD Considerations

LTE options of FDD and TDD will be contained in the same common FDD and TDD test cases, similar to the prose in TS 36.523-1 [1].

The TDD Uplink-downlink configuration 1 in 3GPP TS 36.211 [35], table 4.2-2 is applied.

7.5.1 FDD vs. TDD implementation

FDD/TDD differences are introduced in the common FDD and TDD test cases using branches at a low level in the test case. The branches are used either:

- to assign a variable;

- to implement a different behaviour;

- to change an FDD or TDD parameter in a template sent to the UE or SS.

The mode under test (FDD or TDD) is based on the value of the bands under test.

7.5.2 Guideline for FDD vs. TDD verification

With respect to EUTRA FDD vs. TDD technologies, it is recommended that separate verifications for FDD and TDD are required for the TCs in TS 36.523-1 [1]:

- clause 6, 7, 8, 12, 13;

- with MultiRAT involved.

7.6 Special RLC Modes

7.6.1 Suppression of RLC Acknowledgements

Two different modes, both applicable per radio bearer, are defined as:

- General suppression:

- If this mode is activated, no RLC acknowledgements will be generated by the SS. This mode can be switched on and will persist until it is switched off. Afterwards the SS will continue handling the RLC acknowledgements as normal.

- One time suppression:

  - If this mode is activated, no RLC acknowledgement will be generated by SS for the next RLC message data PDU received. Once this has been done, the SS continues handling RLC acknowledgements as normal.

In case of a handover the modes continue to be active.

7.6.2   Modification of VT(S)

This mode allows to manipulate the RLC state variable VT(S) so that the SS can generate an RLC sequence number as needed during a test. The input to the special test mode is an integer (0..1023) as value of ModifyVTS, The SS shall set variable VT(S) as follows:

$$VT(S) := ModifyVTS.$$

The purpose of this special test mode is to force an incorrect RLC sequence number to be used by the SS. Once VT(S) has been modified in the RLC entity at the SS side, this RLC entity will be inconsistent. One possibility to bring the RLC entity back to normal is to re-establish the RLC peer connection. This is done in the only use case of this special RLC test mode by performing an RRC Connection reconfiguration immediately after the test mode has been applied.

Users of this test mode should ensure that the RLC AM PDU carrying the incorrect sequence number will reach the peer RLC entity. It is therefore recommended to activate the RRC Connection reconfiguration only after some delay. This delay shall be short enough to ensure that the UE will not yet request the retransmission of the RLC PDU corresponding to the skipped sequence numbers.

7.7   System information

7.7.1   System information broadcasting

The rules for the transmission of BCCH messages are specified in TS 36.331 [19], clause 5.2. The current clause provides the implementation guidelines.

The ASPs SYSTEM_CTRL_REQ and SYSTEM_CTRL_CNF are used as interface to SS; the following rules apply:

- The complete system information is provided to SS by using a single ASP.

- SS starts scheduling all system information from the same SFN.

- The scheduling information sent to SS is the same as the scheduling information sent to the UE. For each SI message, the subframeOffset in SYSTEM_CTRL_REQ indicates the exact point in time in the SI window at which SS shall start the transmission of the related SI.

- SS shall set the systemFrameNumber in the MIB to the 8 most significant bits of the SFN. A dummy value is provided by TTCN.

- The system information is sent to SS using the asn.1 types, SS shall encode in unaligned PER and add the necessary padding bits as specified in TS 36.331 [19], clause 9.1.1.1.

- In the E-UTRAN-CDMA2000 Inter RAT configuration, SS shall set the CDMA2000 synchronousSystemTime in SystemInformationBlockType8 to the SFN boundary at or after the ending boundary of the SI-window in which SystemInformationBlockType8 is transmitted (see TS 36.331 [19], clause 6.3.4). The changes of synchronousSystemTime will not result in system information change notification, nor in a modification of systemInfoValueTag in SIB1 in TTCN as specified in TS 36.331 [19], clause 6.3.1. If 1xRTT is being tested, then SS shall overwrite the longCodeState1XRTT in SystemInformationBlockType8 to the state of long code generation registers in CDMA2000 1xRTT system as defined in C.S0002-A [12, Section 1.3] at $\lceil t/10 \rceil \times 10 + 320$ ms, where t equals to the *cdma-SystemTime*. The changes of longCodeState1XRTT will not result in system information change notification, nor in a modification of systemInfoValueTag in SIB1 in TTCN as specified in TS 36.331 [19], clause 6.3.1.

7.7.2 Scheduling information

The maximum number of resource blocks as defined in table 7.7.2-1 are used to broadcast the system information.

Table 7.7.2-1: Maximum number of resource blocks

	Maximum number of resource blocks assigned
SIB1	4
for all SIs	4

The subframe offset values used for SI messages are according to table 7.7.2-2.

Table 7.7.2-2: SubframeOffset values

Scheduling Information No. Acc to TS 36.508 [3], clause 4.4.3.1.2	subframeOffset (FDD)	subframeOffset (TDD)
SI1	1	0
SI2	1	0
SI3	3	15
SI4	7	15
SI5	7	15

All System Information messages are sent only once within the SI-window.

Table 7.7.2-3 (FDD) and 7.7.2-4(TDD) give the SFN's and subframe numbers in which the MIB, SI1, SI2, SI3, SI4 & SI5 are actually scheduled as per default parameters for si-WindowLength(20sf), periodicity for SI1(16), SI2(32), SI3(64) , SI4(64) and SI5(64) for bandwidths 5/10/15/20 MHz defined in TS 36.508 [3]:

Table 7.7.2-3: System Information Scheduling (FDD)

SFN\SUBFrame	0	1	2	3	4	5	6	7	8	9
0	MIB	SI1				SIB1				
1	MIB									
2	MIB	SI2				SIB1				
3	MIB									
4	MIB			SI3		SIB1				
5	MIB									
6	MIB					SIB1		SI4		
7	MIB									
8	MIB					SIB1		SI5		
9	MIB									
10	MIB					SIB1				
11	MIB									
12	MIB					SIB1				
13	MIB									
14	MIB					SIB1				
15	MIB									
16	MIB	SI1				SIB1				
17	MIB									
18	MIB					SIB1				
19	MIB									
20	MIB					SIB1				
21	MIB									
22	MIB					SIB1				
23	MIB									
24	MIB					SIB1				
25	MIB									
26	MIB					SIB1				
27	MIB									
28	MIB					SIB1				
29	MIB									
30	MIB					SIB1				
31	MIB									

SFN\SUBFrame	0	1	2	3	4	5	6	7	8	9
32	MIB	SI1				SIB1				
33	MIB									
34	MIB	SI2				SIB1				
35	MIB									
36	MIB					SIB1				
37	MIB									
38	MIB					SIB1				
39	MIB									
40	MIB					SIB1				
41	MIB									
42	MIB					SIB1				
43	MIB									
44	MIB					SIB1				
45	MIB									
46	MIB					SIB1				
47	MIB									
48	MIB	SI1				SIB1				
49	MIB									
50	MIB					SIB1				
51	MIB									
52	MIB					SIB1				
53	MIB									
54	MIB					SIB1				
55	MIB									
56	MIB					SIB1				
57	MIB									
58	MIB					SIB1				
59	MIB									
60	MIB					SIB1				
61	MIB									
62	MIB					SIB1				
63	MIB									
64	MIB	SI1				SIB1				
65	MIB									
66	MIB	SI2				SIB1				
67	MIB									
68	MIB			SI3		SIB1				
69	MIB									
70	MIB					SIB1		SI4		
71	MIB									
72	MIB					SIB1		SI5		

Table 7.7.2-4: System Information Scheduling (TDD)

SFN\SUBFrame	0	1	2	3	4	5	6	7	8	9
0	MIB, SI1					SIB1				
1	MIB									
2	MIB, SI2					SIB1				
3	MIB									
4	MIB					SIB1				
5	MIB					SI3				
6	MIB					SIB1				
7	MIB					SI4				
8	MIB					SIB1				
9	MIB					SI5				
10	MIB					SIB1				
11	MIB									
12	MIB					SIB1				
13	MIB									
14	MIB					SIB1				
15	MIB									
16	MIB, SI1					SIB1				
17	MIB									

SFN\SUBFrame	0	1	2	3	4	5	6	7	8	9
18	MIB					SIB1				
19	MIB									
20	MIB					SIB1				
21	MIB									
22	MIB					SIB1				
23	MIB									
24	MIB					SIB1				
25	MIB									
26	MIB					SIB1				
27	MIB									
28	MIB					SIB1				
29	MIB									
30	MIB					SIB1				
31	MIB									
32	MIB, SI1					SIB1				
33	MIB									
34	MIB, SI2					SIB1				
35	MIB									
36	MIB					SIB1				
37	MIB									
38	MIB					SIB1				
39	MIB									
40	MIB					SIB1				
41	MIB									
42	MIB					SIB1				
43	MIB									
44	MIB					SIB1				
45	MIB									
46	MIB					SIB1				
47	MIB									
48	MIB, SI1					SIB1				
49	MIB									
50	MIB					SIB1				
51	MIB									
52	MIB					SIB1				
53	MIB									
54	MIB					SIB1				
55	MIB									
56	MIB					SIB1				
57	MIB									
58	MIB					SIB1				
59	MIB									
60	MIB					SIB1				
61	MIB									
62	MIB					SIB1				
63	MIB									
64	MIB, SI1					SIB1				
65	MIB									
66	MIB, SI2					SIB1				
67	MIB									
68	MIB					SIB1				
69	MIB					SI3				
70	MIB					SIB1				
71	MIB					SI4				
72	MIB					SIB1				
73	MIB					SI5				

NOTE: Subframes 4 and 9 are avoided so as to facilitate availability of PDCCHs in the UE specific search space for transmission of PDCCH for both UL C-RNTI/SPS-RNTI and DL C-RNTI/SPS-RNTI/Temp C-RNTI.

7.7.3 System information modification

For system information modification, the same rules as defined in clause 7.7.1 are applied.

The SFN for the start of modification period is calculated by TTCN. The modified system information and the calculated SFN are provided in the ASP SYSTEM_CTRL_REQ.

7.7.3.1 Non-PWS System Information modification

The modification of system information is notified by paging messages containing the systemInfoModification. The paging messages are sent during one modification period before broadcasting the modified system information. The paging messages are sent on paging occasions (PO) within the paging frames (PF). With the default paging and sysinfo parameters provided in 36.508[3] PO is set to 9 for FDD and 0 for TDD.

7.7.3.1.1 UE in Idle_mode

When the UE is in idle mode, the paging frames calculation is based on the UE identity (see to TS 36.304 [14], clause 7). With:

defaultPagingCycle=128

nB=oneT

modificationPeriodCoeff=n4

it results in 4 paging messages to be sent on the paging occasions during the modification period in the frames of:

$$\text{SFN mod } 128 = (\text{UE\_ID}) \text{ mod } 128.$$

7.7.3.1.2 UE in connected mode

When the UE is in connected mode, paging messages are sent on the paging occasions of each frame within the paging cycle throughout a modification period. This results in 128*4 consecutive paging messages to be sent during the modification period.
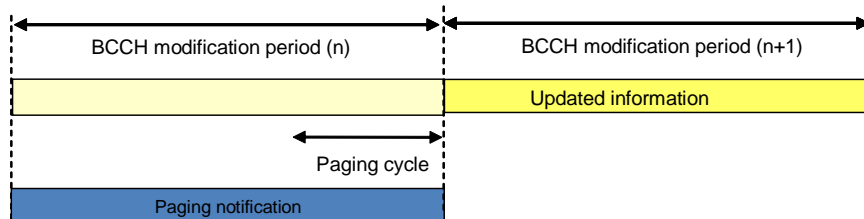
Figure 7.7.3.1.2-1: Paging notification UE in connected mode

For ETWS and/or CMAS capable UEs in connected mode, paging messages are sent on the paging occasions of each frame within the last paging cycle of the modification period. This results in 128 consecutive paging messages to be sent during the modification period.
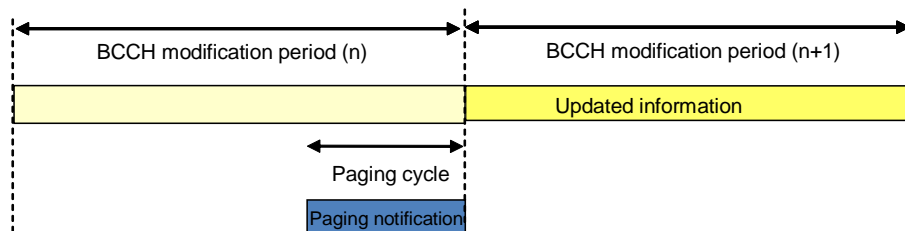
Figure 7.7.3.1.2-2: Paging notification for ETWS and/or CMAS capable UE in connected mode

7.7.3.2 PWS System Information modification

The modification of system information for ETWS and CMAS notification is notified by paging messages. The transmission of system information notification is not necessarily at the beginning of a modification period.

When the UE is in idle mode, the paging frames calculation is the same as defined in clause 7.7.3.1.1.

When the UE is in connected mode, paging messages are sent on the paging occasions of each frame during a paging cycle. This results in 128 consecutive paging messages to be sent. The transmission of the first paging message and the first system information notification are simultaneous and are sent at the beginning of a paging cycle.

7.8 Timers and Timing Restrictions

A timer is set at the beginning of each test case to guard against system failure. Behaviour on expiry of this guard timer shall be consistent for all test cases.

A watchdog timer can be specified for receive statements in order to reduce blocking time when a test case has already failed. Watchdog timers are a kind of TTCN auxiliary timer. When a watchdog timer is used to control a receive event, its expiry does not need to be handled explicitly in the test case, but will lead to a fail or inconclusive verdict due to handling in the default behaviour.

In idle mode operations, an idle mode generic timer is specified for receive statements if the test case specification does not explicitly specify a wait time for the specific test step or test purpose. The expiry of this idle mode generic timer is at least 6 minutes to safely cover most test scenarios.

The watchdog timer and the idle mode generic timer are only to be used inside the test case test body; if the timer expires a fail verdict is applied.

It is the TTCN responsibility to ensure that appropriate timer values are being used.

Tolerances (as described in TS 36.508 [3]) are not applicable to guard timers, idle mode generic timers and watchdog timers.

In general timers of less than 500 ms shall not be implemented by TTCN timers but controlled by usage of the timing information provided by the SS (This is based on an estimate of the system delay). To achieve this, there will be cases when a DL message is scheduled at a specific point in time. This shall be done by adding at least 100 ms to the current time.

If Timing is 'now' the SS shall schedule the data transmission or the (re)configuration in the next available sub-frame, but will ensure that this period is less than 80 ms.

7.8.1 Auxiliary timers

For practical reasons, the TTCN can include timers that are not specified as part of the expected sequence. These timers are documented below.

 RLC and PDCP watchdog timer.

7.8.2 RRC timers reconfiguration

Considering the allowed UE accuracy for the RRC timer T3xx being between 100 ms and 2.5 % of T3xx (see TS 36.133 [37]), the TTCN applies the RRC net timers tolerance as MAX (10% of T3xx, (100 ms + 5 RTT)), whereby:

 FDD: 10 % of T3xx or 140 ms whichever is higher.

 TDD: 10 % of T3xx or 155 ms whichever is higher.

7.8.3 MAC TA timer reconfiguration

Considering that the UE applies new values for MAC timers not before restart of the timer (see TS 36.321 [16], clause 5.8), when the TA timer is changed at the UE, a delay in TTCN will be added so as to allow SS to transmit

Timing advance MCE (based on current periodic Timing advance configuration) and hence resulting in restart of TA timer at UE with new value.

7.8.4 Non-protocol timers

Time durations or periods in the test specification without corresponding references in the core specifications are considered as non-protocol timers for which no timer tolerances are applied in the TTCN.

7.9 Error Indication

There are several situations on lower layer in which SS shall raise an error rather than trying to resolve the problem. This is done by sending a SystemIndicationError to the test case. SS shall raise an error in the following cases:

- HARQ retransmissions (applicable when SS is configured to indicate HARQ retransmissions as errors):

    - HARQ CRC error for UL data;

    - HARQ NACK from the UE unless SS is configured to report HARQ ACK/NACK.

- Paging, System information exceeds max. number of resource blocks.

- Configuration: max. number of resource blocks specified for a channel exceeds system bandwidth.

- When in User-Plane a DL PDCP PDU or SDU not fitting into one TTI is sent with Harq Process being explicitly specified.

- SS gets invalid TimingInfo for TDD from the test case.

- SS detects contradiction of UL grant(s) and TDD configuration.

- Data scheduled for the same TTI does not fit into an available transport block.

Further error conditions are specified in annex D.

7.10 Race Conditions

When two uplink messages are sent from the UE within a very small amount of time, they may be received in either order in the TTCN if they are received on different ports. This may cause a race condition which is due to the snapshot mechanism in TTCN. In these cases, the TTCN will accept the messages in either order and then compare the timestamps of both messages to ensure they were sent in the correct order.

For UL messages received at a single port, there are normally no race conditions, with the exception of the SRB port where the following rules shall be fulfilled, in order to achieve an ordered UL message queue:

- UL messages are queued according to the timing information.

- UL messages with the same timing information are queued according to the logical channel priority with the "higher-first-in" principle.

7.11 Radio Link Failure

A radio link failure shall be triggered by switching the downlink power level of the source cell to the value for non-suitable "Off" for the time period of least T310 + time it takes to receive N310 consecutive out-of-sync indications from lower layers (non-suitable "Off" is defined in TS 36.508 [3], whereas T310 and N310 are defined in TS 36.331 [19]).

If the RRC re-establishment procedure is used in a radio link failure context, it shall be realised by using two cells.

7.12 Test method for RRC signalling latency

Test cases testing RRC signalling latency will need special test method. The PUCCH synchronisation state of UE influences the test method. Following 2 different ways in which the UE's completeness of procedure can be probed are considered:

1. UE is still PUCCH synchronized and can respond to uplink grants.

2. UE needs a RACH procedure and hence RACH procedural delays add upon the actual procedure delay.

7.12.1 Procedure delays in PUCCH synchronized state

For latency tests there may be up to 4 HARQ retransmissions in DL (corresponding to the default configuration of the SS) but HARQ retransmissions in UL cannot be compensated, i.e. any HARQ error in UL shall result in an inconclusive verdict for the test case (otherwise a UE may get fail due to a HARQ error).

Figure 7.12.1-1 demonstrates the latency check procedure that will be applied when UE is in PUCCH synchronized state and can respond to uplink grants.

SS is configured to report ACK/NACK received from UE, to TTCN.

NOTE: Due to L2 signalling (e.g. RLC STATUS PDUs) it is necessary to limit the reporting of UL HARQ ACK/NACK to the time between sending of the RRC message and receiving the ACK.

By default SS is configured to retransmit any DL MAC PDU max 4 times.

To avoid unexpected side effects the Time Alignment timer needs to be set to infinity and the SS shall be configured to not send any Timing Advance MAC control elements during the latency tests (since this may result in additional ACK/NACK)

The SS shall be configured to report HARQ errors and in the case of an UL HARQ error, an inconclusive verdict is assigned.

In the case of HARQ retransmissions in DL the HARQ RTT Timer according to TS 36.321 clause 7.7 [16] is

- 8 for FDD

- 10 for TDD configuration 1 in case the DL PDU is sent in subframe 4 (as per default; see Table 7.12.1-1).

The SS shall schedule DL retransmission at 4th FDD TTI for FDD or 6th TTI for TDD since reception of the NACK.

Let N be the max allowed delay for procedure.

TTCN schedules at time T1 a DL message to the UE.

TTCN schedules UL grants at

$T_2(k) = T_1 + N + \Delta_1 + k * RTT;$

with
   $k = 0..4$; number of HARQ retransmission in DL
   $RTT = 8$ (FDD)
   $RTT = 10$ (TDD)
   $\Delta_1 = 0$ (FDD)
   $\Delta_1 = 0..3$ (TDD; possible UL subframe uncertainty since not all subframes can be used for UL)

Example:
   given TDD; DL PDU sent at subframe 4; N=19
   $\Rightarrow \Delta_1 = 1$ since UL grant cannot be scheduled for subframe 3 but needs subframe 4 too

The UL data is sent by the UE at

$T_3(K) = T_2(K) + 4 + \Delta_2$ with $\Delta_2 = 0$ for FDD and $\Delta_2 = 0..3$ for TDD and K is the value of k corresponding to which a HARQ Ack is received

The latency requirements are fulfilled when

$$T_3(K) - T_1 = N + 4 + \Delta_1 + \Delta_2 + K * RTT$$

Looking at TDD configuration 1 in detail it can be shown that $\Delta = \Delta_1 + \Delta_2 = 0 .. 3$

$$\Rightarrow T_3(K) - T_1 = N + 4 + \Delta + k * RTT; \text{ with } \Delta = 0 .. 3$$

NOTE:
　　as long as N is a multiple of 5ms even for TDD configuration 1 we get $\Delta = 0$
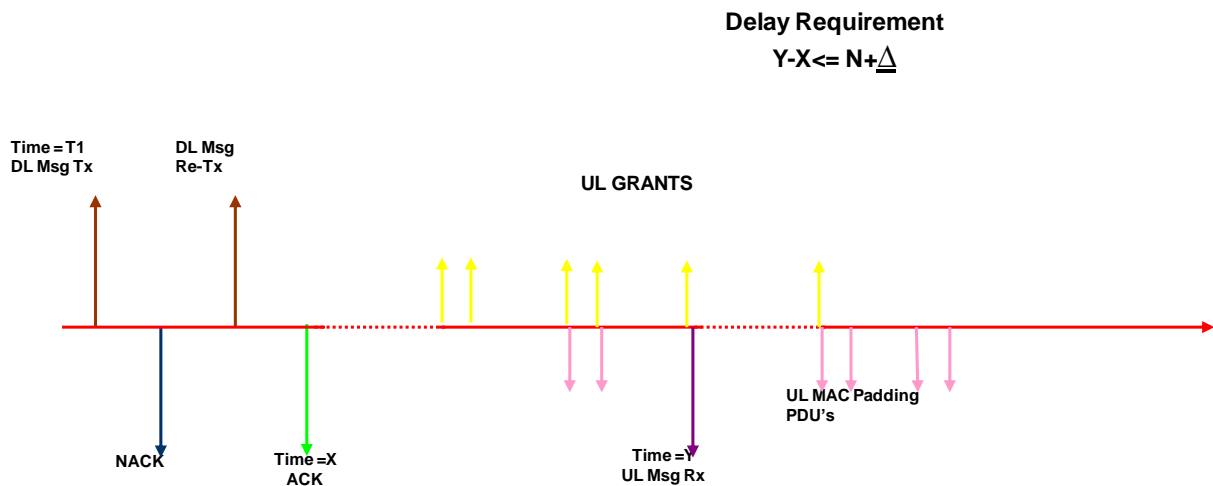
Figure 7.12.1-1: Delays in PUCCH synchronized state

Table 7.12.1-1: TDD configuration 1

Subframe	0	1	2	3	4	5	6	7	8	9
Configuration 1	D	S	U	U	D	D	S	U	U	D
Delay from DL to Ack/Nack [TTIs]			6,7	4				6,7	4	
Delay from NCK to re tx [TTIs]			4	6				4	6	
RTT	11	10			10	11	10			10

7.12.2　Procedure delays when RACH procedure required

Figure 7.12.2-1 demonstrates the latency check procedure that will be applied when UE is not PUCCH synchronized state needs RACH procedure.

　　PRACH configuration index is set as 14 for FDD, 12 for TDD which allows UE to send Preamble in any frame at any subframe.

　　SS is configured to report ACK/NACK, PRACH preambles received from UE.

　　By default SS is configured to retransmit any DL MAC PDU max 4 times [1 Transmission and 4 Retransmission].

　　Let N be the max allowed delay for procedure.

　　TTCN schedules at time T1, DL message to the UE. This is achieved using Time stamps in send ASP's.

The time difference between the ACK and the reception of PRACH preamble will be checked against N plus any Interruption time (TS 36.133 [37]) and verdict is assigned, when $(Y-X) \leq N + T_{interrupt} + \Delta$:

$\Delta = 0$ for FDD;

$\Delta = 3TTI$ for TDD, where 3TTI is UL subframe uncertainty.

If cell change occurs, cell timing differences, Frame number offsets need to be included for procedural delay evaluations.
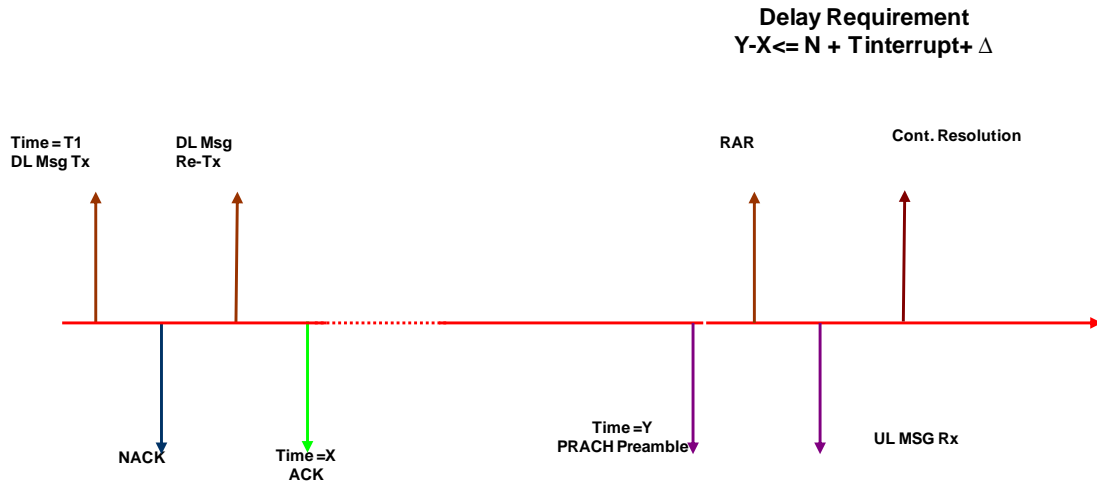
Figure 7.12.2-1: Delays when RACH procedure needed

7.13 RLC test method for scheduled data

The test loop mode is applied to the RLC tests. The allowed SS delay for sending data (< 80 ms) is comparable to the default values of the RLC timers. In order to ensure a unique TTCN implementation of the RLC test cases and the deterministic test result, independent from the SS platforms and UEs, scheduled data method can be applied to the test.

The scheduled data method is suitable to the RLC test if:

Receiving multiple UL RLC SDUs is expected in the test; the UE may send a STATUS PDU in addition.

Time measurement is required for the looped back RLC SDUs.

DL RLC PDUs are sent on consecutive TTIs; the subframe numbers to be applied are relevant in TDD.

Table 7.13-1 illustrates the data scheduling in the RLC test.

Table 7.13-1: Scheduled RLC test events

Scheduled timing		t0 (see note 1)	t1 (see note 1)	t2
Test event descriptions	Multiple SDUs	Obtain the reference time	Send DL data	Provide UL grant (see note 2)
	Time measurement		Send DL data	Receive UL data
	DL data in TDD		Send 1st DL data	Send subsequent data (see note 3)
NOTE 1: (t1-t0) ≥ 100 ms which is greater than the allowed SS max. delay time, 80 ms.				
NOTE 2: (t2-t1) = 60 ms, this duration will allow the UE transmitting max. 3 scheduling requests (every 20 ms once) after the UL data to be looped back being available at the UE without going onto PRACH.				
NOTE 3: The applied TDD subframe numbers 4, 5, 9, 10, 14, 15, 19, 20, 24, 25, ...				

If the test case prose does not indicate timely restrictions for the scheduling, sequential sending events are scheduled in consecutive TTIs.

NOTE 1: For TDD configuration 1, the subframes 0, 4, 5 and 9 are considered as consecutive.

NOTE 2: Scheduling may imply to execute the test steps in the TTCN in an order different from the order given in the test case prose. However, the sequence of the events over the air follows the prose description.

7.14   IP packets for Loopback Mode

7.14.1   IP packets used for Loopback Mode A

It is irrelevant which kind of data is used in loopback mode A. Some PDCP test cases however specify to use IP packets. In these cases, an ICMPv4 ECHO REPLY shall be used with a valid IP header checksum and valid ICMP checksum.

7.14.2   IP packets used for Loopback Mode B

According to TS 36.509 [4], the UE performs loopback mode B above the UL TFT entity. Therefore IP packets need to match the packet filters signalled to the UE according to TS 36.508 [3], clause 6.6.2:

When the UE gets configured via NAS signalling with packet filter #1 and #2 according to TS 36.508 clause 6.6.2 the IP packets shall fulfil the following requirements:

Protocol:

UDP referred to packet filter #1 and #2

IP addresses:

Referred to TS 36.508 [3], table 6.6.2-3, note 1 source and destination IP address are the same.

Ports:

packet filter #1 specifies DL filter $\Rightarrow$ IP packet's source port shall match remote port of packet filter #1.

packet filter #2 specifies UL filter $\Rightarrow$ IP packet's destination port shall match remote port of packet filter #2.

To summarize, on dedicated bearers for loopback mode B, UDP packets used shall match the packet filters configured at the UE side. The UDP packets, having no specific content, shall have the correct header checksum and UDP checksum. On the default bearer, any other packets can be used, as an example, ICMPv4 ECHO REPLY similar as for loopback mode A.

7.15   Connected Mode DRX

The SS shall support connected mode DRX according to TS 36.321 [16], i.e. the SS shall not send any data to the UE while the UE is not monitoring the PDCCH. To achieve this, the SS needs to estimate the UE's Active Time by considering the on-duration as well as the drx-inactivity timer:

on-duration:

The on-duration can be derived from the SS' DRX configuration.

drx-inactivity timer:

According to TS 36.321 [16], clause 5.7 at the UE the drx-inactivity timer is started or restarted during the Active Time whenever PDCCH indicates a new transmission (DL or UL).

There is no activation time for the configuration of DRX at the UE and it is not acceptable just to consider the on-duration after re-configuration of the UE (for DRX_L according to TS 36.508 [3] the DRX cycle is 1.28 s); instead the drx-inactivity timer needs to be taken in account after DRX reconfiguration as well.

The following rules shall be applied to achieve synchronisation of SS and UE:

1. SS shall consider drx-inactivity timer as restarted at the UE whenever the UE is addressed on the PDCCH (DL data or UL grant).

2. When there is a scheduling request sent by the UE, SS assigns a grant independent of DRX; when sending out that grant on PDCCH SS considers drx-inactivity timer as (re-)started (as per 1. above).

3. For all DL messages scheduled with specific timing information SS shall send the data at the given time irrespective of current DRX configuration.

4. DRX (re-)configuration:

   a) when DRX has not been configured at the UE yet:

      a1) TTCN will configure the SS just before the sending out the RRCConnectionReconfiguration message configuring DRX at the UE; no other send-events between the reconfiguration of the SS and sending the RRC message shall be scheduled in TTCN.

      a2) TTCN will schedule sending of the RRCConnectionReconfiguration message configuring DRX with specific timing information.

   b) Reconfiguration of DRX at the UE: Same as a) but:

      b1) TTCN shall schedule sending of the RRCConnectionReconfiguration according to the old DRX configuration (i.e. the SS does not need to cache the new configuration).

   c) RRC connection release:

      c1) TTCN will release DRX at the SS just after the RRC connection release procedure.

5. There shall be no parallel data on any DRBs during DRX reconfiguration.

NOTE: Timing requirements in the DRX test cases:

   a) The drx-Inactivity Timer shall be long compared to the duration between sending RRCConnectionReconfiguration and receiving RRCConnectionReconfigurationComplete (> 50 ms). It ensures the SS in-time sending of the RLC STATUS PDU.

   or

   b) The drx-cycle shall be short compared to the RLC timers applied for SRB1.

Figure 7.15-1 illustrates DRX (re)configuration at the SS and the UE.
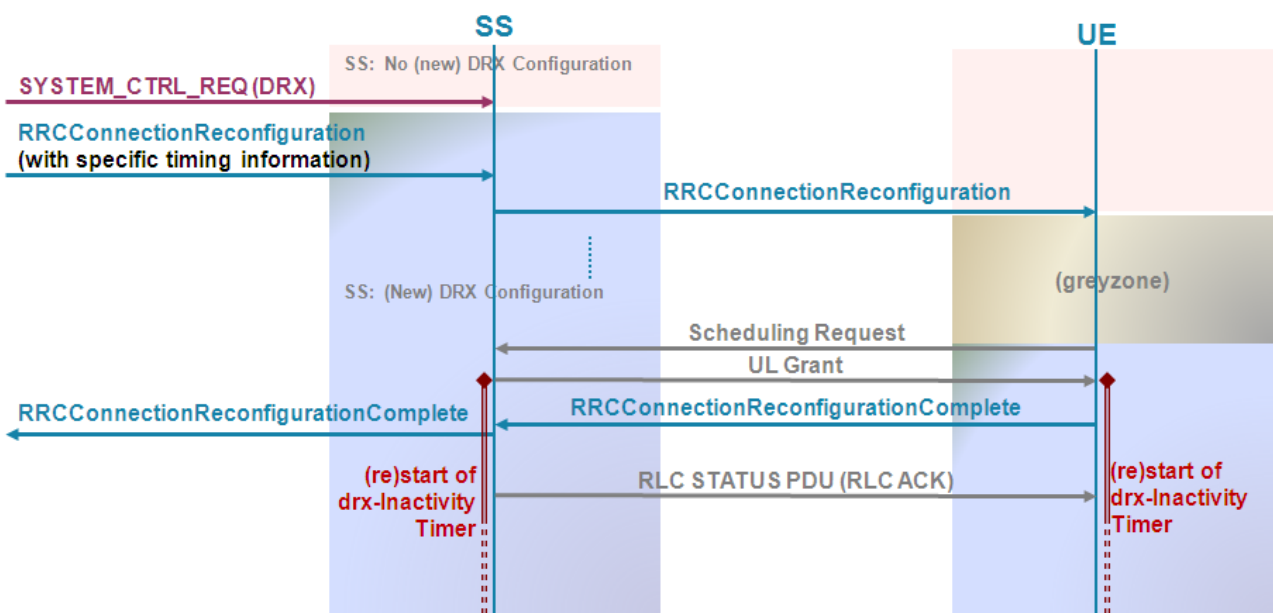
Figure 7.15-1: DRX (Re)configuration

NOTE 1: Between RRCConnectionReconfiguration and RRCConnectionReconfigurationComplete the UE may send a separate RLC STATUS PDU to acknowledge the RRCConnectionReconfiguration, but that does not affect the principle as long as SS applies rule 2.

NOTE 2: During the "greyzone" SS does not know about DRX configuration at the UE; during that period according to rule 4a1 and rule 5 there is no data to be sent by SS.

The TTCN (re)configures the connected mode DRX in SS for the test cases if DRX_S is applied (Ref. TS 36.508 [3]). The (re)configuration of DRX_L in SS is FFS.

For test case 7.1.6.1 and 7.1.6.2, DRX will not be activated at the SS. Periodic UL grants every 5ms (suitable for both FDD and TDD and less than drx-InactivityTimer 6ms) will be allocated to the UE during the steps configuring test case specific DRX parameters of the test case to prevent UE from activating DRX; These grants may result in padding MAC PDU's transmitted by UE, which will be received by SS MAC and discarded.

7.16 Handover Sequences

7.16.1 Sequence of inter-cell handover

In general, the Inter-Cell handover is done without activation time, i.e. the timing information for configuration of the SS and sending of the RRCConnectionReconfiguration is 'Now'.

1. Transfer of the PDCP Count for AM DRBs from source to target cell:

   a) Source Cell: Get PDCP COUNT.

   b) Target Cell: Set PDCP COUNT.

NOTE 1: There shall be no further sending/receiving of AM DRB data before the HO has been done.

2. Target Cell: Inform the SS about the HO and about the source cell id.

3. Target Cell: Configure RACH procedure either dedicated or C-RNTI based.

4. Target Cell: Activate security.

NOTE 2: For AM DRBs the PDCP count is maintained (for SRBs and UM DRBs the PDCP count is reset).

5. Target Cell: configure DRX and measurement gap configuration (if necessary).

NOTE 3: As long as the DRX configuration is not modified by the RRCConnectionReconfiguration the target cell gets the same DRX configuration as the source cell.

NOTE 3A: According to TS 36.331 clause 5.5.6.1 the measurement gap configuration is released at the UE due to the handover, therefore nothing needs to be configured at the target cell regarding measurement gaps unless a new measurement gap configuration is explicitly given in the RRCConnnectionReconfiguration.

6. Source Cell: Stop periodic TA.

NOTE 4: Unless explicitly specified UL grant configuration keeps configured as per default at the source cell.

7. Target Cell: Configure UL grant configuration ("OnSR", periodic TA is not started).

8. Source Cell: Send RRCConnectionReconfiguration.

9. Target Cell: Receive RRCConnectionReconfigurationComplete.

10. Target Cell: Start periodic TA.

11. Target Cell: Inform the SS about completion of the HO (e.g. to trigger PDCP STATUS PDU).

12. Target Cell: Re-configure RACH procedure as for initial access.

13. Source Cell: Reset SRBs and DRBs.

14. Source Cell: Release DRX and MeasGapConfig configuration.

7.16.2 Sequence of intra-cell handover

For Intra-Cell handover dedicated timing information is used: the sequence starts at time T with sending of the RRCConnectionReconfiguration. T is set to 300 ms in advance of the handover.

0. Before T: Get PDCP count for AM DRBs.

1. At T: Send RRCConnectionReconfiguration.

2. At T + 5ms: Release SRBs and DRBs.

3. At T + 5ms: Configure RACH procedure either dedicated or C-RNTI based.

NOTE 1: Since the RACH procedure may require a new C-RNTI to be used it cannot be configured before sending out the RRCConnectionReconfiguration.

3A At T + 5ms: Release MeasGapConfig configuration.

NOTE 2: According to TS 36.331, clause 5.5.6.1 the measurement gap configuration is released at the UE due to the handover, therefore MeasGapConfig is released unless a new measurement gap configuration is explicitly given in the RRCConnectionReconfiguration.

4. At T + 10ms: (Re-) configure SRBs and DRBs.

5. At T + 10ms: Reestablish security, disable TA transmission.

NOTE 3: For AM DRBs the PDCP count is maintained while for SRBs and UM DRBs the PDCP count is reset.

6. (after step 5) Receive RRCConnectionReconfigurationComplete.

7. (after step 6) Re-configure RACH procedure as for initial access, enable TA transmissions.

8. (after step 7) Restore the PDCP count for AM DRBs.

7.16.3 UL Grants used in RA procedure during handover

In the Random Access Procedure a grant is assigned to the UE by the Random Access Response and another grant, as initial grant, is assigned for contention resolution.

When UL data is pending, the UE will try to put as much data into given grants as possible, i.e. it will segment the user data and send it e.g. with the initial grant if possible. To avoid this segmentation of user data, the grants assigned during handover will be set in TTCN to:

Grant assigned by Random Access Response: 56 bits.

Initial grant: 104 bits.

NOTE 1: According to TS 36.321 [16], clause 5.1.4, 56 bits are the minimum grant which can be assigned by the Random Access Response. That is sufficient to convey C-RNTI (3 bytes) and short BSR (2 bytes) or long BSR (4 bytes) but even with short BSR the remaining 2 bytes are not sufficient to convey any segment of the RRCConnectionReconfigurationComplete (at least 4 bytes).

NOTE 2: The RRCConnectionReconfigurationComplete (9 bits) shall completely be conveyed in the initial grant of RA procedure. This requires a minimum of 10 bytes (1 byte MAC header + 2 bytes RLC header + 5 bytes PDCP header + 2 bytes payload). Additionally an optional PHR MAC element (2 bytes) needs to be considered since the PHR has higher priority than the MAC SDU. Any further user data would require a minimum of 5 additional bytes (2 bytes MAC header + 2 bytes RLC header + 1 byte payload).

7.17 Simulation of PDCP MAC-I Failure in UE

PDCP integrity protection test cases 7.3.4.x have the requirement to trigger MAC-I failures in UE for downlink messages; to achieve the MAC-I failure in UE two methods are specified in the subsequent sub clauses.

7.17.1 Integrity and ciphering not yet activated

UE has not yet started Integrity protection and it is required to trigger MAC-I failure for the PDCP PDU carrying RRC SecurityModeCommand starting integrity with one of integrity protection algorithms. Further a conformant UE will respond with SecurityModeFailure without any integrity protection.

This is achieved by:

> Not configuring SS PDCP to start integrity and ciphering with selected algorithm.

> RRC SecurityModeCommand is sent indicating Integrity protection through the desired algorithm.

> Normal behaviour of PDCP layer in SS will include all zeros in MAC-I.

> This results in MAC-I failure as UE will calculate the XMAC-I with indicated algorithm.

7.17.2 Integrity and/or ciphering already activated

UE has started Integrity protection (ciphering configured with possibly non null algorithm) and it is required to trigger MAC-I failure for the PDCP PDU carrying an RRC UECapabilityEnquiry message. A conformant UE will trigger a RRCConnectionReestablishment procedure.

This is achieved by:

> Configuring SS PDCP to use a different Integrity algorithm other than used by UE (i.e. if UE is configured to use AES, SS is configured to use SNOW3G and vice versa).

> Ciphering is configured at SS side same as in UE side.

> The MAC-I included by SS PDCP will be as per new algorithm.

> UE will calculate XMAC-I based on its own algorithm which is different from the algorithm SS has used and will result in MAC-I failure.

7.18 RRC Connection Release Sequence

According to TS 36.331 [19], clause 5.3.8.3, after reception of the RRCConnectionRelease the UE may either wait 60 ms or for indication of acknowledgement from lower layer. After the RRC connection release there are cases where the UE may immediately come up with an RRC connection request. This requires scheduled release of resources at the SS:

1. At T: Send RRCConnectionRelease, stop UL grants.

2. At T + 5ms: Release security.

3. At T + 10ms: Release DRX configuration at the SS.

3A At T + 15ms: Release measurement gap configuration at the SS.

4. At T + 50ms: no action.

5. At T + 55ms: Release SRBs and DRBs.

6. At T + 60ms: (Re-) configure SRBs and DRBs.

7. Delay of 840ms (NOTE)

T is set to 300ms in advance of RRC connection release.

> NOTE: The delay ensures that the UE is camping on the serving cell again to avoid side effects e.g. due to subsequent power level changes. It does not affect any sending of messages by the UE. The delay 840ms is chosen to ensure the UE is re-camping on the cell and has read relevant system information, MIB, SIB1, SIB2 and all other SIs.

7.19 DL CCCH Message and Contention Resolution MAC Control Element transmission in one MAC PDU or in separate MAC PDUs

When the contention based RACH procedure is being executed (RRC Connection Establishment or RRC Connection Reconfiguration), in general the contention resolution MAC control element and the DL RRC PDU (RRC Connection Setup/RRC Connection Reject/RRC Connection Re-establishment/RRC Connection Re-establishment Reject) are sent in one MAC PDU. This is achieved by pre-configuring the SS (before the start of the RRC procedure) to send the encoded DL message and contention resolution MCE in one MAC PDU.

Nevertheless, due to specific test purposes there are still many cases where it is necessary to send the DL CCCH message separately:

RRC connection establishment

When RRC connection establishment is part of the test purpose

Special cases: , e.g. when no contention resolution shall be sent according to the test purpose

RRC Connection Reestablishment is part of the test purpose

RRC Connection Reject is part of the test purpose

RRC Connection Reestablishment Reject is part of the test purpose

NOTE: The way contention resolution is applied has impact on the DCI format being used in a test case: when the DL CCCH message is sent separately DCI combination 1 according to clause 7.3.1 shall be used.

7.20 RRC Connection Reconfiguration Sequence (Measurement Control)

When an RRC Connection Reconfiguration message contains information to configure measurement gaps at the UE according to TS 36.331 [19] clause 5.5.2.9, the SS needs to be configured accordingly:

IF MeasConfig contains measGapConfig:

1. At T: Send RRC Connection Reconfiguration.

2. At T + 5ms: Configure measurement gaps at the SS.

3. (after step 2) Receive RRC Connection Reconfiguration Complete

ELSE

1. Send RRC Connection Reconfiguration (without scheduling)

2. Receive RRC Connection Reconfiguration Complete.

T in general is set to 100ms in advance of the RRC connection reconfiguration.

7.21 GERAN special issues

7.21.1 Timeslot assigned for GERAN CS traffic

Timeslot 3 shall be used as the timeslot assigned for GERAN CS traffic, in order to avoid conflicts with timeslots reserved for other purposes (e.g. the GPRS channel which is assigned to timeslot 4).

7.21.2 Subchannel used in GERAN L2 access message

The subchannel is valid only for the following logical channel types: FACCH/H, SDCCH/8, SDCCH/4. For other logical channel types this field is not applicable and shall be coded as 15 for compatibility with TTCN2 test cases. The SS shall ignore it if this field is coded as 15.

7.22 EUTRAN RSRQ Calculations

7.22.1 Assumptions

- As per 36.214[53] clause 5.1.1 and 5.12, the RSRP and RSSI shall be averaged over the same set of resource blocks. It is assumed that the power calculations made over one symbol are good enough for RSRQ calculations. This is based on the assumption that the power levels remain the same across the symbols on which the UE is calculating the average. The contribution of Nprb and the OFDM symbols carrying cell specific reference symbols per PRB contribute equally in numerator and denominator, hence RSRQ calculations in dB with aggregation over cell DL bandwidth and without aggregation result in the same output.

- As per table 7.4.3.1.1-1, for FDD the timing offset between the intra frequency cells is always a multiple of sub frame duration i.e. 3072 Ts, hence in the symbols carrying cell-specific reference signals in one cell, the other cell (interference) is also carrying a cell-specific reference signal, even though in a different subframe. Hence from an interference calculation perspective, we can safely assume that the cells contributing an interference shall also transmit the same cell specific reference signal in the symbol/

- The noise source is treated as a dummy cell transmitting on all resource elements with equal EPRE. Hence to switch off the noise source, a value of non-suitable "Off" cell, as per 36.508[3] table 6.2.2.1-1 shall be used (<-145), and the signal level uncertainties similar to configured cells in 36.508[3] clause 6.2.2.1 will also be applied to the noise source.

7.22.2 The Ideal Calculation

The test case specifies the RS-EPRE (dBm/15kHz) which is the cell absolute power-cell attenuation in dBm per carrier of 15 kHz; the linear average over few measurements will give the RRP value.

It is assumed that the power levels of all contributors is fluctuating hence in the typical test environment RS-EPRE will be the RSRP over a single carrier frequency.

The RS-EPREmW (mW/15kHz) = 10 power (RSRP/10).

The energy in noise source [Noc] for the frequency is also specified in the same units of dBm/15kHz.

The RSSImW calculation(mW over a resource block frequency of 180 kHz) = 2 (the sum over all intra frequency configured cells RS-EPREmW) + 10 power ((Noc/10)*12.

The cell inference is multiplied by 2 as in a RB, cell specific reference is transmitted in only 2 carriers. But the AWGN transmits on all 12 carriers in the resource block.

The RQRQ in dB will be the 10*log (RS-EPREmW/RSSImW).

7.22.3 Additional RSRQ Calculations For Fixing Boundary Values

In addition to the ideal calculation, various RSRQ calculations take into consideration the combinations of the SS signal uncertainties and possibly all 12 carriers being used for DL transmission.

The 12 carriers being used can happen when the UE makes the measurement in a subframe when a DL PDSCH is scheduled or measurement is in subframe zero and the UE measures in OFDM symbol carrying PBCH i.e. slot 1, symbol 0.

The Min and Max RSRQ values are identified from 6 different RSRQ calculations:

RSRQ Ideal: RSRQ calculated in ideal conditions as given above

RSRQ Min: RSRQ calculation applying –ve signal uncertainty to all configured cells and noise source

RSRQ Max: RSRQ calculation applying +ve signal uncertainty to all configured cells and noise source

RSRQ Max Worst Case: RSRQ calculation applying +ve signal uncertainty for measured cell and –ve signal uncertainty to all remaining configured cells and noise source. This shall be the Max RSRQ possible

RSRQ Max And 12 Carriers: RSRQ calculation applying +ve signal uncertainty to all configured cells and noise source and cell interference considered over all 12 carriers

RSRQ Min Worst Case And 12 Carriers: RSRQ calculation applying -ve signal uncertainty for measured cell and +ve signal uncertainty to all others; and cell interference considered over all 12 carriers. This shall be the Min RSRQ possible

Applying UE measurement accuracy 36.133[37], Table 9.1.6.2-1, +/-4dB normal conditions and side conditions of RSRQ when RSRP Ês/Iot $\geq$ -6 dB & RSRP $\geq$ -124 dBm the final boundary value for RSRQ is

Min RSRQ With UE Meas Acc := Min RSRQ -4 dB

Max RSRQ With UE Meas Acc := Max RSRQ + 4 dB

For conditions to fulfil desired cell selection or reselection, the respective conditions shall be satisfied for both the boundary values Min RSRQ RSRQ With UE Measurement Accuracy and Max RSRQ With UE Measurement Accuracy.

As the Boundary conditions also consider the worst scenario of all 12 carriers being transmitted, the requirement for OCNG is removed. There is no need to restrict measurement bandwidth and will be applicable for both DCI formats.

7.23   Test method for eICIC

When periodic CQI feedback is requested due to TTCN configuration, the SS reports the periodic CQI to the TTCN. SS does not react on periodic CQI received and still allocates grants as configured from TTCN.

In the selected ABS no DL/UL user data (SRB/DRB) is scheduled, nor paging is transmitted; this is controlled by TTCN.

7.24   Carriage Aggregation Signalling Sequences

7.24.1   Initial configuration of Pcell

Cell is configured as a normal cell by using function f_EUTRA_CellConfig_Def. The missing CA default parameters (e.g. UL power control Common) are configured by using additional ASP call(s).
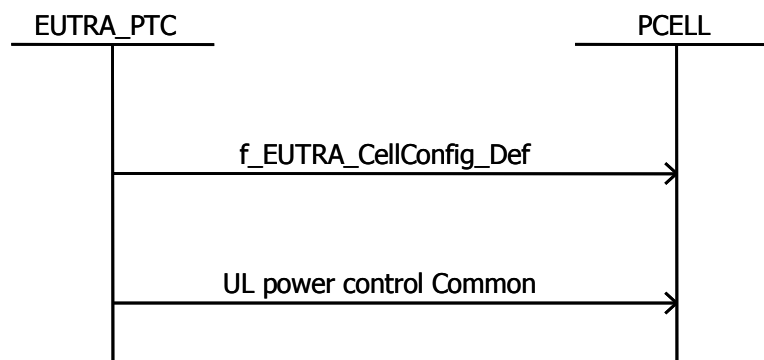
Figure 7.24.1-1: CA sequence of an initial cell configuration for a cell to be used as Pcell

7.24.2 Initial configuration of SCell

Cell is configured as a normal cell except for SRB/DRB configuration by function f_EUTRA_SS_ConfigureActiveCell.

SRB0 not yet configured in step 1 is then configured.

The missing CA default parameters (e.g. UL power control (Common + Dedicated), PUSCH config Dedicated, SRS UL Dedicated) are configured by using additional ASP call(s).
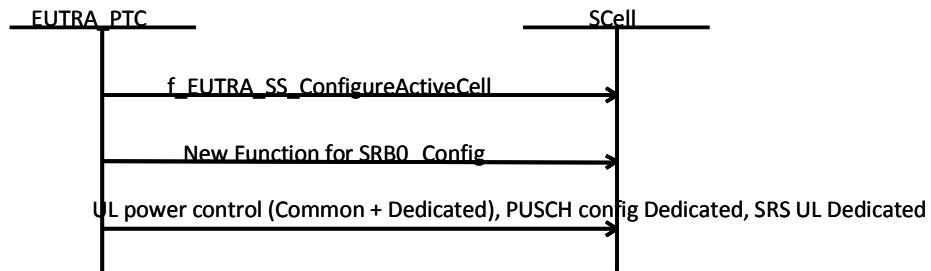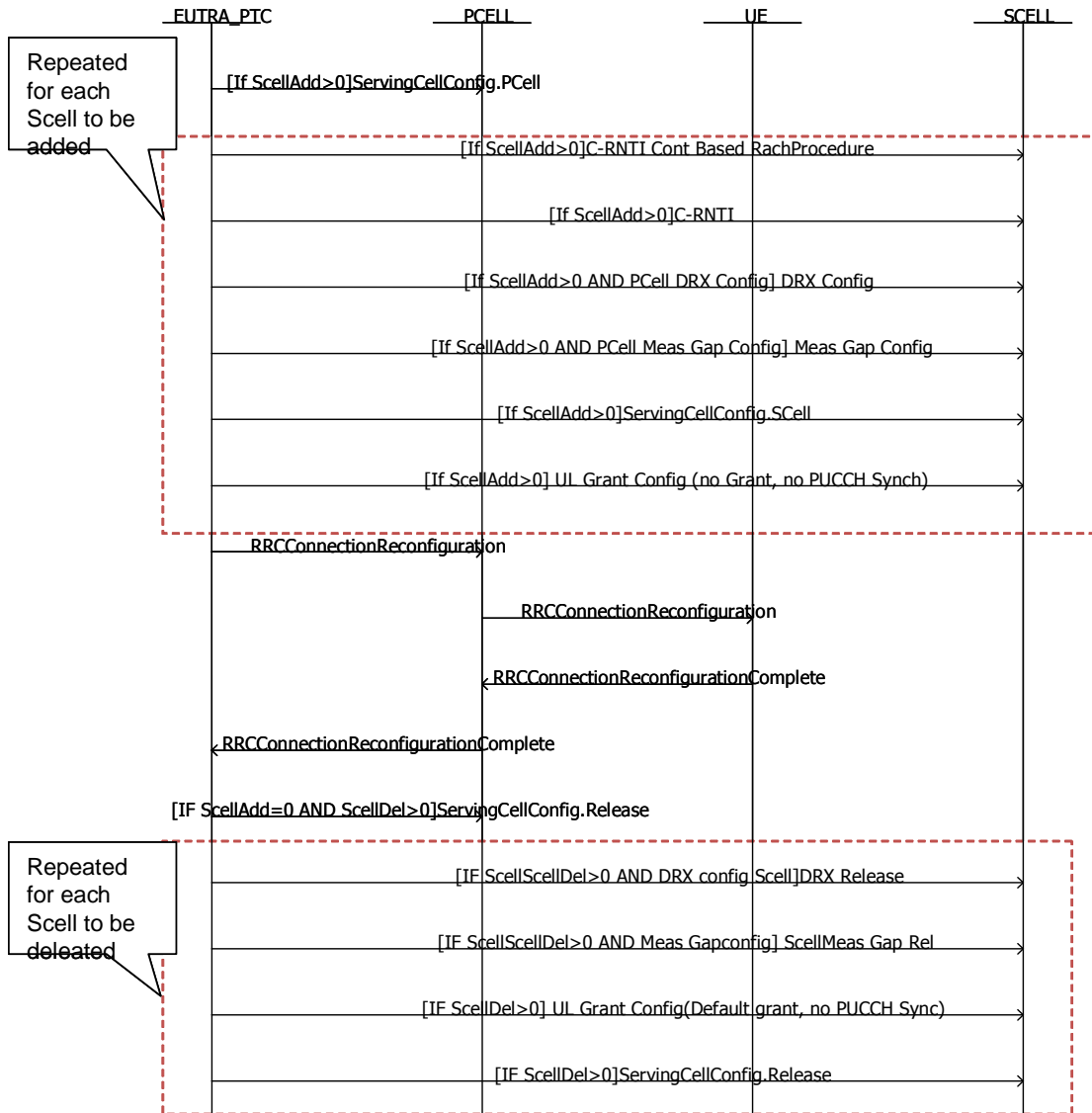

Figure 7.24.2-1: CA sequence of an initial cell configuration for a cell to be used as Scell

7.24.3 Scell Addition and/or release

Figure 7.24.3-1: CA sequence of Scell Addition and/or release

7.25 Test method for MBMS

7.25.1 Schedule transmission of MCCH messages

The rules for the transmission of MCCH messages are specified in TS 36.331 [19], clause 5.8.1.2. The ASPs SYSTEM_CTRL_REQ and SYSTEM_CTRL_CNF are used as interface to SS; the following rules apply:

The complete MCCH information is provided to SS by using a single ASP. The MCCH carries the *MBSFNAreaConfiguration* and may also carry the *MBMSCountingRequest* message.

The scheduling information sent to SS is the same as the scheduling information sent to the UE.

The MCCH information is sent to SS using the asn.1 types, SS shall encode in unaligned PER and add the necessary padding bits as specified in TS 36.331 [19], clause 9.1.1.1.

Segmentation occurs when the MCCH message size is larger than the TBS of the MCH. SS starts scheduling all MCCH information blocks from the same SFN.

NOTE: With the default values NPRB=NRBDL=25 for 5 MHz and default signalling Imcs =2; then Itbs=2 and the TB size will be 1096 bits, hence segmentation may never happen.

7.25.2 MCCH change notification

A change notification is used to indicate the modification of MCCH information. The notification is transmitted on PDCCH, it includes the notification indicator provided in the ASP and is transmitted using the M-RNTI (defined in 3GPP TS 36.321 [16] Table 7.1-1).

The notification messages are sent during one modification period before transmitting the modified MCCH information. The SFN for the start of modification period is calculated by TTCN. The modified MCCH information and the calculated SFN are provided in the ASP SYSTEM_CTRL_REQ. The notification messages are sent on SFN/subframes calculated by TTCN according to 36.331 [19] clause 6.3.7.

7.25.3 MTCH data scheduling

The SS is configured with configuration parameters for CommonCSA, PMCH, MRBs and scheduling information for MTCH data transmission.

When data is sent on MTCH the SS shall set the MSI in the MAC header according to TS 36.321 [16] clause 6.1.3.7. The periodicity of the MSI is defined by the MCH scheduling period i.e. the MSI is not necessarily included in the subframe where the RLC SDU is transmitted.

8 External Function Definitions

The following external functions are required to be implemented by the SS.

TTCN-3 External Function		
Name	fx_KeyDerivationFunction	
Description	Hashing function for Hashing algorithms as defined in TS 33.401 [24] SHA-256 encoding algorithm is used as KEY Description Function	
Parameters	KDF	KDF_HMAC_SHA_256 (no other KDF defined yet)
	Key	256 bit key
	String	string being constructed acc. to TS 33.401 [24], annex A
Return Value	256 bit derived key	

TTCN-3 External Function		
Name	fx_NasIntegrityAlgorithm	
Description	Apply integrity protection algorithm on a given octetstring	
Parameters	NAS PDU	octetstring according to TS 24.301 [21], clause 4.4.3.3 this shall include octet 6 to n of the security protected NAS message, i.e. the sequence number IE and the NAS message IE
	Integrity Algorithm	3 bits as defined in TS 24.301 [21], clause 9.9.3.23
	$KNAS_{int}$	Integrity key
	NAS COUNT	as documented in TS 24.301
	BEARER Id	fix value ('00000'B) acc. TS 33.401 [24], clause 8.1
	Direction	UL: 0 DL: 1 (acc. to TS 33.401 [24], clause B.1)
Return Value	Message Authentication Code (4 octets)	

TTCN-3 External Function	
Name	**fx_NasCiphering**
Description	Apply ciphering on a given octetstring
Parameters	NAS PDU	octetstring
	Ciphering Algorithm	3 bits as defined in TS 24.301 [21], clause 9.9.3.23
	$KNAS_{enc}$	Ciphering Key
	NAS COUNT	as documented in TS 24.301
	BEARER Id	fixed value ('00000'B) acc. TS 33.401 [24], clause 8.1
Return Value	ciphered octet string

TTCN-3 External Function	
Name	**fx_NasDeciphering**
Description	Apply deciphering on a given octetstring
Parameters	ciphered NAS PDU	octetstring
	Ciphering Algorithm	3 bits as defined in TS 24.301 [21], clause 9.9.3.23
	$KNAS_{enc}$	Ciphering Key
	NAS COUNT	as documented in TS 24.301 [21]
	BEARER Id	fixed value ('00000'B) acc. TS 33.401 [24], clause 8.1
Return Value	deciphered octet string

TTCN-3 External Function	
Name	**fx_GetCurrentTestcaseName**
Description	external function giving back the name of the test case currently running
Parameters	None	
Return Value	char string

TTCN-3 External Function	
Name	**fx_AsIntegrityAlgorithm**
Description	Apply integrity protection algorithm on a given octetstring
Parameters	PDCP PDU	octetstring
	Integrity Algorithm	3 bits as defined in TS 33.401 [24]
	$KRRC_{int}$	Integrity key
	PDCP COUNT	octetstring, length 4
	BEARER Id	the value of the DRB identity minus one
	Direction	UL: 0
		DL: 1
		(acc. to TS 33.401 [24], clause B.2)
Return Value	Message Authentication Code (4 octets)

TTCN-3 External Function	
Name	**fx_AsCiphering**
Description	Apply ciphering on a given octetstring
Parameters	SDU	octetstring
	Ciphering Algorithm	3 bits as defined in TS 33.401 [24]
	$KRRC_{enc}$	Ciphering Key
	PDCP COUNT	octetstring, length 4
	BEARER Id	the value of the DRB identity minus one
Return Value	ciphered octet string

TTCN-3 External Function	
Name	**fx_AsDeciphering**
Description	Apply deciphering on a given octetstring
Parameters	ciphered SDU	octetstring
	Ciphering Algorithm	3 bits as defined in TS 33.401 [24]
	$KRRC_{enc}$	Ciphering Key
	PDCP COUNT	octetstring, length 4
	BEARER Id	the value of the DRB identity minus one
Return Value	deciphered octet string

TTCN-3 External Function		
Name	fx_GetSystemTime	
Description	Function to get the system time: Implementation is based on C standard library (time.h)	

Parameters	p_Struct_tm (out)	p_Struct_tm returns local system time equivalent to "struct tm" as defined for C standard library (time.h or ctime):
		
		`type record Struct_tm_Type {`
		`  integer tm_sec,  // seconds after the minute`
		`                   // (0..61; see NOTE)`
		`  integer tm_min,  // minutes after the hour (0..59)`
		`  integer tm_hour, // hours since midnight (0..23)`
		`  integer tm_mday, // day of the month (1..31)`
		`  integer tm_mon,  // months since January (0..11)`
		`  integer tm_year, // years since 1900`
		`  integer tm_wday, // days since Sunday (0..6)`
		`  integer tm_yday, // days since January 1 (0..365)`
		`  integer tm_isdst // Daylight Saving Time flag`
		`};`
		
		NOTE: tm_sec is generally 0-59. Extra range to accommodate for leap seconds in certain systems
		
		C implementation:
		`    time_t v_Now = time(NULL);`
		`    struct tm *v_Tm = localtime(&v_Now);`

	p_TimezoneInfo (out)	p_TimezoneInfo returns the difference (in seconds) between the UTC time (GMT) and the local time (integer value);
		
		C implementation:
		`    int timezone =`
		`      (int)difftime(mktime(gmtime(&v_Now)), v_Now);`
		
		NOTE:
		p_TimezoneInfo does not consider daylight saving e.g. it is always 3600 for CET independent of summer/winter

Return Value	None	

9 IXIT Proforma

This partial IXIT proforma contained in the present document is provided for completion, when the related Abstract Test Suite is to be used against the Implementation Under Test (IUT).

Text in *italics* is a comment for guidance for the production of an IXIT, and is not to be included in the actual IXIT.

The completed partial IXIT will normally be used in conjunction with the completed ICS, as it adds precision to the information provided by the ICS.

9.1 E-UTRAN PIXIT

Table 9.1-1: CommonPIXIT

Parameter Name	Parameter Type	Default Value	Supported Values	Description
px_AccessPointName	octetstring			Access Point Name, as defined in TS 23.003 [48] and used in TS 24.008 [20], clause 10.5.6.1
px_AttachTypeTested	EUTRA_ATTACH_TESTED_Type	EPS_ATTACH_ONLY	EPS_ATTACH_ONLY, COMBINED_ATTACH	Attach Type to be tested, if UE supports both pc_Attach and pc_Combined_Attach
px_eAuthRAND	B128_Type	oct2bit('A3DE0C6D363E30C364A4078F1BF8D577'O)		Random Challenge
px_EllipsoidPointWithAltitude	O8_Type			Ellipsoid Point With Altitude value to be provided in Update UE location information (see 36.509 cl. 6.12)
px_HorizontalVelocity	O3_Type			Horizontal Velocity value to be provided in Update UE location information (see 36.509 cl. 6.12)
px_eJapanMCC_Band6	NAS_Mcc	'442'H		Japan MCC code to be used for Band 6. The same value will be used for E-UTRA and Inter-RAT cells. Type is different to that defined in TS 34.123-3 [7]
px_PWS_CB_DataPage1	charstring			ETWS or CMAS Page 1 warning data message
px_PWS_CB_DataPage2	charstring			ETWS or CMAS Page 2 warning data message
px_PWS_CB_DataPage3	charstring			ETWS or CMAS Page 3 warning data message
px_PWS_CB_DataPage4	charstring			ETWS or CMAS Page 4 warning data message
px_ETWS_DigitalSignature	O43_Type			ETWS Digital Signature
px_IPv4_Address1_UE	charstring			IPv4 Address connected to PDN1
px_IPv4_Address2_UE	charstring			IPv4 Address connected to PDN2
px_IPv4_Address1_NW	charstring			IPv4 Gateway Address in PDN1
px_Ipv4_Address2_NW	charstring			Ipv4 Gateway Address in PDN2
px_Ipv4_Address_HomeAgent	charstring			Ipv4 Home Agent Address
px_IPv6_Address1_UE	charstring			IPv6 Address connected to PDN1
px_IPv6_Address2_UE	charstring			IPv6 Address connected to PDN2
px_IPv6_Address1_NW	charstring			IPv6 Gateway Address in PDN1
px_Ipv6_Address2_NW	charstring			Ipv6 Gateway Address in PDN2
px_Ipv6_Address_HomeAgent	charstring			Ipv6 Home Agent Address
px_SMS_ChkMsgReceived	boolean	true		Whether the operator can check an MT Short Message received
px_SMS_MsgFrmt	charstring	"1"		UE which only supports PDU mode will be configured for text mode
px_RATComb_Tested	RATComb_Tested_Type	EUTRA_UTRA	EUTRA_UTRA,	This parameter represents the network RAT capability /

Parameter Name	Parameter Type	Default Value	Supported Values	Description
			EUTRA_GERAN, EUTRA_Only	preference and indicates which, if any is supported, RAT combination is to be tested.
px_SinglePLMN_Tested	SinglePLMN_Tested_Type	MultiPLMN	SinglePLMN, MultiPLMN	This parameter represents the network capability/preference to support multi PLMNs on the same test Band and indicates the preference of multi PLMNs or single PLMN test environment.
px_UE_CS_PS_UsageSetting_Tested	CS_PS_MODE	VOICE_CENTRIC	VOICE_CENTRIC, DATA_CENTRIC	Specifies which CS/PS mode is under test
px_UE_PS_UsageSetting_Tested	PS_MODE	VOICE_CENTRIC	VOICE_CENTRIC, DATA_CENTRIC	Specifies which PS mode is under test
px_UTRAN_ModeUnderTest	UTRAN_FDD_TDD	UTRAN_FDD	UTRAN_FDD, UTRAN_TDD	Specifies which radio access technology is being tested in UTRAN
px_TestLoopModeB_Delay	O1_Type	'5A'		This parameter represents the IP_PDU_delay to be used for UE test loop mode B in test cases, where long delay may be needed e.g. because of user interaction.

Table 9.1-2: E-UTRAN PIXIT

Parameter Name	Parameter Type	Default Value	Supported Values	Description
px_eTDDsubframeConfig	TDD_SubframeAssignment_Type	1		TDD uplink-downlink subframe configuration
px_ePrimaryBandChannelBandwidth	DI_Bandwidth_Type	n25		E-UTRA primary band channel bandwidth
px_ePrimaryFrequencyBand	FrequencyBand_Type	1		E-UTRA primary frequency band
px_eSecondaryFrequencyBand	FrequencyBand_Type	2		E-UTRA secondary frequency band
px_eSecondaryBandChannelBandwidth	DI_Bandwidth_Type	n25		E-UTRA secondary band channel bandwidth
px_NAS_CipheringAlgorithm	B3_Type	001'B		NAS Ciphering Algorithm (eea1)
px_NAS_IntegrityProtAlgorithm	B3_Type	001'B		NAS Integrity Algorithm (eia1)
px_RRC_CipheringAlgorithm	CipheringAlgorithm	eea1		Ciphering Algorithm
px_RRC_IntegrityProtAlgorithm	IntegrityProtAlgorithm	eia1		Integrity Algorithm
px_eMaxNumberROHC_ContextSessions	MaxNumberROHC_ContextSessions_Type	Cs16		Maximum number of ROHC context sessions

9.2 MultiRAT PIXIT

Table 9.2-1: GERAN PIXIT

Parameter Name	Parameter Type	Default Value	Supported Values	Description
px_GERAN_BandUnderTest	GERAN_BandUnderTestType	GSM_P900		Indicates which band is under test

Table 9.2-2: UTRAN PIXIT

Parameter Name	Parameter Type	Default Value	Supported Values	Description
px_UTRAN_CipheringAlgorithm	CipheringAlgorithm_r7	uea2	uea0, uea1, uea2	UTRAN Ciphering algorithm
px_UARFCN_TDD_D_Low	integer			Low Range downlink UARFCN value for LCR TDD
px_UARFCN_TDD_D_Mid	integer			Mid Range downlink UARFCN value for LCR TDD
px_UARFCN_TDD_D_High	integer			High Range downlink UARFCN value for LCR TDD
px_TDD_OperationBand	charstring			LCR TDD Operation Band

Table 9.2-3: CDMA2000 HRPD PIXIT

Parameter Name	Parameter Type	Default Value	Supported Values	Description
px_HRPD_BandClass	BandclassCDMA2000_Type	1		Band Class; Table 1.5-1 of C.S0057-E v1.0 Default value corresponds to 1.8 to 2.0 GHz PCS band
px_HRPD_SectorID_Cell15	SectorID_HRPD_Type	oct2bit('FEA00000000000000000000000000001'O)		Sector ID of Cell 15; Clause 13.9 of C.S0024-C v2.0
px_HRPD_SectorID_Cell16	SectorID_HRPD_Type	oct2bit('FEA00000000000000000000000000002'O)		Sector ID of Cell 16; Clause 13.9 of C.S0024-C v2.0
px_HRPD_SectorID_Cell17	SectorID_HRPD_Type	oct2bit('FEA00000000000000000000000000003'O)		Sector ID of Cell 17; Clause 13.9 of C.S0024-C v2.0
px_HRPD_SectorID_Cell18	SectorID_HRPD_Type	oct2bit('FEA00000000000000000000000000004'O)		Sector ID of Cell 18; Clause 13.9 of C.S0024-C v2.0
px_ColorCode	ColorCode_Type	64		Colour code of the subnet to which the sectors belong; Same for all HRPD cells
px_ColorCodeDiff	B32_Type	128		Colour code of the subnet to which the sectors belong; A different colour code than default
px_OpenLoopAdjust	OpenLoopAdjust_Type	10		The value of open loop adjust to be used by access terminals in the open loop power estimate, expressed as an unsigned value in units of 1 dB. The value used by the access terminal is -1 times the value of this field
px_UATI24	O3_Type	'123456'O		UATI to be allocated to the UE, clause 6.3.7.2.2 of C.S0024-C v2.0
px_MACIndex	integer	15		ReverseLinkMACIndex to be used. Allowed values 0...383 C.S0024-C v2.0 clause 12.4.1.3.2.2

Table 9.2-4: CDMA2000 1xRTT PIXIT

Parameter Name	Parameter Type	Default Value	Supported Values	Description
px_1XRTT_BaseId_Cell19	B16_Type	int2bit (39,16)		Base ID of Cell 19
px_1XRTT_BaseId_Cell20	B16_Type	int2bit (40,16)		Base ID of Cell 20
px_1XRTT_BaseId_Cell21	B16_Type	int2bit (41,16)		Base ID of Cell 21
px_1XRTT_BaseId_Cell22	B16_Type	int2bit (42,16)		Base ID of Cell 22
px_1XRTT_NID	B16_Type	int2bit (100,16)		default Network ID of 1xRTT Cells
px_1XRTT_TMSI_Def	O4_Type	'1234ABCD'O		TMSI to be used in 1XRTT
px_1XRTT_MinProtRev	ProtRev_Type	0		Minimum Protocol revision supported by Base Station
px_1XRTT_UserInfo_EncMode	EncryptionMode_Type	2		Encryption Mode Rijndael algorithm
px_1XRTT_Sig_EncMode	EncryptionMode_Type	2		Encryption Mode Rijndael algorithm
px_1XRTT_BandClass	BandclassCDMA2000_Type	1		Band Class; Table 1.5-1 of C.S0057 E v1.0. Default value corresponds to 1.8 GHz to 2.0 GHz PCS band
px_PowerDownRegEnabled	boolean	true		Parameter for power down reg in 1xRTT
px_1XRTT_Zone_Timer	B3_Type	'000'B		Zone timer sent in 'System Parameters Message' overhead message
px_RAND	B32_Type	'00001111000011111000011110000111'B		Random Challenge Data to be included along with mobility parameters in CSFBParametersResponseCDMA2000 or HandoverFromEUTRAPreparationRequest
px_RAND2	B32_Type	'00001111000011111000011110000111'B		Random Challenge Data to be included along with mobility parameters in CSFBParametersResponseCDMA2000 or HandoverFromEUTRAPreparationRequest

10   Postambles

The purpose of this clause is to specify postambles to bring the UE to a well defined state regardless of the UE state at the termination of main test body or of the SS conditions and values of the system information inherited from the test.

10.1   Postambles for E-UTRA to UTRA tests

This clause describes UE postamble procedures which are used at the end of inter-RAT test cases specified in TS 36.508 [3] so as to switch off the UE.

UE LTE and UTRAN postamble conditions are specified in table 10.1-1.

Table 10.1-1: UE postamble conditions

LTE UE attach type	UE UTRA CS/PS domain	Postamble condition
attach	pc_CS AND pc_PS	C1
	pc_PS AND NOT (pc_CS)	C2
combined_attach	pc_CS AND pc_PS	C3
	pc_CS AND NOT (pc_PS)	C4

10.1.1 UE postamble states and procedures for E-UTRA to UTRA

In order to bring the UE to the switched/powered off state, a number of procedures need to be executed in a hierarchical sequence, according to the reference end state specified in each test procedure sequence. The sequences and the identified procedures are shown in figure 10.1.1-1.
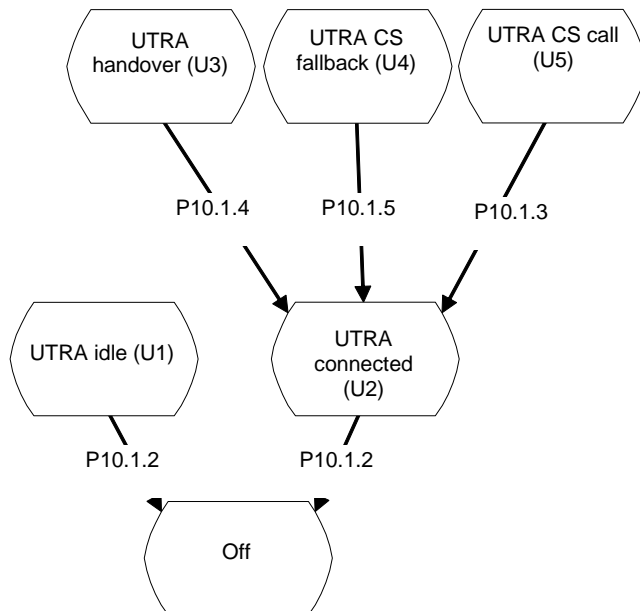

Figure 10.1.1-1: UE postamble procedures for E-UTRA / UTRA test cases

NOTE 1: Depending on the test case specifications the termination of a test case can be in any state of figure 10.1.1-1.

UE in UTRA state U2, U3, U4 and U5 may send data on the established radio bearer and shall be accepted and handled.

NOTE 2: NAS and AS security procedures during routing area update and handover are performed according to TS 33.401 [24], clauses 9.1.1 and 9.2.1 and TS 25.331 [36], clause 8.3.6.3.

10.1.2 Switch/Power off procedure

10.1.2.1 Procedure

Table 10.1.2.1-1: Switch/Power off procedure

Step	Procedure	Message Sequence	
		U - S	Message
1	The UE is powered off or switched off, (see ICS)	-	-
-	EXCEPTION: Steps 2 to 7 specify the behaviour if UE supports pc_SwitchOnOff.	-	-
-	EXCEPTION: Steps 2 to 4 are used only when the UE is in UTRA idle end state (U1).		
2	The UE transmits RRC CONNECTION REQUEST	-->	RRC CONNECTION REQUEST
3	The SS transmit a RRC CONNECTION SETUP	<--	RRC CONNECTION SETUP
4	The UE transmits an RRC CONNECTION SETUP COMPLETE message	-->	RRC CONNECTION SETUP COMPLETE
-	EXCEPTION: Step 5a1 specifies behaviour when the current UTRA cell is in NMO I and the UE is in condition: - C1 or - C3	-	-
5a1	The UE transmits an UPLINK DIRECT TRANSFER message or INITIAL DIRECT TRANSFER message when the UE is in UTRA idle end state (U1). This message includes a DETACH REQUEST message with the detach type='power switched off, GPRS/IMSI combined detach'	-->	DETACH REQUEST
-	EXCEPTION: Step 5b1 specifies behaviour when the current UTRA cell is in (NMO I or NMO II) and the UE is in condition C4	-	-
5b1	The UE transmits an UPLINK DIRECT TRANSFER message or INITIAL DIRECT TRANSFER message when the UE is in UTRA idle end state (U1). This message includes an IMSI DETACH INDICATION message	-->	IMSI DETACH INDICATION
-	EXCEPTION: Step 5c1 specifies behaviour when the current UTRA cell is in (NMO I or NMO II) and the UE is in condition C2	-	-
5c1	The UE transmits an UPLINK DIRECT TRANSFER message or INITIAL DIRECT TRANSFER message when the UE is in UTRA idle end state (U1). This message includes a DETACH REQUEST message with detach type='power switched off, PS detach''	-->	DETACH REQUEST
-	EXCEPTION: Steps 5d1 and 5d2 specify behaviour when the current UTRA cell is in NMO II and the UE is in condition: - C1 or - C3. Both detach messages (in steps 5d1 and 5d2) can be sent by UE in any order.	-	-

Step	Procedure	Message Sequence	
		U - S	Message
5d1	The UE transmits an UPLINK DIRECT TRANSFER message or INITIAL DIRECT TRANSFER message when the UE is in UTRA idle end state (U1) and this is the first message received. This message includes a DETACH REQUEST message with the detach type='power switched off, PS detach"	-->	DETACH REQUEST
5d2	The UE transmits an UPLINK DIRECT TRANSFER message or INITIAL DIRECT TRANSFER message when the UE is in UTRA idle end state (U1) and this is the first message received. This message includes an IMSI DETACH INDICATION message	-->	IMSI DETACH INDICATION
6	The SS transmits an RRC CONNECTION RELEASE message	<--	RRC CONNECTION RELEASE
7	The UE transmits a RRC CONNECTION RELEASE COMPLETE message	-->	RRC CONNECTION RELEASE COMPLETE

10.1.3 CC disconnect procedure

10.1.3.1 Procedure

Table 10.1.3.1-1: CC disconnect procedure

Step	Procedure	Message Sequence	
		U - S	Message
1	The SS transmits a DOWNLINK DIRECT TRANSFER message. This message includes a DISCONNECT message.	<--	DISCONNECT
2	The UE transmits an UPLINK DIRECT TRANSFER message. This message includes a RELEASE message.	-->	RELEASE
3	The SS transmits a DOWNLINK DIRECT TRANSFER message. This message includes a RELEASE COMPLETE message.	<--	RELEASE COMPLETE
-	EXCEPTION: Step 6 may happen in parallel to Step 4. Steps 5a to 5e are only performed if Step 6 has not already occured		
4	Wait for 5 seconds in case the UE sends the RAU on the same connection		
5a	The SS transmits an RRC CONNECTION RELEASE message	<--	RRC CONNECTION RELEASE
5b	The UE transmits a RRC CONNECTION RELEASE COMPLETE message	-->	RRC CONNECTION RELEASE COMPLETE
5c	The UE transmits RRC CONNECTION REQUEST	-->	RRC CONNECTION REQUEST
5d	The SS transmit a RRC CONNECTION SETUP	<--	RRC CONNECTION SETUP
5e	The UE transmits an RRC CONNECTION SETUP COMPLETE message	-->	RRC CONNECTION SETUP COMPLETE
6	The UE transmits an UPLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE REQUEST message with Update type ='Combined RA/LA Updated'	-->	ROUTING AREA UPDATE REQUEST
7	The SS transmits a DOWNLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE ACCEPT message.	<--	ROUTING AREA UPDATE ACCEPT
8	The UE transmits an UPLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE COMPLETE message.	-->	ROUTING AREA UPDATE COMPLETE

10.1.4 PS Routing Area Update procedure

10.1.4.1 Procedure

Table 10.1.4.1-1: PS Routing Area Update procedure

Step	Procedure	Message Sequence	
		U - S	Message
-	EXCEPTION: steps 1a1 to 1a5 specify the UE behaviour when the current UTRA cell is in NMO I and the UE is in condition: - C1 or - C3 and the UE is not registered to the LAC of the current UTRA cell	-	-
1a1	The UE transmits an UPLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE REQUEST message with Update type ='Combined RA/LA Updated'	-->	ROUTING AREA UPDATE REQUEST
1a2	Void	-	-
1a3	Void	-	-
1a4	The SS transmits a DOWNLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE ACCEPT message.	<--	ROUTING AREA UPDATE ACCEPT
1a5	The UE transmits an UPLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE COMPLETE message.	-->	ROUTING AREA UPDATE COMPLETE
-	EXCEPTION: steps 1b1 to 1b5 specify the UE behaviour when the current UTRA cell is in (NMO I or NMO II) and the UE is in condition: - C2 or - C3 and the UE is registered to the LAC of the current UTRA cell	-	-
1b1	The UE transmits an UPLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE REQUEST message with Update type ='RA Update'	-->	ROUTING AREA UPDATE REQUEST
1b2	Void	-	-
1b3	Void	-	-
1b4	The SS transmits a DOWNLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE ACCEPT message.	<--	ROUTING AREA UPDATE ACCEPT
1b5	The UE transmits an UPLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE COMPLETE message.	-->	ROUTING AREA UPDATE COMPLETE
-	EXCEPTION: steps 1c1 to 1c9 specify the UE behaviour when the current UTRA cell is in NMO II and the UE is in condition: - C1 or - C3 and the UE is not registered to the LAC of the current UTRA cell. The LOCATION UPDATE REQUEST message (step 1c6) can be received during the routing area updating procedure (steps 1c1 to 1c4).	-	-
1c1	The UE transmits an UPLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE REQUEST message with Update type ='RA Update'.	-->	ROUTING AREA UPDATE REQUEST

Step	Procedure	Message Sequence	
		U - S	Message
1c2	Void	-	-
1c3	Void	-	-
1c4	The SS transmits a DOWNLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE ACCEPT message.	<--	ROUTING AREA UPDATE ACCEPT
1c5	The UE transmits an UPLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE COMPLETE message.	-->	ROUTING AREA UPDATE COMPLETE
1c6	The UE transmits an UPLINK DIRECT TRANSFER message. This message includes a LOCATION UPDATING REQUEST message.	-->	LOCATION UPDATING REQUEST
1c7	The SS transmits a SECURITY MODE COMMAND message.	<--	SECURITY MODE COMMAND
1c8	The UE transmits a SECURITY MODE COMPLETE message.	-->	SECURITY MODE COMPLETE
1c9	The SS transmits a DOWNLINK DIRECT TRANSFER message. This message includes a LOCATION UPDATING ACCEPT	<--	LOCATION UPDATING ACCEPT
1c10	The EU transmits a UPLINK DIRECT TRANSFER message. This message includes a TMSI REALLOCATION COMPLETE	-->	TMSI REALLOCATION COMPLETE

10.1.5   CS fallback procedure

10.1.5.1   Procedure

Table 10.1.5.1-1: CS fallback procedure

Step	Procedure	Message Sequence	
		U - S	Message
-	EXCEPTION: In parallel to the events described in step 1a1 to 2a5 the steps specified in table 10.1.5.1-2 takes place.	-	-
-	EXCEPTION: Steps 1a1 and 1a2 specify the MO call procedure and step 1b1 specifies the MT call procedure.	-	-
1a1	The UE transmits an INITIAL DIRECT TRANSFER message including a CM SERVICE REQUEST message.	-->	CM SERVICE REQUEST
1a2	The SS transmits an UPLINK DIRECT TRNASFER message including a CM SERVICE REJECT with the reject cause #32 (Service option not supported)	<--	CM SERVICE REJECT
-	EXCEPTION: Step 1b1 specifies the MT call procedure.	-	-
1b1	The UE transmits an INITIAL DIRECT TRANSFER message including a PAGING RESPONSE message.	-->	PAGING RESPONSE
-	EXCEPTION: Steps 2a1 and 2a5 specify the location area update procedure when the current UTRA cell is in NMO II and the UE is in condition C3 and the UE is not registered to the LAC of the current UTRA cell.	-	-
2a1	The UE transmits an UPLINK DIRECT TRANSFER message. This message includes a LOCATION UPDATING REQUEST message.	-->	LOCATION UPDATING REQUEST

Step	Procedure	Message Sequence	
		U - S	Message
2a2	The SS transmits a SECURITY MODE COMMAND message.	<--	SECURITY MODE COMMAND
2a3	The UE transmits a SECURITY MODE COMPLETE message.	-->	SECURITY MODE COMPLETE
2a4	The SS transmits a DOWNLINK DIRECT TRANSFER message. This message includes a LOCATION UPDATING ACCEPT	<--	LOCATION UPDATING ACCEPT
2a5	The EU transmits a UPLINK DIRECT TRANSFER message. This message includes a TMSI REALLOCATION COMPLETE	-->	TMSI REALLOCATION COMPLETE
3	The SS transmits a SECURITY MODE COMMAND message.	<--	SECURITY MODE COMMAND
4	The UE transmits a SECURITY MODE COMPLETE message.	-->	SECURITY MODE COMPLETE
5	The SS transmits a DOWNLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE ACCEPT message.	<--	ROUTING AREA UPDATE ACCEPT
6	The UE transmits an UPLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE COMPLETE message.	-->	ROUTING AREA UPDATE COMPLETE
-	EXCEPTION: Steps 7a1 and 7a5 specify the combined routing updating procedure when the intial RAU procedure was for RA Only. This may occur either before, or after, steps 8 and 9	-	-
7a1	The UE transmits a ROUTING AREA UPDATE REQUEST message.	-->	ROUTING AREA UPDATE REQUEST
7a2	The SS transmits a SECURITY MODE COMMAND message.	<--	SECURITY MODE COMMAND
7a3	The UE transmits a SECURITY MODE COMPLETE message.	-->	SECURITY MODE COMPLETE
7a4	The SS transmits a DOWNLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE ACCEPT message.	<--	ROUTING AREA UPDATE ACCEPT
7a5	The UE transmits an UPLINK DIRECT TRANSFER message. This message includes a ROUTING AREA UPDATE COMPLETE message.	-->	ROUTING AREA UPDATE COMPLETE
-	EXCEPTION: Steps 7b1 and 7b4 specify the location updating procedure when the current UTRA cell is in network mode (NMO I or NMO II) and the UE is in condition C4 and the UE is not registered to the LAC of the current UTRA cell.	-	-
7b1	The UE transmits an UPLINK DIRECT TRANSFER message. This message includes a LOCATION UPDATING REQUEST message.	-->	LOCATION UPDATING REQUEST
7b2	The SS transmits a SECURITY MODE COMMAND message.	<--	SECURITY MODE COMMAND
7b3	The UE transmits a SECURITY MODE COMPLETE message.	-->	SECURITY MODE COMPLETE
7b4	The SS transmits a DOWNLINK DIRECT TRANSFER message. This message includes a LOCATION UPDATING ACCEPT	<--	LOCATION UPDATING ACCEPT
7b5	The EU transmits a UPLINK DIRECT TRANSFER message. This message includes a TMSI REALLOCATION COMPLETE	-->	TMSI REALLOCATION COMPLETE

Step	Procedure	Message Sequence	
		U - S	Message
8	The SS transmits an RRC CONNECTION RELEASE message.	<--	RRC CONNECTION RELEASE
9	The UE transmits an RRC CONNECTION RELEASE COMPLETE message.	-->	RRC CONNECTION RELEASE COMPLETE

Table 10.1.5.1-2: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The UE transmits a ROUTING AREA UPDATE REQUEST message.	-->	ROUTING AREA UPDATE REQUEST	-	-

10.2 Postambles for E-UTRAN to GERAN tests

This clause describes UE postamble procedures which are used at the end of inter-RAT test cases defined in
TS 36.508 [3] so as to switch off the UE. UE LTE and GERAN postamble transitions are specified in table 10.2-1.

Table 10.2-1: UE postamble conditions

LTE UE attach type	UE GERAN CS/PS domain	Postamble condition
attach	pc_GPRS	C1
combined attach	pc_GPRS	C2
	NOT pc_GPRS	C3

10.2.1 UE postamble states and procedures for E-UTRA to GERAN test cases

In order to bring the UE to the switched/powered off state there are a number of procedures that need to be executed in
a hierarchical sequence, according to the reference end state specified in each test procedure sequence. The sequences
and the identified procedures are shown in figure 10.2.1-1.
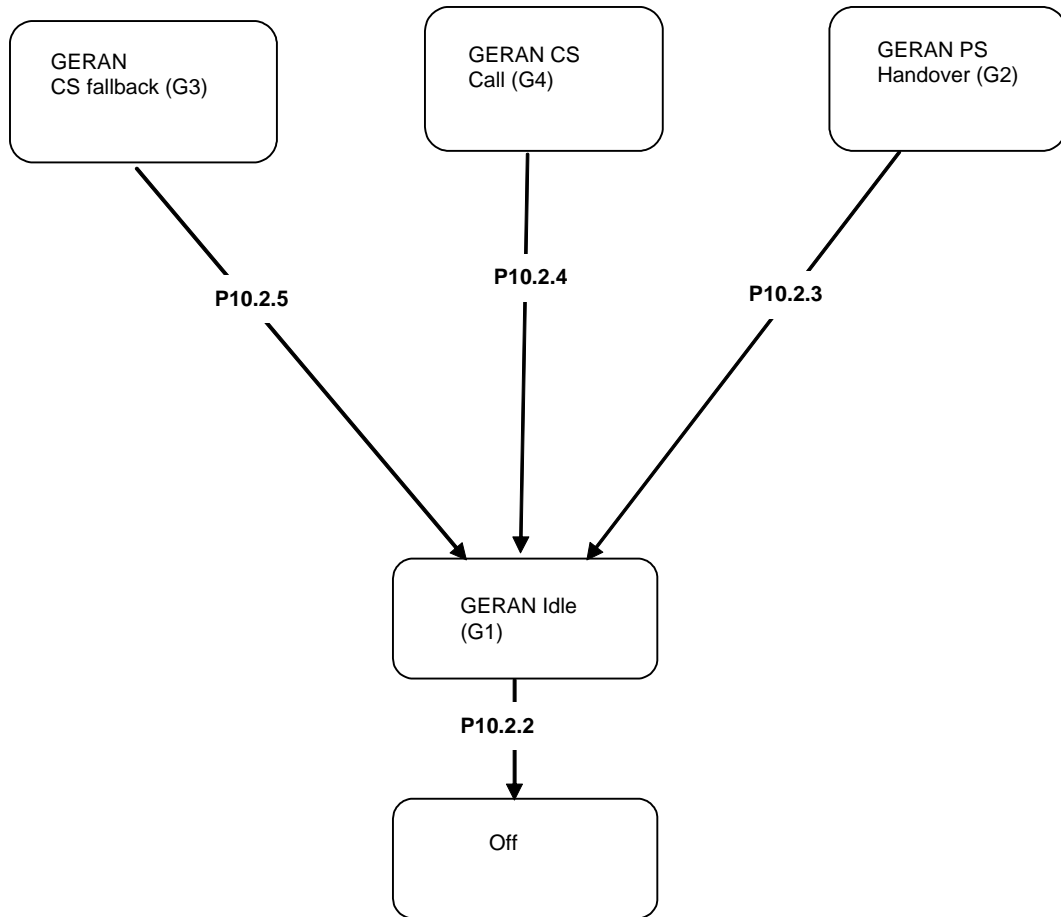
Figure 10.2.1-1: UE postamble procedures for E-UTRA / GERAN test cases

NOTE 1: Depending on the test case specifications the termination of a test case can be in any state of figure 10.2.1-1.

NOTE 2: The security procedures for interworking to GERAN are according to TS 33.401 [24] clauses 10.2.1 and 10.3.1.

10.2.2   Switch/Power off procedure

10.2.2.1   Procedure

Table 10.2.2.1-1: Switch/Power off procedure

Step	Procedure	Message Sequence	
		U - S	Message
1	The UE is powered off or switched off, (see ICS)	-	-
-	EXCEPTION: Steps 2a1 to 2c2 specify the behaviour if UE supports pc_SwitchOnOff.	-	-
-	EXCEPTION: Step 2a1 specifies behaviour when the GERAN cell is in (NMO I or NMO II) and UE is in condition C1	-	-
2a1	The UE transmits a DETACH REQUEST message	-->	DETACH REQUEST
-	EXCEPTION: Step 2b1 specifies behaviour when the GERAN cell is in (NMO I or NMO II) and UE is in condition C3	-	-
2b1	The UE transmits an IMSI DETACH INDICATION message	-->	IMSI DETACH INDICATION
-	EXCEPTION: Steps 2c1 and 2c2 specify behaviour when the GERAN cell is in NMO II and UE is in condition C2. The messages can be sent in any order	-	-
2c1	The UE transmits an IMSI DETACH INDICATION message	-->	IMSI DETACH INDICATION
2c2	The UE transmits a DETACH REQUEST message	-->	DETACH REQUEST

10.2.3 PS Handover procedure

10.2.3.1 Procedure

Table 10.2.3.1-1: PS handover procedure

Step	Procedure	Message Sequence	
		U - S	Message
-	EXCEPTION: Steps 1a1 and 1a3 specify the UE behaviour when GERAN cell is in NMO I and the UE is in condition C2 and the UE is not registered to the LAC of this cell.	-	-
1a1	The UE transmits a ROUTING AREA UPDATE REQUEST message with update type='Combined RA/LA Update'.	-->	ROUTING AREA UPDATE REQUEST
1a2	The SS transmits a ROUTING AREA UPDATE ACCEPT message.	<--	ROUTING AREA UPDATE ACCEPT
1a3	The UE transmits a ROUTING AREA UPDATE COMPLETE message.	-->	ROUTING AREA UPDATE COMPLETE
-	EXCEPTION: Steps 1b1 and 1b3 specify the location updating procedure when GERAN cell is in (NMO I or NMO II) and the UE is in condition C2 and the UE is registered to the LAC of this cell.	-	-
1b1	The UE transmits a ROUTING AREA UPDATE REQUEST message with update type='RA Update'.	-->	ROUTING AREA UPDATE REQUEST
1b2	The SS transmits a ROUTING AREA UPDATE ACCEPT message.	<--	ROUTING AREA UPDATE ACCEPT
1b3	The UE transmits a ROUTING AREA UPDATE COMPLETE message.	-->	ROUTING AREA UPDATE COMPLETE
-	EXCEPTION: Steps 1c1 and 1c6 specify the location updating procedure when GERAN cell is in NMO II and the UE is in condition C2 and the UE is not registered to the LAC of this cell.	-	-
1c1	The UE transmits a ROUTING AREA UPDATE REQUEST message with update type='RA Update'.	-->	ROUTING AREA UPDATE REQUEST
1c2	The SS transmits a ROUTING AREA UPDATE ACCEPT message.	<--	ROUTING AREA UPDATE ACCEPT
1c3	The UE transmits a ROUTING AREA UPDATE COMPLETE message.	-->	ROUTING AREA UPDATE COMPLETE
1c4	The UE transmits a LOCATION UPDATING REQUEST message.	-->	LOCATION UPDATING REQUEST
1c4A1	The UE transmits a *Classmark Change* message	-->	CLASSMARK CHANGE
-	EXCEPTION: The next step describes behaviour that depends on UE capability.	-	-
1c4A2	IF pc_UTRA THEN the UE transmits a *Utran Classmark Change* message.	-->	UTRAN CLASSMARK CHANGE.
1c5	The SS transmits a LOCATION UPDATING ACCEPT	<--	LOCATION UPDATING ACCEPT
1c6	The UE transmits a TMSI REALLOCATION COMPLETE		TMSI REALLOCATION COMPLETE

10.2.4 CC disconnect procedure

10.2.4.1 Procedure

Table 10.2.4.1-1: CC disconnect procedure

Step	Procedure	Message Sequence	
		U - S	Message
1	The SS transmits a DISCONNECT message.	<--	DISCONNECT
2	The UE transmits a RELEASE message.	-->	RELEASE
3	The SS transmits a RELEASE COMPLETE message.	<--	RELEASE COMPLETE
4	The SS transmits a CHANNEL RELEASE message.	<--	CHANNEL RELEASE

10.2.5 CS fallback procedure

10.2.5.1 Procedure

Table 10.2.5.1-1: CS fallback procedure MO call

Step	Procedure	Message Sequence	
		U - S	Message
-	EXCEPTION: Steps 1a1 and 1a2 specify the MO call procedure.	-	-
1a1	The UE transmits a CM SERVICE REQUEST message.	-->	CM SERVICE REQUEST
1a2	The SS transmits a CM SERVICE REJECT with the reject cause #32 (Service option not supported)	<--	CM SERVICE REJECT
-	EXCEPTION: Step 1b1 specifies the MT call procedure.	-	-
1b1	The UE transmits a PAGING RESPONSE message.	-->	PAGING RESPONSE
-	EXCEPTION: Steps 2a1 to 2a6 specify the procedure when GERAN cell is in NMO II and if the UE is in condition C2 and the UE is registered to the LAC of the current GERAN cell.	-	-
2a1	The UE transmits a LOCATION UPDATING REQUEST message.	-->	LOCATION UPDATING REQUEST
2a1A1	The UE transmits a *Classmark Change* message	-->	CLASSMARK CHANGE
-	EXCEPTION: The next step describes behaviour that depends on UE capability.	-	-
2a1A2	IF pc_UTRA THEN the UE transmits a *Utran Classmark Change* message.	-->	UTRAN CLASSMARK CHANGE.
2a2	The SS transmits a LOCATION UPDATING ACCEPT	<--	LOCATION UPDATING ACCEPT
2a3	The UE transmits a TMSI REALLOCATION COMPLETE		TMSI REALLOCATION COMPLETE
2a4	The UE transmits a ROUTING AREA UPDATE REQUEST message.	-->	ROUTING AREA UPDATE REQUEST
2a5	The SS transmits a ROUTING AREA UPDATE ACCEPT message.	<--	ROUTING AREA UPDATE ACCEPT
2a6	The UE transmits a ROUTING AREA UPDATE COMPLETE message.	-->	ROUTING AREA UPDATE COMPLETE
-	EXCEPTION: Steps 2b1 to 2b3 specify the location updating procedure when GERAN cell is in (NMO I or NMO II) and if the UE is in condition C3 and the UE is not registered to the LAC of the current GERAN cell	-	-
2b1	The UE transmits a LOCATION UPDATING	-->	LOCATION UPDATING REQUEST

Step	Procedure	Message Sequence	
		U - S	Message
	REQUEST message.		
2b1A1	The UE transmits a *Classmark Change* message	-->	CLASSMARK CHANGE
-	EXCEPTION: The next step describes behaviour that depends on UE capability.	-	-
2b1A2	IF pc_UTRA THEN the UE transmits a *Utran Classmark Change* message.	-->	UTRAN CLASSMARK CHANGE.
2b2	The SS transmits a LOCATION UPDATING ACCEPT	<--	LOCATION UPDATING ACCEPT
2b3	The UE transmits a TMSI REALLOCATION COMPLETE		TMSI REALLOCATION COMPLETE
-	EXCEPTION: Steps 2c1 to 2c3 specify the routing area updating procedure when the GERAN cell is in NMO I and the UE is in condition C2 and the UE is not registered to the LAC of the current GERAN cell	-	-
2c1	The UE transmits a ROUTING AREA UPDATE REQUEST message with update type = 'Combined RA/LA update'.	-->	ROUTING AREA UPDATE REQUEST
2c2	The SS transmits a ROUTING AREA UPDATE ACCEPT message.	<--	ROUTING AREA UPDATE ACCEPT
2c3	The UE transmits a ROUTING AREA UPDATE COMPLETE message.	-->	ROUTING AREA UPDATE COMPLETE

10.3 Postambles for E-UTRA test cases

This clause describes UE postamble states which can be used in the post condition of E-UTRA test cases defined in TS 36.523-1 [1]. The clause also specifies a set of procedures to bring the UE into these states.

10.3.1 UE postamble states and procedures for E-UTRA test cases

In order to bring the UE to switched/powered off state there are some procedures that need to be executed. The identified procedures are shown in figure 10.3.1-1.
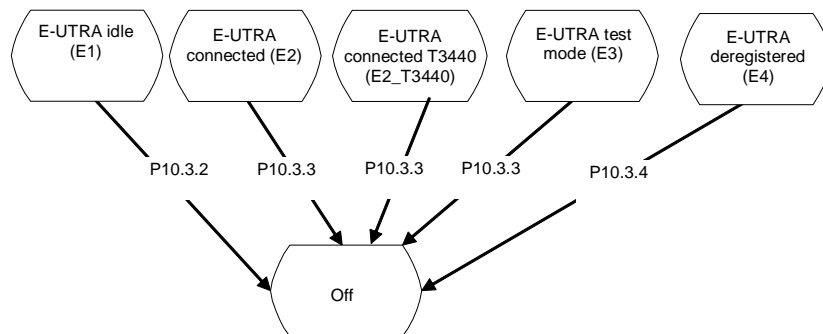
Figure 10.3.1-1: UE postamble states and procedures for E-UTRA

10.3.2 Switch/Power off procedure in State E1

10.3.2.1 Procedure

Table 10.3.2.1-1: Switch/Power off procedure

Step	Procedure	Message Sequence	
		U - S	Message
1	The UE is powered off or switched off, (see ICS)	-	-
-	EXCEPTION: Steps 2a1 to 2a4 specify behaviour if the UE supports pc_SwitchOnOff	-	-
2a1	UE transmits an *RRCConnectionRequest* message.	-->	RRC: *RRCConnectionRequest*
2a2	SS transmit an *RRCConnectionSetup* message.	<--	RRC: *RRCConnectionSetup*
-	EXCEPTION: Steps 2a3Aa1 to 2a3Aa6 specify optional behaviour if the UE has previously performed IMS registration	-	-
2a3Aa1	The UE transmits an *RRCConnectionSetupComplete* message to confirm the successful completion of the connection establishment and to initiate the IMS signalling procedure by including the SERVICE REQUEST message.	-->	RRC: *RRCConnectionSetupComplete* NAS: SERVICE REQUEST
2a3Aa2	The SS transmits a *SecurityModeCommand* message to activate AS security.	<--	RRC: *SecurityModeCommand*
2a3Aa3	The UE transmits a *SecurityModeComplete* message and establishes the initial security configuration.	-->	RRC: *SecurityModeComplete*
2a3Aa4	The SS configures a new data radio bearer, associated with the default EPS bearer context. The *RRCConnectionReconfiguration* message is using condition SRB2-DRB(1, 0). The DRB associated with default EPS bearer context obtained during the attach procedure is established	<--	RRC: *RRCConnectionReconfiguration*
	EXCEPTION: In parallel to the event described in step 2a3Aa5 below, the behaviour in TS 34.229-1[40] Annex C.30 occurs. (IMS de-registration)	-	-
2a3Aa5	The UE transmits an *RRCConnectionReconfigurationComplete* message to confirm the establishment of the new data radio bearer, associated with the default EPS bearer context.	-->	RRC: *RRCConnectionReconfigurationComplete*
2a3Aa6	The UE initiates the Detach procedure by sending DETACH REQUEST	-->	NAS: DETACH REQUEST
	EXCEPTION : Step 2a3Ba1 below specifies the behaviour if the UE has not previously performed IMS registration		
2a3Ba1	The UE transmits an *RRCConnectionSetupComplete* message to confirm the successful completion of the connection establishment and to initiate the Detach procedure by including the DETACH REQUEST message.	-->	RRC: *RRCConnectionSetupComplete* NAS: DETACH REQUEST
2a4	The SS transmits an RRC CONNECTION RELEASE message	<--	RRC CONNECTION RELEASE

10.3.3 Switch/Power off procedure in State E2 and E3

10.3.3.1 Procedure for E2 and E3

Table 10.3.3.1-1: Switch/Power off procedure

Step	Procedure	Message Sequence	
		U - S	Message
1	The UE is powered off or switched off (see ICS)	-	-
-	EXCEPTION: Steps 2a1 to 2a2 specify behaviour if the UE supports pc_SwitchOnOff	-	-
-	EXCEPTION : Step 2a1Aa1 to 2a1Aa2 below specifies optional behaviour if the UE has previously performed IMS registration	-	-
2a1Aa 1 – 2a1Aa 2	The UE performs the procedure described in TS 34.229-1[40] Annex C.30 (IMS de-registration)	-	-
2a1	The UE transmits DETACH REQUEST	-->	DETACH REQUEST
2a2	The SS transmits an RRC CONNECTION RELEASE message	<--	RRC CONNECTION RELEASE

10.3.3.2 Procedure for E2_T3440

Table 10.3.3.2-1: RRC release and switch/power off procedure

Step	Procedure	Message Sequence	
		U - S	**Message**
1	The SS transmits an RRC CONNECTION RELEASE message	<--	RRC CONNECTION RELEASE
2	The SS waits for 5s to ensure that the UE goes to RRC_IDLE state.	-	
3	The UE is powered off or switched off (see ICS)	-	-
-	EXCEPTION: Steps 4a1 to 4a4 specify behaviour if the UE supports pc_SwitchOnOff	-	-
4a1	UE transmits an *RRCConnectionRequest* message.	-->	RRC: *RRCConnectionRequest*
4a2	SS transmit an *RRCConnectionSetup* message.	<--	RRC: *RRCConnectionSetup*
-	EXCEPTION: Steps 4a3Aa1 to 4a3Aa6 specify optional behaviour is the UE has previously performed IMS registration	-	-
4a3Aa 1	The UE transmits an *RRCConnectionSetupComplete* message to confirm the successful completion of the connection establishment and to initiate the IMS signalling procedure by including the SERVICE REQUEST message.	-->	RRC: *RRCConnectionSetupComplete* NAS: SERVICE REQUEST
4a3Aa 2	The SS transmits a *SecurityModeCommand* message to activate AS security.	<--	RRC: *SecurityModeCommand*
4a3Aa 3	The UE transmits a *SecurityModeComplete* message and establishes the initial security configuration.	-->	RRC: *SecurityModeComplete*
4a3Aa 4	The SS configures a new data radio bearer, associated with the default EPS bearer context. The *RRCConnectionReconfiguration* message is using condition SRB2-DRB(1, 0). The DRB associated with default EPS bearer context obtained during the attach procedure is established	<--	RRC: *RRCConnectionReconfiguration*
-	EXCEPTION: In parallel to the event described in step 4a3Aa5 below, the behaviour in TS 34.229-1[40] Annex C.30 occurs. (IMS de-registration)	-	-
4a3Aa 5	The UE transmits an *RRCConnectionReconfigurationComplete* message to confirm the establishment of the new data radio bearer, associated with the default EPS bearer context.	-->	RRC: *RRCConnectionReconfigurationComplete*
4a3Aa 6	The UE initiates the Detach procedure by sending DETACH REQUEST	-->	NAS: DETACH REQUEST
-	EXCEPTION : Step 4a3Ba1 below specifies the behaviour if the UE has not previously performed IMS registration	-	
4a3 Ba1	The UE transmits an *RRCConnectionSetupComplete* message to confirm the successful completion of the connection establishment and to initiate the Detach procedure by including the DETACH REQUEST message.	-->	RRC: *RRCConnectionSetupComplete* NAS: DETACH REQUEST
4a4	The SS transmits an RRC CONNECTION RELEASE message	<--	RRC CONNECTION RELEASE

10.3.4 Switch/Power off procedure in State E4

10.3.4.1 Procedure

Table 10.3.4.1-1: Switch/Power off procedure

Step	Procedure	Message Sequence	
		U - S	Message
1	The UE is powered off or switched off (see ICS)	-	-

10.4 Postambles for E-UTRA to HRPD test cases

This clause describes UE postamble states which can be used in the post condition of E-UTRA test cases defined in TS 36.523-1 [1]. The clause also specifies a set of procedures to bring the UE into these states.

10.4.1 UE postamble procedures for E-UTRA to HRPD (No Pre-Registration)

10.4.1.1 Registration on HRPD Cell

Table 10.4.1.1: Registration on HRPD Cell procedure

Step	Procedure	Message Sequence	
		U - S	Message
1	The UE transmits a *UATIRequest* message.	-->	*UATIRequest*
2	The SS transmits *UATIAssignment* message	<--	*UATIAssignment*
3	The UE transmits *UATIComplete* message	-->	*UATIComplete*
4	The UE transmits *ConnectionRequest* message .	-->	*ConnectionRequest*
5	The SS transmits a *TrafficChannelAssignment* message .	<--	*TrafficChannelAssignment*
6	The UE transmits *TrafficChannelcomplete* .	-->	*TrafficChannelcomplete*
7	The UE transmits *ConfigurationRequest* message for SCP configuration .	-->	*SCP:ConfigurationRequest*
8	The SS transmits a *ConfigurationResponse* message for SCP configuration .	<--	*SCP:ConfigurationResponse*
9	The UE transmits *ConfigurationRequest* message for Stream protocol .	-->	*Stream:ConfigurationRequest*
10	The SS transmits a *ConfigurationResponse* message for Stream protocol accepting EMPA bound to service network .	<--	*Stream: ConfigurationResponse*
11	The UE transmits *EMPA ConfigurationRequest* message .	-->	*EMPA:ConfigurationRequest*
12	The SS transmits an *EMPA ConfigurationResponse* message .	<--	*EMPA: ConfigurationResponse*
13	The UE transmits *ConfigurationComplete* message .	-->	*ConfigurationComplete*
14	Optionally session negotiation initiated by the SS might take place	<-->	-
15	Optionally device level authentication may take place .	<-->	-
16	Optionally Location Update procedure may take place if the SS is configured to support it.	<-->	-
17	PPP LCP negotiation is performed between the UE and the SS. EAP-AKA is selected as the authentication protocol.	<-->	-
18	Tunnelled EAP-AKA is performed between the UE and the SS.	<-->	-
19	The UE transmits *VSNCP Configure-Request* message, including a PDN-ID, PDN Type,	-->	*VSNCP: Configure-Request*

Step	Procedure	Message Sequence	
		U - S	Message
	APN, PDN Address with empty content, Protocol Configuration Options, and Attach Type = "handover". The Address Allocation Preference option contained in the Protocol Configuration Options indicates whether the UE wants to perform the IP address allocation during the attach procedure or deferred IPv4 address allocation. PDN Type indicates the UE's IP capability (IPv4, IPv6 or IPv4/v6)		
20	The SS transmits a *VSNCP Configure-Ack* message.	<--	*VSNCP: Configure-Ack*
21	The SS transmits a *VSNCP Configure-Request* message including the PDN-ID configuration option.	<--	*VSNCP: Configure-Request*
22	The UE transmits *VSNCP Configure-Ack* message.	-->	*VSNCP :Configure-Ack*
23	Optionally IPv4 address allocation by DHCPv4 may occur (depending on the Address Allocation Preference indicated by the UE at Step 19).	<-->	-
24	Optionally Link global IPv6 address configuration by ICMPv6 may occur (depending on the Address Allocation Preference indicated by the UE at Step 19).*solicitation* message.	<-->	-

10.4.1.2 Detach on HRPD Cell

Table 10.4.1.2: Detach on HRPD Cell procedure

Step	Procedure	Message Sequence	
		U - S	Message
1	The UE transmits PPP:LCP Terminate-Request	-->	LCP:Terminate-Request
2	The SS transmits PPP: LCP Terminate-Ack	<--	LCP:Terminate-Ack
3	the UE and SS perform Session update to release the reservations	<-->	-

11 Guidelines on test execution

This clause provides the guidelines on test executions.

The restriction on test case execution as listed in this clause is due to the restriction of bandwidth to accommodate the necessary number of radio frequencies for the specific operating Band as used by the test cases.

11.1 EUTRA single technology

This clause provides the guidelines for the test cases to be executed on the pure EUTRA test configuration.

A test case using more than one radio frequency, i.e. using the radio frequencies f2 or f3 or f4 specified in TS 36.508 [3], shall avoid to be executed on operating:

Band 12 with 10MHz bandwidth,

Band 13,

Band 17 with 10MHz bandwidth,

Band 18.

The list containing such test cases is given below:

6.1.1.1, 6.1.1.2, 6.1.1.3, 6.1.1.6, 6.1.2.7, 6.1.2.8, 6.1.2.9, 6.1.2.11, 6.1.2.13, 6.1.2.15, 6.1.2.17, 6.1.2.18, 6.3.1, 6.3.5, 6.3.6, 6.3.9, 6.3.10,

8.1.3.4, 8.1.3.5, 8.2.4.6, 8.3.1.3, 8.3.1.3a, 8.3.1.4, 8.3.1.6, 8.3.1.9, 8.3.1.10, 8.3.1.11, 8.3.4.2, 8.3.4.3, 8.3.4.5, 8.6.2.2, 8.6.2.3a, 8.6.2.8, 8.6.2.10, 8.6.2.13, 8.6.4.2, 8.6.4.3, 8.6.4.6, 8.6.6.2, 8.6.6.3, 8.6.8.6,

9.2.1.1.1a, 9.2.1.1.7, 9.2.1.1.13, 9.2.1.1.15, 9.2.1.1.16, 9.2.1.2.1, 9.2.1.2.10, 9.2.1.2.12, 9.2.1.2.14, 9.2.3.2.1, 9.2.3.2.12, 9.2.3.2.15, 9.2.3.2.16,

11.2.6, 11.2.7,

13.4.1.2.

A test case using more than two radio frequencies, i.e. using the radio frequencies f3 or f4 specified in TS 36.508 [3], shall avoid to be executed on operating:

Band 6,

Band 11,

Band 14,

Band 17 with 5MHz bandwidth,

Band 23 with 10MHz bandwidth,

Band 38

Band 39

The list containing such test cases is given below:

6.1.1.1, 6.1.1.2, 6.1.1.3, 6.1.1.6, 6.1.2.7, 6.1.2.8, 6.1.2.9, 6.1.2.15,

8.1.3.5, 8.3.1.4, 8.6.2.13, 8.6.4.3,

9.2.1.1.1a, 9.2.1.1.7, 9.2.1.1.15.

A test case using more than three radio frequencies, i.e. using the radio frequency f4 specified in TS 36.508 [3], shall avoid to be executed on operating:

Band 12 with 5MHz bandwidth,

Band 19,

Band 20,

Band 21,

Band 27,

Band 34.

The list containing such test cases is given below:

6.1.1.1, 6.1.1.2, 6.1.1.6,

9.2.1.1.7.

11.1.1   Replacement of test case execution

In case of bandwidth limitation for accommodation of more frequencies, a number of test cases can be replaced with the corresponding mirror test cases without affecting the test coverage. The table 11.1.1-1 shows the possible replacements. Only one of the paired test cases is required for execution.

Table 11.1.1-1: Replacement of test cases

Original test case	Replacing test case
6.1.1.1	6.1.1.1b
6.1.1.2	6.1.1.2a
6.1.1.3	6.1.1.3b
6.1.1.6	6.1.1.6a
6.1.2.7	6.1.2.7a
6.1.2.8	6.1.2.8a
6.1.2.9	6.1.2.9a
8.3.1.9	8.3.1.9a
8.3.1.11	8.3.1.11a
9.2.1.1.1a	9.2.1.1.1b
9.2.1.1.7	9.2.1.1.7a
9.2.1.1.13	9.2.1.1.13a
9.2.1.1.15	9.2.1.1.15a
9.2.1.1.16	9.2.1.1.16a

11.2 EUTRA – UTRA - GERAN

This clause contains the guidelines for the EUTRA interRAT test cases to be executed on the different test configurations: with only UTRA configured, with only GERAN configured or with UTRA-GERAN both configured. Whether or not an EUTRA frequency band overlaps the UTRA band, the dependency will affect the restrictions of the test execution on this band.

Editor's note: an EUTRA band overlaps the GSM band is FFS.

11.2.1   UTRA configured – GERAN not configured

This clause provides the guidelines for the EUTRA interRAT test cases where UTRA is configured, while GERAN is either not needed or not configured.

11.2.1.1   EUTRA band overlapping UTRA band

The restriction on test case execution as listed in this clause is due to the bandwidth of an EUTRA Band accommodating the necessary number of EUTRA or EUTRA, UTRA radio frequencies if an E-UTRA band overlaps the UTRA Band. A test case using more than one radio frequency, on the same EUTRA and UTRA band, shall avoid to be executed on operating

Band 12 with 10MHz bandwidth,

Band 13,

Band 17 with 10MHz bandwidth,

Band 18.

The list containing such test cases is given below:

6.2.1.2, 6.2.1.3, 6.2.2.1, 6.2.2.5, 6.2.2.8, 6.2.3.3, 6.2.3.3a, 6.2.3.4, 6.2.3.4a, 6.2.3.5, 6.2.3.5a, 6.2.3.6, 6.2.3.13, 6.2.3.31, 6.2.3.32, 6.2.3.33, 6.3.3, 6.3.4, 6.3.7, 6.3.8, 6.3.11, 6.3.12,

8.1.3.6, 8.1.3.6a, 8.1.3.7, 8.3.2.3, 8.3.2.3a, 8.3.2.4, 8.3.3.2, 8.3.4.4, 8.4.1.2, 8.4.1.4, 8.4.1.5, 8.4.2.2, 8.4.2.4, 8.5.2.1, 8.6.3.1, 8.6.5.1, 8.6.7.1, 8.7.1,

9.2.1.1.11, 9.2.1.1.12, 9.2.1.2.1b, 9.2.1.2.1c, 9.2.1.2.1d, 9.2.1.2.5, 9.2.1.2.8, 9.2.1.2.9, 9.2.1.2.11, 9.2.1.2.13, 9.2.1.2.15, 9.2.2.1.3, 9.2.2.1.10, 9.2.3.1.6, 9.2.3.1.10, 9.2.3.1.11, 9.2.3.1.12, 9.2.3.1.15, 9.2.3.1.15a, 9.2.3.1.17, 9.2.3.1.18, 9.2.3.1.18a, 9.2.3.2.1a, 9.2.3.2.1b, 9.2.3.2.1c, 9.2.3.2.3, 9.2.3.2.5, 9.2.3.2.6, 9.2.3.2.7, 9.2.3.2.8, 9.2.3.2.9, 9.2.3.2.11, 9.2.3.2.13, 9.2.3.2.14, 9.2.3.3.1, 9.2.3.3.2, 9.2.3.3.3, 9.2.3.3.4, 9.2.3.3.5, 9.2.3.3.5a, 9.2.3.3.6, 9.3.1.4, 9.3.1.5, 9.3.1.6,

11.2.10, 11.2.11,

13.1.2, 13.1.2a, 13.1.3, 13.1.4, 13.1.5, 13.1.15, 13.1.16, 13.3.2.1, 13.4.2.1, 13.4.2.4, 13.4.3.1, 13.4.3.2, 13.4.3.4, 13.4.2.6, 13.4.3.7, 13.4.3.8, 13.4.3.9, 13.4.3.10, 13.4.3.11, 13.4.3.12, 13.4.3.13, 13.4.3.14, 13.4.3.16.

A test case using more than two radio frequencies on the same EUTRA and UTRA band shall avoid to be executed on operating:

Band 6,

Band 11,

Band 14,

Band 17 with 5MHz bandwidth,

Band 23 with 10MHz bandwidth,

Band 38,

Band 39.

The list containing such test cases is given below:

6.2.1.2, 6.2.1.3,

9.2.1.2.9, 9.2.1.2.11, 9.2.1.2.13, 9.2.3.1.15, 9.2.3.1.18, 9.2.3.2.5, 9.2.3.2.6, 9.2.3.2.7, 9.2.3.2.8, 9.2.3.2.11, 9.2.3.2.13, 9.2.3.2.14.

A test case using more than three radio frequencies, on the same EUTRA and UTRA band shall avoid to be executed on operating

Band 12 with 5MHz bandwidth,

Band 19,

Band 20,

Band 21,

Band 27,

Band 34.

The list containing such test cases is given below:

9.2.1.2.13, 9.2.3.2.13.

11.2.1.2 EUTRA band not overlapping UTRA band

The restriction on test case execution as listed in this clause is due to the bandwidth of an EUTRA Band accomodating the necessary number of EUTRA radio frequencies. A test case using more than one radio frequency shall avoid to be executed on E-UTRA operating

Band 12 with 10MHz bandwidth,

Band 13,

Band 17 with 10MHz bandwidth,

Band 18.

The list containing such test cases is given below:

6.2.1.2, 6.2.1.3,

9.2.1.2.9, 9.2.1.2.11, 9.2.1.2.13, 9.2.3.1.15, 9.2.3.1.18, 9.2.3.2.5, 9.2.3.2.6, 9.2.3.2.7, 9.2.3.2.8, 9.2.3.2.11, 9.2.3.2.13, 9.2.3.2.14,

A test case using more than two radio frequencies shall avoid to be executed on E-UTRA operating

Band 6,

Band 11,

Band 14,

Band 17 with 5MHz bandwidth,

Band 23 with 10MHz bandwidth,

Band 38,

Band 39.

The list containing such test cases is given below:

9.2.1.2.13, 9.2.3.2.13.

11.2.2 GERAN configured - UTRA not configured

This clause provides the guidelines for the EUTRA/GERAN test cases where UTRA is either not needed or not configured. The restriction on test case execution as listed in this clause is due to the restriction of bandwidth of an EUTRA Band accomodating the necessary number of EUTRA radio frequencies.

A test case using more than one radio frequency shall avoid to be executed on E-UTRA operating

Band 12 with 10MHz bandwidth,

Band 13,

Band 17 with 10MHz bandwidth,

Band 18.

The list containing such test cases is given below:

6.2.1.4, 6.2.3.17, 6.2.3.18,

8.3.2.2,

9.2.1.2.9, 9.2.1.2.11, 9.2.1.2.13, 9.2.3.1.15, 9.2.3.1.18, 9.2.3.2.5, 9.2.3.2.6, 9.2.3.2.7, 9.2.3.2.8, 9.2.3.2.11, 9.2.3.2.13, 9.2.3.2.14.

A test case using more than two radio frequencies, i.e. using the radio frequencies f3 or f4 specified in TS 36.508 [3], shall avoid to be executed on operating:

Band 6,

Band 11,

Band 14,

Band 17 with 5MHz bandwidth,

Band 23 with 10MHz bandwidth,

Band 38

Band 39

The list containing such test cases is given below:

9.2.1.2.13, 9.2.3.2.13.

11.2.3   Neither UTRA nor GERAN configured

Certain EMM test cases can be executed as EUTRA_Only configuration despite of UTRA or GERAN test branches included in the test cases. The restriction on test case execution as listed in this clause is due to the bandwidth of an EUTRA Band accomodating the necessary number of EUTRA radio frequencies.

A test case using more than one radio frequency shall avoid to be executed on E-UTRA operating

Band 12 with 10MHz bandwidth,

Band 13,

Band 17 with 10MHz bandwidth,

Band 18.

The list containing such test cases is given below:

9.2.3.1.15, 9.2.3.1.18.

11.2.4   Both UTRA and GERAN configured

This clause provides the guidelines for the EUTRA - UTRA - GERAN test cases where three RAT technologies are simultaneously configured.

11.2.4.1   EUTRA band overlapping UTRA band

The restriction on test case execution as listed in this clause is due to the bandwidth of an EUTRA Band accommodating the necessary number of EUTRA or EUTRA, UTRA radio frequencies if an E-UTRA band overlaps the UTRA Band.

A test case using more than one radio frequency shall avoid to be executed on E-UTRA operating

Band 12 with 10MHz bandwidth,

Band 13,

Band 17 with 10MHz bandwidth,

Band 18.

The list containing such test cases is given below:

6.2.1.1, 8.3.2.5, 8.3.2.6,

9.2.1.2.6, 9.2.1.2.7, 11.2.8

A test case using more than two radio frequencies, i.e. using the radio frequencies f3 or f4 specified in TS 36.508 [3], shall avoid to be executed on operating:

Band 6,

Band 11,

Band 14,

Band 17 with 5MHz bandwidth,

Band 23 with 10MHz bandwidth,

Band 38

Band 39

The list containing such test cases is given below:

6.2.1.1.

11.2.4.2   EUTRA band not overlapping UTRA band

The restriction on test case execution as listed in this clause is due to the restriction of bandwidth of an EUTRA Band accomodating the necessary number of EUTRA radio frequencies.

A test case using more than one radio frequency shall avoid to be executed on E-UTRA operating

Band 12 with 10MHz bandwidth,

Band 13,

Band 17 with 10MHz bandwidth,

Band 18.

The list containing such test cases is given below:

6.2.1.1

11.2.5   Replacement of test case execution

In case of bandwidth limitation for accommodation of more frequencies, a number of test cases can be replaced with the corresponding mirror test cases without affecting the test coverage. The table 11.2.1.5-1 shows the possible replacements. Only one of the paired test cases is required for execution.

Table 11.2.5-1: Replacement of interRAT test cases

Original test case	Replacing test case
9.2.3.1.15	9.2.3.1.15a
9.2.3.1.18	9.2.3.1.18a

11.3   Guidelines for EUTRA inter-band

The restriction on test case execution as listed in this clause is due to the restriction of bandwidth of an EUTRA band accomodating the necessary number of EUTRA radio frequencies. The inter-band test includes also EUTRA FDD-TDD and inter-band carrier aggregation tests.

11.3.1   Primary operating band

A test case using more than one radio frequency on the first operating band, shall avoid to be executed on operating

Band 12 with 10MHz bandwidth,

Band 13,

Band 17 with 10MHz bandwidth,

Band 18.

The list containing such test cases is given below:

6.1.2.15a, 8.1.3.12.

11.3.2   Secondary operating band for inter-band cells

Test case using more than one radio frequency, on the second operating band, shall avoid to be executed on operating

Band 12 with 10MHz bandwidth,

Band 13,

Band 17 with 10MHz bandwidth,

Band 18.

The list containing such test cases is given below:

6.1.1.1a, 6.1.1.3a, 6.1.1.4a, 6.1.2.16, 8.1.3.11a, 8.2.4.13a, 8.2.4.14a, 8.3.1.12a, 8.3.1.14a, 8.6.4.4.

11.4   Guidelines for EUTRA CA

The restriction on CA test case execution as listed in this clause is due to the restriction of bandwidth of an EUTRA CA band accomodating the necessary number of EUTRA radio frequencies.

11.4.1   CA contiguous Intra-band operation

Test case using more than two radio frequencies, i.e. using the radio frequencies f3 or f4 specified in TS 36.508 [3], shall avoid to be executed on E-UTRA CA Configuration:

CA_38C.

The list containing such test cases is given below:

8.2.4.17.1, 8.2.4.19.1, 8.2.4.21.1

11.4.2   CA Inter-band operation

Test case using more than one radio frequency on the secondary band, i.e. using the radio frequency f6 specified in TS 36.508 [3], shall avoid to be executed on E-UTRA CA Configuration:

CA_1A-19A,

CA_1A-21A,

CA_4A-13A,

CA_2A-17A,

CA_4A-17A.

The list containing such test cases is given below:

8.2.4.17.2, 8.2.4.19.2, 8.2.4.21.2