12 Transceiver

12.1 Conducted spurious emissions

12.1.1 MS allocated a channel

12.1.1.1 Definition

Conducted spurious emissions, when the MS has been allocated a channel, are emissions from the antenna connector at frequencies other than those of the carrier and sidebands associated with normal modulation.

12.1.1.2 Conformance requirement

1. The conducted spurious power emitted by the MS, when allocated a channel, shall be no more than the levels in table 12.1.

   1.1 Under normal voltage conditions; 3GPP TS 45.005, subclauses 4.3 and 4.3.3.

   1.2 Under extreme voltage conditions; 3GPP TS 45.005, subclauses 4.3 and 4.3.3, and clause D.2.

Table 12.1

Frequency range	Power level in dBm		
	GSM 400, GSM 700, T-GSM 810 GSM 850, GSM 900	DCS 1 800	PCS 1 900
9 kHz to 1 GHz	-36	-36	-36
1 GHz to 12,75 GHz	-30		-30
1 GHz to 1 710 MHz		-30	
1 710 MHz to 1 785 MHz		-36	
1 785 MHz to 12,75 GHz		-30	

12.1.1.3 Test purpose

1. To verify that conducted spurious emissions from the MS when allocated a channel do not exceed the conformance requirements. These conducted spurious emissions will be measured in the frequency band 100 kHz to 12,75 GHz excluding the following received bands:

   For GSM 400, GSM 900 and DCS 1 800:

   - the band 925 MHz to 960 MHz;
   - the band 1 805 MHz to 1 880 MHz;
   - in addition for GSM 400 MS:
     - the band 460,4 MHz to 467,6 MHz;
     - the band 488,8 MHz to 496 MHz.

   For GSM 700, T-GSM 810, GSM 850 and PCS 1 900:

   - the band 728 MHz to 746 MHz;
   - the band 747 MHz to 763 MHz;
   - the band 869 MHz to 894 MHz;
   - the band 1 930 MHz to 1 990 MHz.

   1.1 Under normal voltage conditions.

1.2 Under extreme voltage conditions.

NOTE: The band 9 kHz to 100 kHz is not tested, because of test implementation problems.

12.1.1.4 Method of test

12.1.1.4.1 Initial conditions

For circuit switched capable devices, a call is set up by the SS according to the generic call set up procedure on a channel in the Mid ARFCN range.

The SS may command the MS to loop back its channel decoder output to channel encoder input.

The SS sends Standard Test Signal C1.

The SS sets the MS to operate at its maximum output power.

For packet switched only devices supporting GMSK only on uplink, a GPRS unacknowledged RLC mode uplink TBF using CS-1 as the uplink coding scheme is established on a channel in the Mid ARFCN range.

For packet switched only devices supporting 8PSK on uplink, an EGPRS unacknowledged RLC mode uplink TBF using MCS-5 as the uplink coding scheme is established on a channel in the Mid ARFCN range.

The MS shall be operated with its highest number of uplink slots.

The Test Mode defined in 3GPP TS 04.14 (subclause 5.4) will be utilised. If the MS is capable of both:

Mode (a) transmitting pseudo-random data sequence in RLC data blocks;

Mode (b) transmitting looped-back RLC data blocks;

then Mode (a) will be used.

If Mode (b) is used then the SS sends the pseudo-random data sequence specified for Mode (a) on the downlink for loopback on the uplink.

The SS sets the power value of each active timeslot to the MS's maximum power.

Specific PICS statements:

- MS supporting packet switched services only (TSPC_operation_mode_C)
- MS supporting 8PSK on uplink (TSPC_Type_EGPRS_8PSK_uplink)

PIXIT Statements:

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12.1.1.4.2 Procedure

a) Measurements are made in the frequency range 100 kHz to 12,75 GHz. Spurious emissions are measured at the connector of the transceiver, as the power level of any discrete signal, higher than the requirement in table 12.1 minus 6 dB, delivered into a 50 Ω load.

   The measurement bandwidth based on a 5 pole synchronously tuned filter is according to table 12.2. The power indication is the peak power detected by the measuring system.

   The measurement on any frequency shall be performed for at least one TDMA frame period with the exception of the idle frame.

NOTE: This ensures that both the active times (MS transmitting) and the quiet times are measured.

b) The test is repeated under extreme voltage test conditions ([annex 1, TC2.2 and TC3]).

Table 12.2

Frequency range	Frequency offset	Filter bandwidth	Approx video bandwidth
100 kHz to 50 MHz	-	10 kHz	30 kHz
50 MHz to 500 MHz excl. relevant TX band: GSM 450: 450,4 MHz to 457,6 MHz; GSM 480: 478,8 MHz to 486 MHz, and the RX bands: For GSM 400 MS: 460,4 MHz to 467,6 MHz; 488,8 MHz to 496 MHz.	-	100 kHz	300 kHz
500 MHz to 12,75 GHz, excl. relevant TX band: GSM 710: 698 MHz to 716 MHz GSM 750: 777 MHz to 793 MHz T-GSM 810: 806 MHz to 821 MHz; GSM 850: 824 MHz to 849 MHz; P-GSM: 890 MHz to 915 MHz; E-GSM: 880 MHz to 915 MHz; DCS: 1 710 MHz to 1 785 MHz, PCS 1 900: 1 850 MHz to 1 910 MHz; and the RX bands: For GSM 400 MS, GSM 900 MS and DCS 1 800 MS: 925 MHz to 960 MHz; 1 805 MHz to 1 880 MHz. For GSM 710, GSM 750, T-GSM 810, GSM 850 MS and PCS 1 900 MS: 728 MHz to 746 MHz; 747 MHz to 763 MHz; 851 MHz to 866 MHz 869 MHz to 894 MHz; 1 930 MHz to 1 990 MHz	0 to 10 MHz >= 10 MHz >= 20 MHz >= 30 MHz (offset from edge of relevant TX band)	100 kHz 300 kHz 1 MHz 3 MHz	300 kHz 1 MHz 3 MHz 3 MHz
relevant TX band: GSM 450: 450,4 MHz to 457,6 MHz GSM 480: 478,8 MHz to 486 MHz GSM 710: 698 MHz to 716 MHz GSM 750: 777 MHz to 793 MHz T-GSM 810: 806 MHz to 821 MHz; GSM 850: 824 MHz to 849 MHz P-GSM: 890 MHz to 915 MHz E-GSM: 880 MHz to 915 MHz DCS: 1 710 MHz to 1 785 MHz PCS 1 900: 1 850 MHz to 1 910 MHz	1,8 to 6,0 MHz > 6,0 MHz (offset from carrier)	30 kHz 100 kHz	100 kHz 300 kHz
NOTE 1: The excluded RX bands are tested in subclause 13.4. NOTE 2: The filter and video bandwidths, and frequency offsets are only correct for measurements on an MS transmitting on a channel in the Mid ARFCN range. NOTE 3: Due to practical implementation, the video bandwidth is restricted to a maximum of 3 MHz.			

12.1.1.5 Test requirement

The power of any spurious emission shall not exceed the levels given in table 12.3.

Table 12.3

Frequency range		Power level in dBm GSM 400, GSM 700, T-GSM 810, GSM 850, GSM 900	DCS 1 800	PCS 1 900
100 kHz to	1 GHz	-36	-36	-36
1 GHz to	12,75 GHz	-30		-30
1 GHz to	1710 MHz		-30	
1 710 MHz to	1 785 MHz		-36	
1 785 MHz to	12,75 GHz		-30	

12.1.2 MS in idle mode

12.1.2.1 Definition

Conducted spurious emissions are any emissions from the antenna connector, when the MS is in idle mode.

12.1.2.2 Conformance requirement

1. The conducted spurious power emitted by the MS, when in idle mode, shall be no more than the levels in table 12.4.

   1.1 Under normal voltage conditions; 3GPP TS 05.05, subclauses 4.3 and 4.3.3.

   1.2 Under extreme voltage conditions; 3GPP TS 05.05, subclauses 4.3 and 4.3.3, and clause D.2.

Table 12.4

Frequency range		Power level in dBm GSM 400, T-GSM 810 GSM 900, DCS 1 800	GSM 700, GSM 850, PCS 1 900
9 kHz to	880 MHz	-57	-57
880 MHz to	915 MHz	-59	-57
915 MHz to	1000 MHz	-57	-57
1 GHz to	1 710 MHz	-47	
1 710 MHz to	1 785 MHz	-53	
1 785 MHz to	12,75 GHz	-47	
1 GHz to	1 850 MHz		-47
1 850 MHz to	1 910 MHz		-53
1 910 MHz to	12,75 GHz		-47

12.1.2.3 Test purpose

1. To verify that conducted spurious emissions, in the frequency band 100 kHz to 12,75 GHz from the MS when in idle mode do not exceed the conformance requirements.

   1.1 Under normal voltage conditions.

   1.2 Under extreme voltage conditions.

NOTE: The band 9 KHz to 100 kHz is not tested, because of test implementation problems.

12.1.2.4 Method of test

12.1.2.4.1 Initial conditions

The RF power level of the BCCH shall not exceed –80 dBm in order to prevent conflicts in the frequency range 915 MHz to 1000 MHz (see Table 12.6, row 3). The page mode is continuously set to Paging Reorganization and BS_AG_BLKS_RES is set to 0 so that the MS receiver will operate continually.

The CCCH_CONF shall be set to 000. 1 basic physical channel used for CCCH not combined with SDCCHs.

The BCCH allocation shall either be empty or contain only the serving cell BCCH.

NOTE: This is to ensure that the receiver does not scan other ARFCN. Scanning other ARFCN could lead to a moving in frequency of the spurious and therefore to the possibility of either not measuring a spurious emission or measuring it more than once.

For circuit switched capable devices, the MS is in MM state "idle, updated" and the BCCH message content from the serving cell shall ensure that Periodic Location Updating is not used.

For GPRS only devices, the MS is in GMM state “registered, updated”. The value of the Periodic RA Update timer in the GMM ATTACH ACCEPT message shall indicate that the timer is disabled and the BCCH message content shall indicate that SPLIT_PG_CYCLE is not supported on CCCH in the cell and SPLIT_PG_CYCLE has been negotiated at GPRS Attach.

Specific PICS statements:

- MS supporting packet switched services only (TSPC_operation_mode_C).

12.1.2.4.2 Procedure

a) Measurements are made in the frequency range 100 kHz to 12,75 GHz. Spurious emissions are measured as the power level of any discrete signal, higher than the requirement in table 12.4 minus 6 dB, delivered into a 50 Ω load.

The measurement bandwidth based on a 5 pole synchronously tuned filter is set according to table 12.5. The power indication is the peak power detected by the measuring system.

The measurement time on any frequency shall be such that it includes the time during which the MS receives a TDMA frame containing the paging channel.

Table 12.5

Frequency range	Filter bandwidth	Video bandwidth
100 kHz to 50 MHz	10 kHz	30 kHz
50 MHz to 12,75 GHz	100 kHz	300 kHz

b) The test is repeated under extreme voltage test conditions ([annex 1, TC2.2 and TC3]).

12.1.2.5 Test requirement

The power of any spurious emission shall not exceed the levels given in table 12.6.

Table 12.6

Frequency range		Power level in dBm	
		GSM 400, T-GSM 810 GSM 900, DCS 1 800	GSM 700, GSM 850, PCS 1 900
100 kHz to	880 MHz	-57	-57
880 MHz to	915 MHz	-59	-57
915 MHz to	1 000 MHz	-57	-57
1 GHz to	1 710 MHz	-47	
1 710 MHz to	1 785 MHz	-53	
1 785 MHz to	12,75 GHz	-47	
1 GHz to	1 850 MHz		-47
1 850 MHz to	1 910 MHz		-53
1 910 MHz to	12,75 GHz		-47

12.2 Radiated spurious emissions

This test is performed either on an outdoor test site, fulfilling the requirements of [GC4 of annex 1], or in an anechoic shielded chamber, fulfilling the requirements of ([GC5 of annex 1)]. Performing the measurement in the anechoic shielded chamber is preferred. The sample shall be placed at the specified height on the support.

NOTE: The test method described has been written for measurement in an anechoic shielded chamber. If an outdoor test site is used then additional precautions are necessary to ensure correct measurement. These measures are familiar to test houses which perform spurious emissions tests and are:

a) Raise/lower the test antenna through the specified height range during both the emission detection and substitution parts of the test.

b) Perform a qualitative pre-search in a shielded environment for test sites where the ambient RF environment can prevent the detection of spurious emissions which exceed the limit.

c) Detect emissions at a more sensitive threshold to that specified in subclause 12.2.1.4 to allow for destructive interference due to ground plane reflections at the test antenna search height.

12.2.1 MS allocated a channel

12.2.1.1 Definition

Radiated spurious emissions, when the MS has been allocated a channel, are any emissions radiated by the cabinet and structure of the mobile station, including all interconnecting cables.

This is also known as "cabinet radiation".

The test applies to all types of MS with the exception of the test at extreme voltages for an MS where a practical connection, to an external power supply, is not possible.

NOTE: A "practical connection" shall be interpreted to mean it is possible to connect extreme voltages to the MS without interfering with the configuration of the MS in a way which could invalidate the test.

12.2.1.2 Conformance requirement

1. The radiated spurious power emitted by the MS, when allocated a channel, shall be no more than the levels in table 12.7 under normal voltage conditions; 3GPP TS 05.05, subclauses 4.3 and 4.3.3.

2. The radiated spurious power emitted by the MS, when allocated a channel, shall be no more than the levels in table 12.7 under extreme voltage conditions; 3GPP TS 05.05, subclauses 4.3 and 4.3.3, and clause D.2.

Table 12.7

Frequency range		Power level in dBm		
		GSM 400, GSM 700, T-GSM 810, GSM 850, GSM 900	DCS 1 800	PCS 1 900
30 MHz to	1 GHz	-36	-36	-36
1 GHz to	4 GHz	-30		-30
1 GHz to	1 710 MHz		-30	
1 710 MHz to	1 785 MHz		-36	
1 785 MHz to	4 GHz		-30	

12.2.1.3 Test purpose

1. To verify that radiated spurious emissions from the MS when allocated a channel do not exceed the conformance requirements under normal voltage conditions.

2. To verify that radiated spurious emissions from the MS when allocated a channel do not exceed the conformance requirements under extreme voltage conditions.

12.2.1.4 Method of test

12.2.1.4.1 Initial conditions

A call is set up by the SS according to the generic call set up procedure on a channel in the Mid ARFCN range.

NOTE: The power supply shall be connected to the MS such that the physical configuration does not change in a way that could have an effect on the measurement. In particular, the battery pack of the MS should not normally be removed. In cases where no practical connection can be made to the power supply, the MS's intended battery source shall be used.

The SS may command the MS to loop back its channel decoder output to its channel encoder input.

The SS sends Standard Test Signal C1.

The SS sets the MS to operate at its maximum output power.

12.2.1.4.2 Procedure

a) Initially the test antenna is closely coupled to the MS and any spurious emission radiated by the MS is detected by the test antenna and receiver in the range 30 MHz to 4 GHz.

NOTE 1: This is a qualitative step to identify the frequency and presence of spurious emissions which are to be measured in subsequent steps.

b) The test antenna separation is set to the appropriate measurement distance and at each frequency at which an emission has been detected, the MS shall be rotated to obtain maximum response and the effective radiated power of the emission determined by a substitution measurement. In case of an anechoic shielded chamber pre - calibration may be used instead of a substitution measurement.

c) The measurement bandwidth, based on a 5 pole synchronously tuned filter, is set according to table 12.8. The power indication is the peak power detected by the measuring system.

   The measurement on any frequency shall be performed for at least one TDMA frame period, with the exception of the idle frame.

NOTE 2: This ensures that both the active times (MS transmitting) and the quiet times are measured.

NOTE 3: For these filter bandwidths some difficulties may be experienced with noise floor above required measurement limit. This will depend on the gain of the test antenna, and adjustment of the measuring system bandwidth is permissible. Alternatively, for test frequencies above 900 MHz, the test antenna separation from the MS may be reduced to 1 metre.

d) The measurements are repeated with the test antenna in the orthogonal polarization plane.

e) The test is repeated under extreme voltage test conditions (see [annex 1, TC2.2]).

Table 12.8

Frequency range	Frequency offset	Filter bandwidth	Approx video bandwidth
30 MHz to 50 MHz	-	10 kHz	30 kHz
50 MHz to 500 MHz	-	100 kHz	300 kHz
excl. relevant TX band:			
GSM 450: 450,4 MHz to 457,6 MHz;			
GSM 480: 478,8 MHz to 486 MHz			
500 MHz to 4 GHz,	0 to 10 MHz	100 kHz	300 kHz
	>= 10 MHz	300 kHz	1 MHz
Excl. relevant TX band:	>= 20 MHz	1 MHz	3 MHz
GSM 710: 698 MHz to 716 MHz	>= 30 MHz	3 MHz	3 MHz
GSM 750: 777 MHz to 793 MHz			
T-GSM 810: 806MHz to 821 MHz			
GSM 850: 824 MHz to 849 MHz			
P-GSM: 890 MHz to 915 MHz;	(offset from edge of		
E-GSM: 880 MHz to 915 MHz;	relevant TX band)		
DCS: 1 710 MHz to 1 785 MHz.			
PCS 1 900: 1 850 MHz to 1 910 MHz			
Relevant TX band:			
GSM 450: 450,4 MHz to 457,6 MHz	1,8 MHz to 6,0 MHz	30 kHz	100 kHz
GSM 480: 478,8 MHz to 486 MHz	> 6,0 MHz	100 kHz	300 kHz
GSM 710: 698 MHz to 716 MHz			
GSM 750: 777 MHz to 793 MHz			
T-GSM 810: 806MHz to 821 MHz			
GSM 850: 824 MHz to 849 MHz	(offset from carrier)		
P-GSM: 890 MHz to 915 MHz			
E-GSM: 880 MHz to 915 MHz			
DCS: 1 710 MHz to 1 785 MHz			
PCS 1 900: 1 850 MHz to 1 910 MHz			
NOTE 1: The filter and video bandwidths, and frequency offsets are only correct for measurements on an MS transmitting on a channel in the Mid ARFCN range.			
NOTE 2: Due to practical implementation of a SS, the video bandwidth is restricted to a maximum of 3 MHz.			

12.2.1.5 Test requirement

The power of any spurious emission shall not exceed the levels given in table 12.7.

12.2.2 MS in idle mode

12.2.2.1 Definition

Radiated spurious emissions, when the MS is in idle mode, are any emissions radiated by the cabinet and structure of the mobile station, including all interconnecting cables.

This is also known as "cabinet radiation".

The test applies to all types of MS with the exception of the test at extreme voltages for an MS where a practical connection, to an external power supply, is not possible.

NOTE: A "practical connection" shall be interpreted to mean it is possible to connect extreme voltages to the MS without interfering with the configuration of the MS in a way which could invalidate the test.

12.2.2.2 Conformance requirement

1. The radiated spurious power emitted by the MS, when in idle mode, shall be no more than the levels in table 12.9. under normal voltage conditions; 3GPP TS 05.05, subclauses 4.3 and 4.3.3.

2. The radiated spurious power emitted by the MS, when in idle mode, shall be no more than the levels in table 12.9. under extreme voltage conditions; 3GPP TS 05.05, subclauses 4.3 and 4.3.3, and clause D.2.

Table 12.9

Frequency range		Power level in dBm	
		GSM 400, T-GSM 810, GSM 900, DCS 1 800	GSM 700, GSM 850, PCS 1 900
30 MHz to	880 MHz	-57	-57
880 MHz to	915 MHz	-59	-57
915 MHz to	1 000 MHz	-57	-57
1 GHz to	1 710 MHz	-47	
1 710 MHz to	1 785 MHz	-53	
1 785 MHz to	4GHz	-47	
1 GHz to	1 850 MHz		-47
1 850 MHz to	1 910 MHz		-53
1 910 MHz to	4GHz		-47

12.2.2.3 Test purpose

1. To verify that radiated spurious emissions from the MS when in idle mode do not exceed the requirements under normal voltage conditions.

2. To verify that radiated spurious emissions from the MS when in idle mode do not exceed the requirements under extreme voltage conditions.

12.2.2.4 Method of test

12.2.2.4.1 Initial conditions

NOTE 1: The power supply shall be connected to the MS such that the physical configuration does not change in a way that could have an effect on the measurement. In particular, the battery pack of the MS should not normally be removed. In cases where no practical connection can be made to the power supply, the MS's intended battery source shall be used.

The BCCH message content from the serving cell shall ensure that Periodic Location Updating is not used and that page mode is continuously set to Paging Reorganization and BS_AG_BLKS_RES is set to 0 so that the MS receiver will operate continually.

The CCCH_CONF shall be set to 000. 1 basic physical channel used for CCCH not combined with SDCCHs.

The BCCH allocation shall either be empty or contain only the serving cell BCCH.

NOTE 2: This is to ensure that the receiver does not scan other ARFCN. Scanning other ARFCN could lead to a moving in frequency of the spurious and therefore to the possibility of either not measuring a spurious emission or measuring it more than once.

The MS is in MM state "idle, updated".

12.2.2.4.2 Procedure

a) Initially the test antenna is closely coupled to the MS and any spurious emission radiated by the MS is detected by the test antenna and receiver in the range 30 MHz to 4 GHz.

NOTE 1: This is a qualitative step to identify the frequency and presence of spurious emissions which are to be measured in subsequent steps.

b) The test antenna separation is set to the appropriate measurement distance and at each frequency at which a spurious emission has been detected the MS is rotated to obtain a maximum response. The effective radiated power of the emission is determined by a substitution measurement. In case of an anechoic shielded chamber pre-calibration may be used instead of a substitution measurement.

c) The measurement bandwidth based on a 5 pole synchronously tuned filter shall be according to table 12.10. The power indication is the peak power detected by the measuring system.

   The measurement time on any frequency shall be such that it includes the time during which the MS receives a TDMA frame containing the paging channel.

NOTE 2: For these filter bandwidths some difficulties may be experienced with noise floor above required measurement limit. This will depend on the gain of the test antenna, and adjustment of the measuring system bandwidth is permissible. Alternatively, for test frequencies above 900 MHz, the test antenna separation from the MS may be reduced to 1 metre.

Table 12.10

Frequency range	Filter bandwidth	Video bandwidth
30 MHz to 50 MHz 50 MHz to 4 GHz	10 kHz 100 kHz	30 kHz 300 kHz

d) The measurements are repeated with the test antenna in the orthogonal polarization plane.

e) The test is repeated under extreme voltage test conditions (see [Annex 1, TC2.2]).

12.2.2.5 Test requirement

The power of any spurious emission shall not exceed the levels given in table 12.9.

12.3 Conducted spurious emissions for MS supporting the R-GSM frequency band

12.3.1 MS allocated a channel

12.3.1.1 Definition

Conducted spurious emissions, when the MS has been allocated a channel, are emissions from the antenna connector at frequencies other than those of the carrier and sidebands associated with normal modulation.

12.3.1.2 Conformance requirement

1. The conducted spurious power emitted by the MS, when allocated a channel, shall be no more than the levels in table 12.11.

   1.1 Under normal voltage conditions; 3GPP TS 05.05, subclauses 4.3 and 4.3.3.

   1.2 Under extreme voltage conditions; 3GPP TS 05.05, subclause 4.3 and 4.3.3, and clause D.2.

Table 12.11

Frequency range	Power level in dBm	
	R-GSM 900 small MS	R-GSM 900 other MS
9 kHz to 1 GHz 9 kHz to 876 MHz 876 MHz to 915 MHz 915 MHz to 1 GHz 1 GHz to 12,75 GHz	-36 -30	 -36 -42 -36 -30

12.3.1.3 Test purpose

1. To verify that conducted spurious emissions, in the frequency band 100 kHz to 12,75 GHz excluding the R-GSM 900 and DCS 1 800 receive bands, from the MS when allocated a channel do not exceed the conformance requirements.

   1.1 Under normal voltage conditions.

   1.2 Under extreme voltage conditions.

NOTE: The band 9 kHz to 100 kHz is not tested, because of test implementation problems.

12.3.1.4 Method of test

12.3.1.4.1 Initial conditions

A call is set up by the SS according to the generic call set up procedure on a channel in the Mid ARFCN range.

The SS may command the MS to loop back its channel decoder output to channel encoder input.

The SS sends Standard Test Signal C1.

The SS sets the MS to operate at its maximum output power.

12.3.1.4.2 Procedure

a) Measurements are made in the frequency range 100 kHz to 12,75 GHz. Spurious emissions are measured at the connector of the transceiver, as the power level of any discrete signal, higher than the requirement in table 12.11 minus 6 dB, delivered into a 50 Ω load.

   The measurement bandwidth based on a 5 pole synchronously tuned filter is according to table 12.12. The power indication is the peak power detected by the measuring system.

   The measurement on any frequency shall be performed for at least one TDMA frame period with the exception of the idle frame.

NOTE: This ensures that both the active times (MS transmitting) and the quiet times are measured.

b) The test is repeated under extreme voltage test conditions ([annex 1, TC2.2 and TC3]).

Table 12.12

Frequency range	Frequency offset	Filter bandwidth	Approx video bandwidth
100 kHz to 50 MHz	-	10 kHz	30 kHz
50 MHz to 500 MHz	-	100 kHz	300 kHz
500 MHz to 12,75 GHz, excl. relevant TX band: R-GSM: 876 MHz to 915 MHz; ; , and the RX bands: 921 MHz to 960 MHz; 1 805 MHz to 1 880 MHz.	0 to 10 MHz >= 10 MHz >= 20 MHz >= 30 MHz (offset from edge of relevant TX band)	100 kHz 300 kHz 1 MHz 3 MHz	300 kHz 1 MHz 3 MHz 3 MHz
relevant TX band: R-GSM: 876 MHz to 915 MHz	1,8 MHz to 6,0 MHz > 6,0 MHz (offset from carrier)	30 kHz 100 kHz	100 kHz 300 kHz
NOTE 1: The frequency ranges 921 MHz to 960 MHz and 1 805 MHz to 1 880 MHz are excluded as these ranges are tested in subclause 13.9. NOTE 2: The filter and video bandwidths, and frequency offsets are only correct for measurements on an MS transmitting on a channel in the Mid ARFCN range. NOTE 3: Due to practical implementation, the video bandwidth is restricted to a maximum of 3 MHz.			

12.3.1.5 Test requirement

The power of any spurious emission shall not exceed the levels given in table 12.13.

Table 12.13

Frequency range		Power level in dBm	
		R-GSM 900 small MS	R-GSM 900 other MS
100 kHz to	1 GHz	-36	
100 kHz to	876 MHz		-36
876 MHz to	915 MHz		-42
915 MHz to	1 GHz		-36
1 GHz to	12,75 GHz	-30	-30

12.3.2 MS in idle mode

12.3.2.1 Definition

Conducted spurious emissions are any emissions from the antenna connector, when the MS is in idle mode.

12.3.2.2 Conformance requirement

1. The conducted spurious power emitted by the MS, when in idle mode, shall be no more than the levels in table 12.14.

   1.1 Under normal voltage conditions; 3GPP TS 05.05, subclauses 4.3 and 4.3.3.

   1.2 Under extreme voltage conditions; 3GPP TS 05.05, subclauses 4.3 and 4.3.3, and clause D.2.

Table 12.14

Frequency range		Power level in dBm
9 kHz to	880 MHz	-57
880 MHz to	915 MHz	-59
915 MHz to	1 000 MHz	-57
1 GHz to	1 710 MHz	-47
1 710 MHz to	1 785 MHz	-53
1 785 MHz to	12,75 GHz	-47

12.3.2.3 Test purpose

1. To verify that conducted spurious emissions, in the frequency band 100 kHz to 12,75 GHz from the MS when in idle mode do not exceed the conformance requirements.

   1.1 Under normal voltage conditions.

   1.2 Under extreme voltage conditions.

NOTE: The band 9 kHz to 100 kHz is not tested, because of test implementation problems.

12.3.2.4 Method of test

12.3.2.4.1 Initial conditions

The BCCH message content from the serving cell shall ensure that Periodic Location Updating is not used and that page mode is continuously set to Paging Reorganization and BS_AG_BLKS_RES is set to 0 so that the MS receiver will operate continually.

The CCCH_CONF shall be set to 000. 1 basic physical channel used for CCCH not combined with SDCCHs.

The BCCH allocation shall either be empty or contain only the serving cell BCCH.

NOTE: This is to ensure that the receiver does not scan other ARFCN. Scanning other ARFCN could lead to a moving in frequency of the spurious and therefore to the possibility of either not measuring a spurious emission or measuring it more than once.

The MS is in MM state "idle, updated".

12.3.2.4.2 Procedure

a) Measurements are made in the frequency range 100 kHz to 12,75 GHz. Spurious emissions are measured as the power level of any discrete signal, higher than the requirement in table 12.14 minus 6 dB, delivered into a 50 Ω load.

The measurement bandwidth based on a 5 pole synchronously tuned filter is set according to table 12.15. The power indication is the peak power detected by the measuring system.

The measurement time on any frequency shall be such that it includes the time during which the MS receives a TDMA frame containing the paging channel.

Table 12.15

Frequency range	Filter bandwidth	Video bandwidth
100 kHz to 50 MHz	10 kHz	30 kHz
50 MHz to 12,75 GHz	100 kHz	300 kHz

b) The test is repeated under extreme voltage test conditions ([annex 1, TC2.2 and TC3]).

12.3.2.5 Test requirement

The power of any spurious emission shall not exceed the levels given in table 12.16.

Table 12.16

Frequency range		Power level in dBm
100 kHz to	880 MHz	-57
880 MHz to	915 MHz	-59
915 MHz to	1 000 MHz	-57
1 GHz to	1 710 MHz	-47
1 710 MHz to	1 785 MHz	-53
1 785 MHz to	12,75 GHz	-47

12.4 Radiated spurious emissions for MS supporting the R-GSM frequency band

This subclause applies only to MS supporting the R-GSM frequency band.

This test is performed either on an outdoor test site, fulfilling the requirements of [GC4 of annex 1], or in an anechoic shielded chamber, fulfilling the requirements of ([GC5 of annex 1)]. Performing the measurement in the anechoic shielded chamber is preferred. The sample shall be placed at the specified height on the support.

NOTE: The test method described has been written for measurement in an anechoic shielded chamber. If an outdoor test site is used then additional precautions are necessary to ensure correct measurement. These measures are familiar to test houses which perform spurious emissions tests and are:

a) Raise/lower the test antenna through the specified height range during both the emission detection and substitution parts of the test.

b) Perform a qualitative pre-search in a shielded environment for test sites where the ambient RF environment can prevent the detection of spurious emissions which exceed the limit.

c) Detect emissions at a more sensitive threshold to that specified in subclause 12.4.1.4 to allow for destructive interference due to ground plane reflections at the test antenna search height.

12.4.1 MS allocated a channel

12.4.1.1 Definition

Radiated spurious emissions, when the MS has been allocated a channel, are any emissions radiated by the cabinet and structure of the mobile station, including all interconnecting cables.

This is also known as "cabinet radiation".

The test applies to all types of MS with the exception of the test at extreme voltages for an MS where a practical connection, to an external power supply, is not possible.

NOTE: A "practical connection" shall be interpreted to mean it is possible to connect extreme voltages to the MS without interfering with the configuration of the MS in a way which could invalidate the test.

12.4.1.2 Conformance requirement

1. The radiated spurious power emitted by the MS, when allocated a channel, shall be no more than the levels in table 1217 under normal voltage conditions; 3GPP TS 05.05, subclauses 4.3 and 4.3.3.

2. The radiated spurious power emitted by the MS, when allocated a channel, shall be no more than the levels in table 12.17 under extreme voltage conditions; 3GPP TS 05.05, subclauses 4.3 and 4.3.3, and clause D.2.

Table 12.17

Frequency range		Power level in dBm	
		R-GSM 900 small MS	R-GSM 900 other MS
30 MHz to	1 GHz	-36	
30 MHz to	876 MHz		-36
876 MHz to	915 MHz		-42
915 MHz to	1 GHz		-36
1 GHz to	4 GHz	-30	-30

12.4.1.3 Test purpose

1. To verify that radiated spurious emissions from the MS when allocated a channel do not exceed the conformance requirements under normal voltage conditions.

2. To verify that radiated spurious emissions from the MS when allocated a channel do not exceed the conformance requirements under extreme voltage conditions.

12.4.1.4 Method of test

12.4.1.4.1 Initial conditions

A call is set up by the SS according to the generic call set up procedure on a channel in the Mid ARFCN range.

NOTE: The power supply shall be connected to the MS such that the physical configuration does not change in a way that could have an effect on the measurement. In particular, the battery pack of the MS should not normally be removed. In cases where no practical connection can be made to the power supply, the MS's intended battery source shall be used.

The SS may command the MS to loop back its channel decoder output to its channel encoder input.

The SS sends Standard Test Signal C1.

The SS sets the MS to operate at its maximum output power.

12.4.1.4.2 Procedure

a) Initially the test antenna is closely coupled to the MS and any spurious emission radiated by the MS is detected by the test antenna and receiver in the range 30 MHz to 4 GHz.

NOTE 0: This is a qualitative step to identify the frequency and presence of spurious emissions which are to be measured in subsequent steps.

b) The test antenna separation is set to the appropriate measurement distance and at each frequency at which an emission has been detected, the MS shall be rotated to obtain maximum response and the effective radiated power of the emission determined by a substitution measurement. In case of an anechoic shielded chamber pre-calibration may be used instead of a substitution measurement.

c) The measurement bandwidth, based on a 5 pole synchronously tuned filter, is set according to table 12.18. The power indication is the peak power detected by the measuring system.

   The measurement on any frequency shall be performed for at least one TDMA frame period, with the exception of the idle frame.

NOTE 1: This ensures that both the active times (MS transmitting) and the quiet times are measured.

NOTE 2: For these filter bandwidths some difficulties may be experienced with noise floor above required measurement limit. This will depend on the gain of the test antenna, and adjustment of the measuring system bandwidth is permissible. Alternatively, for test frequencies above 900 MHz, the test antenna separation from the MS may be reduced to 1 metre.

d) The measurements are repeated with the test antenna in the orthogonal polarization plane.

e) The test is repeated under extreme voltage test conditions (see [annex 1, TC2.2]).

Table 12.18

Frequency range	Frequency offset	Filter bandwidth	Approx video bandwidth
30 MHz to 50 MHz	-	10 kHz	30 kHz
50 MHz to 500 MHz	-	100 kHz	300 kHz
500 MHz to 4 GHz,	0 to 10 MHz	100 kHz	300 kHz
	>= 10 MHz	300 kHz	1 MHz
excl. relevant TX band:	>= 20 MHz	1 MHz	3 MHz
R-GSM: 876 MHz to 915 MHz;	>= 30 MHz	3 MHz	3 MHz
	(offset from edge of relevant TX band)		
relevant TX band:			
R-GSM: 876 MHz to 915 MHz	1,8 MHz to 6,0 MHz	30 kHz	100 kHz
	> 6,0 MHz	100 kHz	300 kHz
	(offset from carrier)		
NOTE 1: The filter and video bandwidths, and frequency offsets are only correct for measurements on an MS transmitting on a channel in the Mid ARFCN range.			
NOTE 2: Due to practical implementation of a SS, the video bandwidth is restricted to a maximum of 3 MHz.			

12.4.1.5 Test requirement

The power of any spurious emission shall not exceed the levels given in table 12.17.

12.4.2 MS in idle mode

12.4.2.1 Definition

Radiated spurious emissions, when the MS is in idle mode, are any emissions radiated by the cabinet and structure of the mobile station, including all interconnecting cables.

This is also known as "cabinet radiation".

The test applies to all types of MS with the exception of the test at extreme voltages for an MS where a practical connection, to an external power supply, is not possible.

NOTE: A "practical connection" shall be interpreted to mean it is possible to connect extreme voltages to the MS without interfering with the configuration of the MS in a way which could invalidate the test.

12.4.2.2 Conformance requirement

1. The radiated spurious power emitted by the MS, when in idle mode, shall be no more than the levels in table 12.19. under normal voltage conditions; 3GPP TS 05.05, subclauses 4.3 and 4.3.3.

2. The radiated spurious power emitted by the MS, when in idle mode, shall be no more than the levels in table 12.19. under extreme voltage conditions; 3GPP TS 05.05, subclauses 4.3 and 4.3.3, and clause D.2.

Table 12.19

Frequency range		Power level in dBm
30 MHz to	880 MHz	-57
880 MHz to	915 MHz	-59
915 MHz to	1 000 MHz	-57
1 GHz to	1 710 MHz	-47
1 710 MHz to	1 785 MHz	-53
1 785 MHz to	4 GHz	-47

12.4.2.3 Test purpose

1. To verify that radiated spurious emissions from the MS when in idle mode do not exceed the requirements under normal voltage conditions.

2. To verify that radiated spurious emissions from the MS when in idle mode do not exceed the requirements under extreme voltage conditions.

12.4.2.4 Method of test

12.4.2.4.1 Initial conditions

NOTE 1: The power supply shall be connected to the MS such that the physical configuration does not change in a way that could have an effect on the measurement. In particular, the battery pack of the MS should not normally be removed. In cases where no practical connection can be made to the power supply, the MS's intended battery source shall be used.

The BCCH message content from the serving cell shall ensure that Periodic Location Updating is not used and that page mode is continuously set to Paging Reorganization and BS_AG_BLKS_RES is set to 0 so that the MS receiver will operate continually.

The CCCH_CONF shall be set to 000. 1 basic physical channel used for CCCH not combined with SDCCHs.

The BCCH allocation shall either be empty or contain only the serving cell BCCH.

NOTE 2: This is to ensure that the receiver does not scan other ARFCN. Scanning other ARFCN could lead to a moving in frequency of the spurious and therefore to the possibility of either not measuring a spurious emission or measuring it more than once.

The MS is in MM state "idle, updated".

12.4.2.4.2 Procedure

a) Initially the test antenna is closely coupled to the MS and any spurious emission radiated by the MS is detected by the test antenna and receiver in the range 30 MHz to 4 GHz.

NOTE 1: This is a qualitative step to identify the frequency and presence of spurious emissions which are to be measured in subsequent steps.

b) The test antenna separation is set to the appropriate measurement distance and at each frequency at which a spurious emission has been detected the MS is rotated to obtain a maximum response. The effective radiated power of the emission is determined by a substitution measurement. In case of an anechoic shielded chamber pre-calibration may be used instead of a substitution measurement.

c) The measurement bandwidth based on a 5 pole synchronously tuned filter shall be according to table 12.20. The power indication is the peak power detected by the measuring system.

The measurement time on any frequency shall be such that it includes the time during which the MS receives a TDMA frame containing the paging channel.

NOTE 2: For these filter bandwidths some difficulties may be experienced with noise floor above required measurement limit. This will depend on the gain of the test antenna, and adjustment of the measuring system bandwidth is permissible. Alternatively, for test frequencies above 900 MHz, the test antenna separation from the MS may be reduced to 1 metre.

Table 12.20

Frequency range	Filter bandwidth	Video bandwidth
30 MHz to 50 MHz 50 MHz to 4 GHz	10 kHz 100 kHz	30 kHz 300 kHz

d) The measurements are repeated with the test antenna in the orthogonal polarization plane.

e) The test is repeated under extreme voltage test conditions (see [annex 1, TC2.2]).

12.4.2.5 Test requirement

The power of any spurious emission shall not exceed the levels given in table 12.19.

13 Transmitter

13.1 Frequency error and phase error

13.1.1 Definition

The frequency error is the difference in frequency, after adjustment for the effect of the modulation and phase error, between the RF transmission from the MS and either:

- the RF transmission from the BS; or
- the nominal frequency for the ARFCN used.

The phase error is the difference in phase, after adjustment for the effect of the frequency error, between the RF transmission from the MS and the theoretical transmission according to the intended modulation.

13.1.2 Conformance requirement

1. The MS carrier frequency shall be accurate to within 0,1 ppm, or accurate to within 0,1 ppm compared to signals received from the BS. For GSM 400 MS a value of 0,2 ppm shall be used in both cases.

   1.1 Under normal conditions; 3GPP TS 05.10, subclause 6.1.

   1.2 Under vibration conditions; 3GPP TS 05.10, subclause 6.1; 3GPP TS 05.05, annex D in subclause D.2.3.

   1.3 Under extreme conditions; 3GPP TS 05.10, subclause 6.1; 3GPP TS 05.05, subclause 4.4; 3GPP TS 05.05, annex D in subclauses D.2.1 and D.2.2.

2. The RMS phase error (difference between the phase error trajectory and its linear regression on the active part of the time slot) for each burst shall not be greater than 5 degrees.

   2.1 Under normal conditions; 3GPP TS 05.05, subclause 4.6.

   2.2 Under vibration conditions; 3GPP TS 05.05, subclause 4.6; 3GPP TS 05.05, annex D in subclause D.2.3.

   2.3 Under extreme conditions; 3GPP TS 05.05, subclause 4.6; 3GPP TS 05.05, annex D in subclauses D.2.1 and D.2.2.

3. The maximum peak deviation during the useful part of each burst shall not be greater than 20 degrees.

   3.1 Under normal conditions; 3GPP TS 05.05, subclause 4.6.

3.2 Under vibration conditions; 3GPP TS 05.05, subclause 4.6; 3GPP TS 05.05, annex D in subclause D.2.3.

3.3 Under extreme conditions; 3GPP TS 05.05, subclause 4.6; 3GPP TS 05.05, annex D in subclauses D.2.1 and D.2.2.

13.1.3 Test purpose

1. To verify that the MS carrier frequency error does not exceed 0,1 ppm (0,2 ppm for GSM 400):

   1.1 Under normal conditions.

   1.2 When the MS is being vibrated.

   1.3 Under extreme conditions.

NOTE: The transmit frequency accuracy of the SS is expected to be sufficient to ensure that the difference between 0,1 ppm (0,2 ppm for GSM 400) absolute and 0,1 ppm (0,2 ppm for GSM 400) compared to signals received from the BS would be small enough to be considered insignificant.

2. To verify that the RMS phase error on the useful part of the bursts transmitted by the MS does not exceed conformance requirement 2:

   2.1 Under normal conditions.

   2.2 When the MS is being vibrated.

   2.3 Under extreme conditions.

3. To verify that the maximum phase error on the useful part of the bursts transmitted by the MS does not exceed conformance requirement 3:

   3.1 Under normal conditions.

   3.2 When the MS is being vibrated.

   3.3 Under extreme conditions.

13.1.4 Method of test

NOTE: In order to measure the accuracy of the frequency and phase error a sampled measurement of the transmitted phase trajectory is obtained. This is compared with the theoretically expected phase trajectory. The regression line of the difference between the expected trajectory and the measured trajectory is an indication of the frequency error (assumed constant through the burst), whilst the departure of the phase differences from this trajectory is a measure of the phase error. The peak phase error is the value furthest from the regression line and the RMS phase error is the root mean square average of the phase error of all samples.

13.1.4.1 Initial conditions

A call is set up according to the Generic call setup procedure.

The SS commands the MS to hopping mode (table 6.1).

NOTE 1: It is not necessary to test in hopping mode but is done here as a simple means of making the MS change channel, it would be sufficient to test in non hopping mode and to make sure bursts are taken from a few different channels.

The SS activates ciphering mode.

NOTE 2: Ciphering mode is active during this test to give a pseudo-random bit stream to the modulator.

The SS commands the MS to complete the traffic channel loop back without signalling of erased frames (see subclause 36.2.1.1).

The SS generates Standard Test Signal C1 of annex 5.

Specific PICS statements:

- MS without vibration sensitive components (TSPC_No_Vibration_Sensitive_Components)

PIXIT Statements:

-

13.1.4.2 Procedure

a) For one transmitted burst, the SS captures the signal as a series of phase samples over the period of the burst. These samples are evenly distributed over the duration of the burst with a minimum sampling rate of 2/T, where T is the modulation symbol period. The received phase trajectory is then represented by this array of at least 294 samples.

b) The SS then calculates, from the known bit pattern and the formal definition of the modulator contained in 3GPP TS 05.04, the expected phase trajectory.

c) From a) and b) the phase trajectory error is calculated, and a linear regression line computed through this phase trajectory error. The slope of this regression line is the frequency error of the mobile transmitter relative to the simulator reference. The difference between the regression line and the individual sample points is the phase error of that point.

c.1) The sampled array of at least 294 phase measurements is represented by the vector:

$\varnothing_m = \varnothing_m(0)...\varnothing_m(n)$

where the number of samples in the array n+1 >= 294.

c.2) The calculated array, at the corresponding sampling instants, is represented by the vector:

$\varnothing_c = \varnothing_c(0)...\varnothing_c(n)$.

c.3) The error array is represented by the vector:

$\varnothing_e = \{\varnothing_m(0) - \varnothing_c(0)\}.........\{\varnothing_m(n) - \varnothing_c(n)\} = \varnothing_e(0)...\varnothing_e(n)$.

c.4) The corresponding sample numbers form a vector t = t(0)...t(n).

c.5) By regression theory the slope of the samples with respect to t is k where:

$$k = \frac{\sum_{j=0}^{j=n} t(j) * \varnothing_e(j)}{\sum_{j=0}^{j=n} t(j)^2}$$

c.6) The frequency error is given by k/(360 * γ), where γ is the sampling interval in s and all phase samples are measured in degrees.

c.7) The individual phase errors from the regression line are given by:

$\varnothing_e(j) - k*t(j)$.

c.8) The RMS value $\varnothing_e$ of the phase errors is given by:

$$\varnothing_e(RMS) = \left[\frac{\sum_{j=0}^{j=n} \{\varnothing_e(j) - k * t(j)\}^2}{n+1}\right]^{1/2}$$

d) Steps a) to c) are repeated for 20 bursts, not necessarily contiguous.

e) The SS instructs the MS to its maximum power control level, all other conditions remaining constant. Steps a) to d) are repeated.

f) The SS instructs the MS to the minimum power control level, all other conditions remaining constant. Steps a) to d) are repeated.

g) The MS is hard mounted on a vibration table and vibrated at the frequency/amplitudes specified in annex 1, TC4.

During the vibration steps a) to f) are repeated.

NOTE 1: If the call is terminated when mounting the MS to the vibration table, it will be necessary to establish the initial conditions again before repeating steps a) to f).

h) The MS is re-positioned on the vibration table in the two orthogonal planes to the plane used in step g). For each of the orthogonal planes step g) is repeated.

i) Steps a) to f) are repeated under extreme test conditions (see annex 1, TC2.2).

NOTE 2: The series of samples taken to determine the phase trajectory could also be used, with different post-processing, to determine the transmitter burst characteristics of subclause 13.3. Although described independently, it is valid to combine the tests of subclauses 13.1 and 13.3, giving both answers from single sets of captured data.

NOTE 3: Steps g) and h) are skipped if TSPC_No_Vibration_Sensitive_Components is declared as Yes

13.1.5 Test requirements

13.1.5.1 Frequency error

For all measured bursts, the frequency error, derived in step c.6), shall be less than 0,1 ppm, except for GSM 400 MS where a value of 0,2 ppm shall be used.

13.1.5.2 Phase error

For all measured bursts, the RMS phase error, derived in step c.8), shall not exceed 5 degrees.

For all measured bursts, each individual phase error, derived in step c.7), shall not exceed 20 degrees.

13.1a Frequency error in VAMOS configuration

13.1a.1 Definition

The frequency error is the difference in frequency, after adjustment for the effect of the modulation and phase error, between the RF transmission from the MS and either:

- the RF transmission from the BS; or

- the nominal frequency for the ARFCN used.

The phase error is the difference in phase, after adjustment for the effect of the frequency error, between the RF transmission from the MS and the theoretical transmission according to the intended modulation.

13.1a.2 Conformance requirement

1. The MS carrier frequency shall be accurate to within 0,1 ppm, or accurate to within 0,1 ppm compared to signals received from the BS. For GSM 400 MS a value of 0,2 ppm shall be used in both cases.

   1.1 Under normal conditions; 3GPP TS 45.10, subclause 6.1.

   1.2 Under extreme conditions; 3GPP TS 45.10, subclause 6.1; 3GPP TS 45.05, subclause 4.4; 3GPP TS 45.05, annex D in subclauses D.2.1 and D.2.2.

13.1a.3 Test purpose

1. To verify that the MS carrier frequency error does not exceed 0,1 ppm (0,2 ppm for GSM 400):

1.1 Under normal conditions.

1.2 Under extreme conditions.

NOTE: The transmit frequency accuracy of the SS is expected to be sufficient to ensure that the difference between 0,1 ppm (0,2 ppm for GSM 400) absolute and 0,1 ppm (0,2 ppm for GSM 400) compared to signals received from the BS would be small enough to be considered insignificant.

13.1a.4 Method of test

This test uses the same measurement process as test 13.1.

13.1a.4.1 Initial conditions

A call is set up according to the Generic call setup procedure in the mid ARFCN range with a power control level set to maximum power..

The SS activates ciphering mode.

NOTE 1: Ciphering mode is active during this test to give a pseudo-random bit stream to the modulator.

The SS generates Standard Test Signal C1 of annex 5 using AQPSK modulation with SCPIR=0dB, on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 form TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SS commands the MS to complete the traffic channel loop back without signalling of erased frames (see subclause 36.2.1.1).

The power level of the Standard Test Signal C1 is set 20 dB above reference sensitivity level( ).

Specific PICS statements:

-

PIXIT Statements:

-

13.1a.4.2 Procedure

a) The SS calculates the frequency accuracy of the captured burst as described in test 13.1.

b) Steps a) is repeated for 20 bursts spaced over a period of not less than 1800s).

c) The SS changes to SCPIR=-4dB, all other conditions remain constant.

d) The SS calculates the frequency accuracy of the captured burst as described in test 13.1.

e) Steps d) is repeated for 20 bursts spaced over a period of not less than 300s).

f) Steps a) to e) are repeated under extreme test conditions (see annex 1, TC2.2).

13.1a.5 Test requirements

13.1a.5.1 Frequency error

For all measured bursts, the frequency error, derived in repeats of steps a) and d), shall be less than 0,1 ppm, except for GSM 400 MS where a value of 0,2 ppm shall be used.

13.1b Frequency error and phase error in TIGHTER configuration \ with legacy TSC in VAMOS mode

13.1b.1 Definition

The frequency error is the difference in frequency, after adjustment for the effect of the modulation and phase error, between the RF transmission from the MS and either:

- the RF transmission from the BS; or
- the nominal frequency for the ARFCN used.

The phase error is the difference in phase, after adjustment for the effect of the frequency error, between the RF transmission from the MS and the theoretical transmission according to the intended modulation.

13.1b.2 Conformance requirement

1. The MS carrier frequency shall be accurate to within 0,1 ppm, or accurate to within 0,1 ppm compared to signals received from the BS. For GSM 400 MS a value of 0,2 ppm shall be used in both cases.

   1.1 Under normal conditions; 3GPP TS 45.10, subclause 6.1.

   1.2 Under extreme conditions; 3GPP TS 45.10, subclause 6.1; 3GPP TS 45.05, subclause 4.4; 3GPP TS 45.05, annex D in subclauses D.2.1 and D.2.2.

13.1b.3 Test purpose

1. To verify that the MS carrier frequency error does not exceed 0,1 ppm (0,2 ppm for GSM 400):

   1.1 Under normal conditions.

   1.2 Under extreme conditions.

NOTE: The transmit frequency accuracy of the SS is expected to be sufficient to ensure that the difference between 0,1 ppm (0,2 ppm for GSM 400) absolute and 0,1 ppm (0,2 ppm for GSM 400) compared to signals received from the BS would be small enough to be considered insignificant.

13.1b.4 Method of test

This test uses the same measurement process as test 13.1.

13.1b.4.1 Initial conditions

A call is set up according to the Generic call setup procedure in the mid ARFCN range with a power control level set to maximum power..

The SS activates ciphering mode.

NOTE 1: Ciphering mode is active during this test to give a pseudo-random bit stream to the modulator.

The SS generates Standard Test Signal C1 of annex 5 using AQPSK modulation with SCPIR=0dB, on the active VAMOS subchannel (subchannel 1) using trainings sequence 5 form TSC set 1. The other VAMOS subchannel (subchannel 2) uses trainings sequences 5 from TSC set 2.

The SS commands the MS to complete the traffic channel loop back without signalling of erased frames (see subclause 36.2.1.1).

The power level of the Standard Test Signal C1 is set 20 dB above reference sensitivity level( ).

Specific PICS statements:

-

PIXIT Statements:

-

13.1b.4.2 Procedure

a) The SS calculates the frequency accuracy of the captured burst as described in test 13.1.

b) Steps a) is repeated for 20 bursts spaced over a period of not less than 1800s).

c) The SS changes to SCPIR=-4dB, all other conditions remain constant.

d) The SS calculates the frequency accuracy of the captured burst as described in test 13.1.

e) Steps d) is repeated for 20 bursts spaced over a period of not less than 300s).

f) Steps a) to e) are repeated under extreme test conditions (see annex 1, TC2.2).

13.1b.5 Test requirements

13.1b.5.1 Frequency error

For all measured bursts, the frequency error, derived in repeats of steps a) and d), shall be less than 0,1 ppm, except for GSM 400 MS where a value of 0,2 ppm shall be used.

13.2b Frequency error under multipath and interference conditions in TIGHTER configuration \ with legacy TSC in VAMOS mode

13.2b.1 Definition

The frequency error under multipath and interference conditions is a measure of the ability of the MS to maintain frequency synchronization with the received signal under conditions of Doppler shift, multipath reception and interference.

13.2b.2 Conformance requirement

1. The MS carrier frequency error for each burst shall be accurate to within 0,1 ppm (0,2 ppm for GSM 400), or 0,1 ppm (0,2 ppm for GSM 400) compared to signals received from the BS for signal levels down to 3 dB below the reference sensitivity level.

   1.1 Under normal conditions; 3GPP TS 45.10, subclauses 6 and 6.1.

   1.2 Under extreme conditions; 3GPP TS 45.10, subclauses 6 and 6.1; 3GPP TS 45.05 annex D in subclauses D.2.1 and D.2.2.

2. The MS carrier frequency error for each burst shall be accurate to within 0,1 ppm (0,2 ppm for GSM 400), or 0,1 ppm (0,2 ppm for GSM 400) compared to signals received from the BS for 3 dB less carrier to interference ratio than the reference interference ratios (3GPP TS 05.10, subclauses 6 and 6.1).

13.2b.3 Test purpose

1. To verify that the MS carrier frequency error at reference sensitivity, under conditions of multipath and Doppler shift does not exceed 0,1 ppm (0,2 ppm for GSM 400) + the frequency error due to the Doppler shift of the received signal and the assessment error in the MS.

   1.1 Under normal conditions.

   1.2 Under extreme conditions.

NOTE 1: Although the conformance requirement states that frequency synchronization should be maintained for input signals 3 dB below reference sensitivity. Due to the Radio Link Failure counter this test condition cannot be established. Hence all tests in this subclause are conducted at reference sensitivity level.

2. To verify that the MS carrier frequency error, under interference conditions and TUlow fading profile, does not exceed 0,1 ppm (0,2 ppm for GSM 400) + the frequency error due to the Doppler shift of the received signal and the assessment error in the MS.

NOTE 2: The test adds the effect of Doppler shift to the requirements as the conformance requirement refers to signals input to the MS receiver whereas the frequency reference for measurement will not take account of the Doppler shift.

13.b.4 Method of test

This test uses the same measurement process as test 13.1 for the MS operating under various RF conditions.

NOTE 3: The BA list sent on the BCCH and the SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCH but if they are provided none will be within 5 channels of the ARFCN used for the serving BCCH or TCH.

13.2b.4.1 Initial conditions

The MS is brought into the idle updated state on a serving cell with BCCH in the mid ARFCN range.

The SS commands the MS to transmit at maximum power.

13.2b.4.2 Procedure

a) The level of the serving cell BCCH is set to 10 dB above the reference sensitivity level( ) and the fading function set to RA. The SS waits 30 s for the MS to stabilize to these conditions. The SS is set up to capture the first burst transmitted by the MS during call establishment. A call is initiated by the SS on a channel in the mid ARFCN range as described for the generic call set up procedure but to a TCH at level 10 dB above the reference sensitivity level( ), using AQPSK modulation with SCPIR=0dB, on the active VAMOS subchannel (subchannel 1) using trainings sequence 5 form TSC set 1. The other VAMOS subchannel (subchannel 2) uses trainings sequences 5 from TSC set 2. Fading function set to RA.

b) The SS calculates the frequency accuracy of the captured burst as described in test 13.1.

c) The SS sets the serving cell BCCH and TCH to the reference sensitivity level( ) applicable to the type of MS, still with the fading function set to RA and then waits 30 s for the MS to stabilize to these conditions.

d) The SS shall capture subsequent bursts from the traffic channel in the manner described in test 13.1.

NOTE 4: Due to the very low signal level at the MS receiver input the MS receiver is liable to error. The "looped back" bits are therefore also liable to error, and hence the SS does not know the expected bit sequence. The SS will have to demodulate the received signal to derive (error free) the transmitter burst bit pattern. Using this bit pattern the SS can calculate the expected phase trajectory according to the definition within 3GPP TS 05.04.

e) The SS calculates the frequency accuracy of the captured burst as described in test 13.1.

f) Steps d) and e) are repeated for 5 traffic channel bursts spaced over a period of not less than 20 s.

g) The initial conditions are established again and steps a) to f) are repeated but with the fading function set to HT100 (HT200 for GSM 400, HT120 for GSM 700).

h) The initial conditions are established again and steps a) to f) are repeated but with the fading function set to TU50 (TU100 for GSM 400, TU 60 for GSM 700).

i) The initial conditions are established again and steps a) and b) are repeated but with the following differences:

   - the levels of the BCCH and TCH are set to 18 dB above reference sensitivity level( ) and SCPIR=-4dB.

   - two further independent interfering signals are sent on the same nominal carrier frequency as the BCCH and TCH and at a level 10 dB below the level of the TCH and modulated with random data, including the midamble.

   - the fading function for all channels is set to TUlow.

   - the SS waits 100 s for the MS to stabilize to these conditions.

j) Repeat steps d) to f), except that at step f) the measurement period must be extended to 200 s and the number of measurements increased to 20.

k) Repeat step h) under extreme test conditions (see annex 1, TC2.2).

13.2b.5 Test requirements

The frequency error, with reference to the SS carrier frequency as measured in repeats of step e), for each measured burst shall be less than the values shown in tables 13-1a and 13-1b.

Table 13-1a: Requirements for frequency error under multipath, Doppler shift and interference conditions

T-GSM 810, GSM 850 and GSM 900		DCS 1 800		PCS 1 900	
Propagation condition	**Permitted frequency error**	**Propagation condition**	**Permitted frequency error**	**Propagation condition**	**Permitted frequency error**
RA250	±300 Hz	RA130	±400 Hz	RA130	±420 Hz
HT100	±180 Hz	HT100	±350 Hz	HT100	±370 Hz
TU50	±160 Hz	TU50	±260 Hz	TU50	±280 Hz
TU3	±230 Hz	TU1,5	±320 Hz	TU1,5	±330 Hz

Table 13-1b: Requirements for frequency error under multipath, Doppler shift and interference conditions

GSM 450		GSM 480		GSM 700	
Propagation condition	**Permitted frequency error**	**Propagation condition**	**Permitted frequency error**	**Propagation condition**	**Permitted frequency error**
RA500	±300 Hz	RA500	±300 Hz	RA 300	±300 Hz
HT200	±180 Hz	HT200	±180 Hz	HT 120	±180 Hz
TU100	±160 Hz	TU100	±160 Hz	TU 60	±160 Hz
TU6	±230 Hz	TU6	±230 Hz	TU 3.6	±230 Hz

13.2 Frequency error under multipath and interference conditions

13.2.1 Definition

The frequency error under multipath and interference conditions is a measure of the ability of the MS to maintain frequency synchronization with the received signal under conditions of Doppler shift, multipath reception and interference.

13.2.2 Conformance requirement

1. The MS carrier frequency error for each burst shall be accurate to within 0,1 ppm (0,2 ppm for GSM 400), or 0,1 ppm (0,2 ppm for GSM 400) compared to signals received from the BS for signal levels down to 3 dB below the reference sensitivity level.

   1.1 Under normal conditions; 3GPP TS 05.10, subclauses 6 and 6.1.

   1.2 Under extreme conditions; 3GPP TS 05.10, subclauses 6 and 6.1; 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2.

2. The MS carrier frequency error for each burst shall be accurate to within 0,1 ppm (0,2 ppm for GSM 400), or 0,1 ppm (0,2 ppm for GSM 400) compared to signals received from the BS for 3 dB less carrier to interference ratio than the reference interference ratios (3GPP TS 05.10, subclauses 6 and 6.1).

13.2.3 Test purpose

1. To verify that the MS carrier frequency error at reference sensitivity, under conditions of multipath and Doppler shift does not exceed 0,1 ppm (0,2 ppm for GSM 400) + the frequency error due to the Doppler shift of the received signal and the assessment error in the MS.

   1.1 Under normal conditions.

1.2 Under extreme conditions.

NOTE 1: Although the conformance requirement states that frequency synchronization should be maintained for input signals 3 dB below reference sensitivity. Due to the Radio Link Failure counter this test condition cannot be established. Hence all tests in this subclause are conducted at reference sensitivity level.

2. To verify that the MS carrier frequency error, under interference conditions and TUlow fading profile, does not exceed 0,1 ppm (0,2 ppm for GSM 400) + the frequency error due to the Doppler shift of the received signal and the assessment error in the MS.

NOTE 2: The test adds the effect of Doppler shift to the requirements as the conformance requirement refers to signals input to the MS receiver whereas the frequency reference for measurement will not take account of the Doppler shift.

13.2.4 Method of test

This test uses the same measurement process as test 13.1 for the MS operating under various RF conditions.

NOTE: The BA list sent on the BCCH and the SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCH but if they are provided none will be within 5 channels of the ARFCN used for the serving BCCH or TCH.

13.2.4.1 Initial conditions

The MS is brought into the idle updated state on a serving cell with BCCH in the mid ARFCN range.

13.2.4.2 Procedure

a) The level of the serving cell BCCH is set to 10 dB above the reference sensitivity level( ) and the fading function set to RA. The SS waits 30 s for the MS to stabilize to these conditions. The SS is set up to capture the first burst transmitted by the MS during call establishment. A call is initiated by the SS on a channel in the mid ARFCN range as described for the generic call set up procedure but to a TCH at level 10 dB above the reference sensitivity level( ) and fading function set to RA.

b) The SS calculates the frequency accuracy of the captured burst as described in test 13.1.

c) The SS sets the serving cell BCCH and TCH to the reference sensitivity level( ) applicable to the type of MS, still with the fading function set to RA and then waits 30 s for the MS to stabilize to these conditions.

d) The SS shall capture subsequent bursts from the traffic channel in the manner described in test 13.1.

NOTE: Due to the very low signal level at the MS receiver input the MS receiver is liable to error. The "looped back" bits are therefore also liable to error, and hence the SS does not know the expected bit sequence. The SS will have to demodulate the received signal to derive (error free) the transmitter burst bit pattern. Using this bit pattern the SS can calculate the expected phase trajectory according to the definition within 3GPP TS 05.04.

e) The SS calculates the frequency accuracy of the captured burst as described in test 13.1.

f) Steps d) and e) are repeated for 5 traffic channel bursts spaced over a period of not less than 20 s.

g) The initial conditions are established again and steps a) to f) are repeated but with the fading function set to HT100 (HT200 for GSM 400, HT120 for GSM 700).

h) The initial conditions are established again and steps a) to f) are repeated but with the fading function set to TU50 (TU100 for GSM 400, TU 60 for GSM 700).

i) The initial conditions are established again and steps a) and b) are repeated but with the following differences:

- the levels of the BCCH and TCH are set to 18 dB above reference sensitivity level( ).
- two further independent interfering signals are sent on the same nominal carrier frequency as the BCCH and TCH and at a level 10 dB below the level of the TCH and modulated with random data, including the midamble.

- the fading function for all channels is set to TUlow.

- the SS waits 100 s for the MS to stabilize to these conditions.

j) Repeat steps d) to f), except that at step f) the measurement period must be extended to 200 s and the number of measurements increased to 20.

k) The initial conditions are established again and steps a) to j) are repeated for ARFCN in the Low ARFCN range.

l) The initial conditions are established again and steps a) to j) are repeated for ARFCN in the High ARFCN range.

m) Repeat step h) under extreme test conditions (see annex 1, TC2.2).

13.2.5 Test requirements

The frequency error, with reference to the SS carrier frequency as measured in repeats of step e), for each measured burst shall be less than the values shown in tables 13-1a and 13-1b.

Table 13-1a: Requirements for frequency error under multipath, Doppler shift and interference conditions

T-GSM 810, GSM 850 and GSM 900		DCS 1 800		PCS 1 900	
Propagation condition	Permitted frequency error	Propagation condition	Permitted frequency error	Propagation condition	Permitted frequency error
RA250	±300 Hz	RA130	±400 Hz	RA130	±420 Hz
HT100	±180 Hz	HT100	±350 Hz	HT100	±370 Hz
TU50	±160 Hz	TU50	±260 Hz	TU50	±280 Hz
TU3	±230 Hz	TU1,5	±320 Hz	TU1,5	±330 Hz

Table 13-1b: Requirements for frequency error under multipath, Doppler shift and interference conditions

GSM 450		GSM 480		GSM 700	
Propagation condition	Permitted frequency error	Propagation condition	Permitted frequency error	Propagation condition	Permitted frequency error
RA500	±300 Hz	RA500	±300 Hz	RA 300	±300 Hz
HT200	±180 Hz	HT200	±180 Hz	HT 120	±180 Hz
TU100	±160 Hz	TU100	±160 Hz	TU 60	±160 Hz
TU6	±230 Hz	TU6	±230 Hz	TU 3.6	±230 Hz

13.2a Frequency error under multipath and interference conditions in VAMOS configuration

13.2a.1 Definition

The frequency error under multipath and interference conditions is a measure of the ability of the MS to maintain frequency synchronization with the received signal under conditions of Doppler shift, multipath reception and interference.

13.2a.2 Conformance requirement

1. The MS carrier frequency error for each burst shall be accurate to within 0,1 ppm (0,2 ppm for GSM 400), or 0,1 ppm (0,2 ppm for GSM 400) compared to signals received from the BS for signal levels down to 3 dB below the reference sensitivity level.

   1.1 Under normal conditions; 3GPP TS 45.10, subclauses 6 and 6.1.

   1.2 Under extreme conditions; 3GPP TS 45.10, subclauses 6 and 6.1; 3GPP TS 45.05 annex D in subclauses D.2.1 and D.2.2.

2. The MS carrier frequency error for each burst shall be accurate to within 0,1 ppm (0,2 ppm for GSM 400), or 0,1 ppm (0,2 ppm for GSM 400) compared to signals received from the BS for 3 dB less carrier to interference ratio than the reference interference ratios (3GPP TS 05.10, subclauses 6 and 6.1).

13.2a.3 Test purpose

1. To verify that the MS carrier frequency error at reference sensitivity, under conditions of multipath and Doppler shift does not exceed 0,1 ppm (0,2 ppm for GSM 400) + the frequency error due to the Doppler shift of the received signal and the assessment error in the MS.

   1.1 Under normal conditions.

   1.2 Under extreme conditions.

NOTE 1: Although the conformance requirement states that frequency synchronization should be maintained for input signals 3 dB below reference sensitivity. Due to the Radio Link Failure counter this test condition cannot be established. Hence all tests in this subclause are conducted at reference sensitivity level.

2. To verify that the MS carrier frequency error, under interference conditions and TUlow fading profile, does not exceed 0,1 ppm (0,2 ppm for GSM 400) + the frequency error due to the Doppler shift of the received signal and the assessment error in the MS.

NOTE 2: The test adds the effect of Doppler shift to the requirements as the conformance requirement refers to signals input to the MS receiver whereas the frequency reference for measurement will not take account of the Doppler shift.

13.2a.4 Method of test

This test uses the same measurement process as test 13.1 for the MS operating under various RF conditions.

NOTE: The BA list sent on the BCCH and the SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCH but if they are provided none will be within 5 channels of the ARFCN used for the serving BCCH or TCH.

13.2a.4.1 Initial conditions

The MS is brought into the idle updated state on a serving cell with BCCH in the mid ARFCN range.

The SS commands the MS to transmit at maximum power.

13.2a.4.2 Procedure

a) The level of the serving cell BCCH is set to 10 dB above the reference sensitivity level( ) and the fading function set to RA. The SS waits 30 s for the MS to stabilize to these conditions. The SS is set up to capture the first burst transmitted by the MS during call establishment. A call is initiated by the SS on a channel in the mid ARFCN range as described for the generic call set up procedure but to a TCH at level 10 dB above the reference sensitivity level( ), using AQPSK modulation with SCPIR=0dB, on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 form TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1. Fading function set to RA.

b) The SS calculates the frequency accuracy of the captured burst as described in test 13.1.

c) The SS sets the serving cell BCCH and TCH to the reference sensitivity level( ) applicable to the type of MS, still with the fading function set to RA and then waits 30 s for the MS to stabilize to these conditions.

d) The SS shall capture subsequent bursts from the traffic channel in the manner described in test 13.1.

NOTE: Due to the very low signal level at the MS receiver input the MS receiver is liable to error. The "looped back" bits are therefore also liable to error, and hence the SS does not know the expected bit sequence. The SS will have to demodulate the received signal to derive (error free) the transmitter burst bit pattern. Using this bit pattern the SS can calculate the expected phase trajectory according to the definition within 3GPP TS 05.04.

e) The SS calculates the frequency accuracy of the captured burst as described in test 13.1.

f) Steps d) and e) are repeated for 5 traffic channel bursts spaced over a period of not less than 20 s.

g) The initial conditions are established again and steps a) to f) are repeated but with the fading function set to HT100 (HT200 for GSM 400, HT120 for GSM 700).

h) The initial conditions are established again and steps a) to f) are repeated but with the fading function set to TU50 (TU100 for GSM 400, TU 60 for GSM 700).

i) The initial conditions are established again and steps a) and b) are repeated but with the following differences:

- the levels of the BCCH and TCH are set to 18 dB above reference sensitivity level( ) and SCPIR=-4dB.
- two further independent interfering signals are sent on the same nominal carrier frequency as the BCCH and TCH and at a level 10 dB below the level of the TCH and modulated with random data, including the midamble.
- the fading function for all channels is set to TUlow.
- the SS waits 100 s for the MS to stabilize to these conditions.

j) Repeat steps d) to f), except that at step f) the measurement period must be extended to 200 s and the number of measurements increased to 20.

k) Repeat step h) under extreme test conditions (see annex 1, TC2.2).

13.2a.5 Test requirements

The frequency error, with reference to the SS carrier frequency as measured in repeats of step e), for each measured burst shall be less than the values shown in tables 13-1a and 13-1b.

Table 13-1a: Requirements for frequency error under multipath, Doppler shift and interference conditions

T-GSM 810, GSM 850 and GSM 900		DCS 1 800		PCS 1 900	
Propagation condition	Permitted frequency error	Propagation condition	Permitted frequency error	Propagation condition	Permitted frequency error
RA250	±300 Hz	RA130	±400 Hz	RA130	±420 Hz
HT100	±180 Hz	HT100	±350 Hz	HT100	±370 Hz
TU50	±160 Hz	TU50	±260 Hz	TU50	±280 Hz
TU3	±230 Hz	TU1,5	±320 Hz	TU1,5	±330 Hz

Table 13-1b: Requirements for frequency error under multipath, Doppler shift and interference conditions

GSM 450		GSM 480		GSM 700	
Propagation condition	Permitted frequency error	Propagation condition	Permitted frequency error	Propagation condition	Permitted frequency error
RA500	±300 Hz	RA500	±300 Hz	RA 300	±300 Hz
HT200	±180 Hz	HT200	±180 Hz	HT 120	±180 Hz
TU100	±160 Hz	TU100	±160 Hz	TU 60	±160 Hz
TU6	±230 Hz	TU6	±230 Hz	TU 3.6	±230 Hz

13.3 Transmitter output power and burst timing

13.3.1 Definition

The transmitter output power is the average value of the power delivered to an artificial antenna or radiated by the MS and its integral antenna, over the time that the useful information bits of one burst are transmitted.

The transmit burst timing is the envelope of the RF power transmitted with respect to time. The timings are referenced to the transition from bit 13 to bit 14 of the Training Sequence ("midamble") before differential decoding. The timing of the modulation is referenced to the timing of the received signal from the SS.

13.3.2 Conformance requirement

1. The MS maximum output power shall be as defined in 3GPP TS 05.05, subclause 4.1.1, table for GMSK modulation, according to its power class, with a tolerance of ±2 dB under normal conditions; 3GPP TS 05.05, subclause 4.1.1, table for GMSK modulation.

2. The MS maximum output power shall be as defined in 3GPP TS 05.05, subclause 4.1.1, table for GMSK modulation, according to its power class, with a tolerance of ±2,5 dB under extreme conditions; 3GPP TS 05.05, subclause 4.1.1, table for GMSK modulation; 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2.

3. The power control levels shall have the nominal output power levels as defined in 3GPP TS 05.05, subclause 4.1.1, from the lowest power control level up to the maximum output power corresponding to the class of the MS (for tolerance on maximum output power see conformance requirements 1), with a tolerance of ±3 dB, ±4 dB or ±5 dB under normal conditions; 3GPP TS 05.05, subclause 4.1.1.

4. The power control levels shall have the nominal output power levels as defined in 3GPP TS 05.05, 4.1.1, from the lowest power control level up to the maximum output power corresponding to the class of the MS (for tolerance on maximum output power see conformance requirements 2), with a tolerance of ±4 dB, ±5 dB or ±6 dB under extreme conditions; 3GPP TS 05.05, subclause 4.1.1; 3GPP TS 05.05 annex D subclauses D.2.1 and D.2.2.

5. The output power actually transmitted by the MS at consecutive power control levels shall form a monotonic sequence and the interval between power control levels shall be 2 ± 1,5 dB (1 ± 1dB between power control level 30 and 31 for PCS 1 900); 3GPP TS 05.05, subclause 4.1.1.

6. The transmitted power level relative to time for a normal burst shall be within the power/time template given in 3GPP TS 05.05, annex B in figure B.1:

   6.1 Under normal conditions; 3GPP TS 05.05, subclause 4.5.2.

   6.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.5.2, 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2.

7. When accessing a cell on the RACH and before receiving the first power command during a communication on a DCCH or TCH (after an IMMEDIATE ASSIGNMENT), all GSM, class 1 and class 2 DCS 1 800 and PCS 1 900 MS shall use the power control level defined by the MS_TXPWR_MAX_CCH parameter broadcast on the BCCH of the cell, or if MS_TXPWR_MAX_CCH corresponds to a power control level not supported by the MS as defined by its power class, the MS shall act as though the closest supported power control level had been broadcast. A Class 3 DCS 1 800 MS shall use the POWER_OFFSET parameter.

8. The transmissions from the MS to the BS, measured at the MS antenna, shall be 468,75 - TA bit periods behind the transmissions received from the BS, where TA is the last timing advance received from the current serving BS. The tolerance on these timings shall be ±1 bit period:

   8.1 Under normal conditions; 3GPP TS 05.10, subclause 6.4.

   8.2 Under extreme conditions; 3GPP TS 05.10, subclause 6.4, 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2.

9. The transmitted power level relative to time for a random access burst shall be within the power/time template given in 3GPP TS 05.05, annex B in figure B.3:

   9.1 Under normal conditions; 3GPP TS 05.05, subclause 4.5.2.

   9.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.5.2, 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2.

10 The MS shall use a TA value of 0 for the Random Access burst sent:

   10.1 Under normal conditions; 3GPP TS 05.10, subclause 6.6.

   10.2 Under extreme conditions; 3GPP TS 05.10, subclause 6.6, 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2.

13.3.3 Test purpose

1. To verify that the maximum output power of the MS, under normal conditions, is within conformance requirement 1.

2. To verify that the maximum output power of the MS, under extreme conditions, is within conformance requirement 2.

3. To verify that all nominal output power levels, relevant to the class of MS, are implemented in the MS and have output power levels, under normal conditions, within conformance requirement 3.

4. To verify that all nominal output levels, relevant to the class of MS, are implemented in the MS and have output power levels, under extreme conditions, within conformance requirement 4.

5. To verify that the step in the output power transmitted by the MS at consecutive power control levels is within conformance requirement 5 under normal conditions.

6. To verify that the output power relative to time, when sending a normal burst is within conformance requirement 6:

   6.1 Under normal conditions.

   6.2 Under extreme conditions.

7. To verify that the MS uses the maximum power control level according to its power class if commanded to a power control level exceeding its power class.

8. To verify that, for normal bursts, the MS transmissions to the BS are timed within conformance requirement 8:

   8.1 Under normal conditions.

   8.2 Under extreme conditions.

9. To verify that the output power relative to time, when sending an access burst is within conformance requirement 9:

   9.1 Under normal conditions.

   9.2 Under extreme conditions.

10. To verify that, for an access burst, the MS transmission to the BS is timed within conformance requirement 10:

    10.1 Under normal conditions.

    10.2 Under extreme conditions.

13.3.4 Methods of test

Two methods of test are described, separately for:

1) equipment fitted with a permanent antenna connector or fitted with a temporary test connector as a test fixture, and for

2) equipment fitted with an integral antenna, and which cannot be connected to an external antenna.

NOTE: The behaviour of the MS in the system is determined to a high degree by the antenna, and this is the only transmitter test in this EN using the integral antenna. Further studies are ongoing on improved testing on the integral antenna, taking practical conditions of MS use into account.

13.3.4.1 Method of test for equipment with a permanent or temporary antenna connector

13.3.4.1.1 Initial conditions

A call is set up by the SS according to the generic call set up procedure on a channel with ARFCN in the Mid ARFCN range, power control level set to Max power. MS TXPWR_MAX_CCH is set to the maximum value supported by the Power Class of the Mobile under test. For DCS 1 800 mobile stations the POWER_OFFSET parameter is set to 6 dB.

13.3.4.1.2 Procedure

a) Measurement of normal burst transmitter output power.

- The SS takes power measurement samples evenly distributed over the duration of one burst with a sampling rate of at least 2/T, where T is the bit duration. The samples are identified in time with respect to the modulation on the burst. The SS identifies the centre of the useful 147 transmitted bits, i.e. the transition from bit 13 to bit 14 of the midamble, as the timing reference.

- The transmitter output power is calculated as the average of the samples over the 147 useful bits. This is also used as the 0 dB reference for the power/time template.

b) Measurement of normal burst timing delay.

- The burst timing delay is the difference in time between the timing reference identified in a) and the corresponding transition in the burst received by the MS immediately prior to the MS transmit burst sampled.

c) Measurement of normal burst power/time relationship.

- The array of power samples measured in a) are referenced in time to the centre of the useful transmitted bits and in power to the 0 dB reference, both identified in a).

d) Steps a) to c) are repeated with the MS commanded to operate on each of the nominal output power levels supported by the MS, (see tables 13-2, 13-3 and 13-4) and in step a) on one nominal output power level higher than supported by the MS.

e) The SS commands the MS to the maximum power control level supported by the MS and steps a) to c) are repeated for ARFCN in the Low and High ranges.

f) Measurement of access burst transmitter output power.

- The SS causes the MS to generate an Access Burst on an ARFCN in the Mid ARFCN range, this could be either by a handover procedure or a new request for radio resource. In the case of a handover procedure the Power Level indicated in the HANDOVER COMMAND message is the maximum power control level supported by the MS. In the case of an Access Burst the MS shall use the Power Level indicated in the MS_TXPWR_MAX_CCH parameter. If the power class of the MS is DCS 1 800 Class 3, the MS shall also use the POWER_OFFSET parameter.

- The SS takes power measurement samples evenly distributed over the duration of the access burst as described in a). However, in this case the SS identifies the centre of the useful bits of the burst by identifying the transition from the last bit of the synch sequence. The centre of the burst is then five data bits prior to this point and is used as the timing reference.

- The transmitter output power is calculated as the average of the samples over the 87 useful bits of the burst. This is also used as the 0 dB reference for the power/time template.

g) Measurement of access burst timing delay.

- The burst timing delay is the difference in time between the timing reference identified in f) and the MS received data on the common control channel.

h) Measurement of access burst power/time relationship.

- The array of power samples measured in f) is referenced in time to the centre of the useful transmitted bits and in power to the 0 dB reference, both identified in f).

i) Depending on the method used in step f) to cause the MS to send an Access Burst, the SS sends either a HANDOVER COMMAND with power control level set to 10 or it changes the System Information elements MS_TXPWR_MAX_CCH and for DCS 1 800 the POWER_OFFSET on the serving cell BCCH in order to limit the MS transmit power on the Access Burst to power control level 10 (+23 dBm for GSM 400, GSM 700, T-GSM 810, GSM 850, and GSM 900 or +10 dBm for DCS 1 800 and PCS 1 900) and then steps f) to h) are repeated.

j) Steps a) to i) are repeated under extreme test conditions (annex 1, TC2.2) except that the repeats at step d) are only performed for power control level 10 and the minimum nominal output power level supported by the MS.

13.3.4.2 Method of test for equipment with an integral antenna

NOTE: If the MS is equipped with a permanent connector, such that the antenna can be disconnected and the SS be connected directly, then the method of subclause 13.3.4.1 will be applied.

The tests in this subclause are performed on an unmodified test sample.

13.3.4.2.1 Initial conditions

The MS is placed in the anechoic shielded chamber (annex 1, GC5) or on the outdoor test site, on an isolated support, in the position for normal use, at a distance of at least 3 metres from a test antenna, connected to the SS.

NOTE: The test method described has been written for measurement in an anechoic shielded chamber. If an outdoor test site is used then, in addition, it is necessary to raise/lower the test antenna through the specified height range to maximize the received power levels from both the test sample and the substitution antenna.

A call is set up by the SS according to the generic call set up procedure on a channel with ARFCN in the Mid ARFCN range, power control level set to Max power. MS_TXPWR_MAX_CCH is set to the maximum value supported by the Power Class of the Mobile under test. For DCS 1 800 mobile stations the POWER_OFFSET parameter is set to 6 dB.

13.3.4.2.2 Procedure

a) With the initial conditions set according to subclause 13.3.4.2.1 the test procedure in subclause 13.3.4.1.2 is followed up to and including step i), except that in step a), when measurements are done at maximum power for ARFCN in the Low, Mid and High range, the measurement is made eight times with the MS rotated by n*45 degrees for all values of n in the range 0 to 7.

   The measurements taken are received transmitter output power measurements rather than transmitter output power measurements, the output power measurement values can be derived as follows.

b) Assessment of test site loss for scaling of received output power measurements.

   The MS is replaced by a half-wave dipole, resonating at the centre frequency of the transmit band, connected to an RF generator.

   The frequency of the RF signal generator is set to the frequency of the ARFCN used for the 24 measurements in step a), the output power is adjusted to reproduce the received transmitter output power averages recorded in step a).

   For each indication the power, delivered by the generator (in Watts) to the half-wave dipole, is recorded. These values are recorded in the form Pnc, where n = MS rotation and c = channel number.

   For each channel number used compute:

$$\text{Pac(Watts into dipole)} = \frac{1}{8} * \sum_{n=0}^{n=7} \text{Pnc}$$

   from which: Pac (Tx dBm) = $10\log_{10}(\text{Pac}) + 30 + 2{,}15$

   The difference, for each of the three channels, between the actual transmitter output power averaged over the 8 measurement orientations and the received transmitter output power at orientation n = 0 is used to scale the received measurement results to actual transmitter output powers for all measured power control levels and ARFCN, which can then be checked against the requirements.

c) Temporary antenna connector calibration factors (transmit).

   A modified test sample equipped with a temporary antenna connector is placed in a climatic test chamber and is linked to the SS by means of the temporary antenna connector.

   Under normal test conditions, the power measurement and calculation parts of steps a) to i) of 13.3.4.1.2 are repeated except that the repeats at step d) are only performed for power control level 10 and the minimum nominal output power level supported by the MS.

NOTE 1: The values noted here are related to the output transmitter carrier power levels under normal test conditions, which are known after step b). Therefore frequency dependent calibration factors that account for the effects of the temporary antenna connector can be determined.

d) Measurements at extreme test conditions.

NOTE 2: Basically the procedure for extreme conditions is:

- the power/time template is tested in the "normal" way;

- the radiated power is measured by measuring the difference with respect to the radiated power under normal test conditions.

Under extreme test conditions steps a) to i) of subclause 13.3.4.1.2 are repeated except that the repeats at step d) are only performed for power control level 10 and the minimum nominal output power level supported by the MS.

The transmitter output power under extreme test conditions is calculated for each burst type, power control level and for every frequency used by adding the frequency dependent calibration factor, determined in c), to the values obtained at extreme conditions in this step.

13.3.5 Test requirements

a) The transmitter output power, under every combination of normal and extreme test conditions, for normal bursts and access bursts, at each frequency and for each nominal output power level applicable to the MS power class, shall be at the relevant level shown in table 13-2, table 13-3 or table 13-4 within the tolerances also shown in table 13-2, table 13-3 or table 13-4.

Bands other than DCS 1800 and PCS 1900 - begin

Table 13-2: Bands other than DCS 1800 and PCS 1900 transmitter output power for different power classes

Power class				Power control level (note2)	Transmitter output power	Tolerances	
2	3	4	5		dBm	normal	extreme
·				2	39	±2 dB	±2,5 dB
·	·			3	37	±3 dB (note1)	±4 dB (note1)
·	·			4	35	±3 dB	±4 dB
·	·	·		5	33	±3 dB (note1)	±4 dB (note1)
·	·	·		6	31	±3 dB	±4 dB
·	·	·	·	7	29	±3 dB (note1)	±4 dB (note1)
·	·	·	·	8	27	±3 dB	±4 dB
·	·	·	·	9	25	±3 dB	±4 dB
·	·	·	·	10	23	±3 dB	±4 dB
·	·	·	·	11	21	±3 dB	±4 dB
·	·	·	·	12	19	±3 dB	±4 dB
·	·	·	·	13	17	±3 dB	±4 dB
·	·	·	·	14	15	±3 dB	±4 dB
·	·	·	·	15	13	±3 dB	±4 dB
·	·	·	·	16	11	±5 dB	±6 dB
·	·	·	·	17	9	±5 dB	±6 dB
·	·	·	·	18	7	±5 dB	±6 dB
·	·	·	·	19	5	±5 dB	±6 dB
NOTE1: When the power control level corresponds to the power class of the MS, then the tolerances shall be 2,0 dB under normal test conditions and 2,5 dB under extreme test conditions.							
NOTE2: There is no requirement to test power control levels 20-31							

Bands other than DCS 1800 and PCS 1900 - end

DCS 1 800 only - begin

Table 13-3: DCS 1 800 transmitter output power for different power classes

Power class			Power control level (note2)	Transmitter output power	Tolerances	
1	2	3		dBm	normal	extreme
		·	29	36	±2,0 dB	±2,5 dB
		·	30	34	±3,0 dB	±4,0 dB
		·	31	32	±3,0 dB	±4,0 dB
·		·	0	30	±3,0 dB (note1)	±4 dB (note1)
·		·	1	28	±3 dB	±4 dB
·		·	2	26	±3 dB	±4 dB
·	·	·	3	24	±3 dB (note1)	±4 dB (note1)
·	·	·	4	22	±3 dB	±4 dB
·	·	·	5	20	±3 dB	±4 dB
·	·	·	6	18	±3 dB	±4 dB
·	·	·	7	16	±3 dB	±4 dB
·	·	·	8	14	±3 dB	±4 dB
·	·	·	9	12	±4 dB	±5 dB
·	·	·	10	10	±4 dB	±5 dB
·	·	·	11	8	±4 dB	±5 dB
·	·	·	12	6	±4 dB	±5 dB
·	·	·	13	4	±4 dB	±5 dB
·	·	·	14	2	±5 dB	±6 dB
·	·	·	15	0	±5 dB	±6 dB
NOTE1: When the power control level corresponds to the power class of the MS, then the tolerances shall be 2,0 dB under normal test conditions and 2,5 dB under extreme test conditions.						
NOTE2: There is no requirement to test power control levels 16-28						

DCS 1 800 only – end

PCS 1 900 only - begin

Table 13-4: PCS 1 900 transmitter output power for different power classes

Power class			Power control level (note2)	Transmitter output power	Tolerances	
1	2	3		dBm	Normal	Extreme
		·	30	33	±2,0 dB	±2,5 dB
		·	31	32	±2,0 dB	±2,5 dB
·		·	0	30	±3,0 dB (note1)	±4 dB (note1)
·		·	1	28	±3 dB	±4 dB
·		·	2	26	±3 dB	±4 dB
·	·	·	3	24	±3 dB (note1)	±4 dB (note1)
·	·	·	4	22	±3 dB	±4 dB
·	·	·	5	20	±3 dB	±4 dB
·	·	·	6	18	±3 dB	±4 dB
·	·	·	7	16	±3 dB	±4 dB
·	·	·	8	14	±3 dB	±4 dB
·	·	·	9	12	±4 dB	±5 dB
·	·	·	10	10	±4 dB	±5 dB
·	·	·	11	8	±4 dB	±5 dB
·	·	·	12	6	±4 dB	±5 dB
·	·	·	13	4	±4 dB	±5 dB
·	·	·	14	2	±5 dB	±6 dB
·	·	·	15	0	±5 dB	±6 dB
NOTE1: When the power control level corresponds to the power class of the MS, then the tolerances shall be 2,0 dB under normal test conditions and 2,5 dB under extreme test conditions.						
NOTE2: There is no requirement to test power control levels 16-29						

PCS 1 900 only - end

b) The difference between the transmitter output power at two adjacent power control levels, measured at the same frequency, shall not be less than 0,5 dB and not be more than 3,5 dB. For PCS 1 900 Class 3 the difference between the transmitter output power at power controls level 30 and 31, measured at the same frequency, shall not be less than 0 dB and not be more than 2 dB.

c) The power/time relationship of the measured samples for normal bursts shall be within the limits of the power time template of figure 13-1 at each frequency, under every combination of normal and extreme test conditions and at each power control level measured.

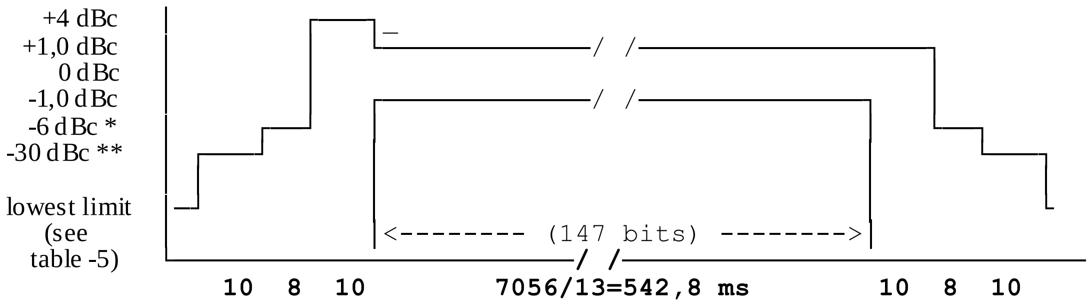


Figure 13-1: Power / time template for normal bursts

* For MS supporting bands other than DCS 1800 and PCS 1900:

-4 dBc for power control level 16;

-2 dBc for power control level 17;

-1 dBc for power control levels 18 and 19.

For DCS 1 800 and PCS 1 900 MS:

-4 dBc for power control level 11;

-2 dBc for power control level 12;

-1 dBc for power control levels 13, 14 and 15.

** For MS supporting bands other than DCS 1800 and PCS 1900:

-30 dBc or -17 dBm, whichever is the higher.

For DCS 1 800 and PCS 1 900 MS:

-30 dBc or -20 dBm, whichever is the higher.

Table 13-5: Lowest measurement limit for power / time template

	lowest limit
Bands other than DCS 1800 and PCS 1900	-59 dBc or -54 dBm whichever is the highest, except for the timeslot preceding the active slot, for which the allowed level is equal to -59 dBc or -36 dBm, whichever is the highest
DCS 1 800, PCS 1 900	-48 dBc or -48 dBm whichever is the highest

d) All the power control levels, for the type and power class of the MS as stated by the manufacturer, shall be implemented in the MS.

e) When the transmitter is commanded to a power control level outside of the capability corresponding to the type and power class of the MS as stated by the manufacturer, then the transmitter output power shall be within the tolerances for the closest power control level corresponding to the type and power class as stated by the manufacturer.

f) The centre of the transmitted normal burst as defined by the transition of bits 13/14 of the midamble shall be 3 timeslot periods (1 731 μs) ±1 bit period (±3,69 μs) after the centre of the corresponding received burst.

g) The power/time relationship of the measured samples for access bursts shall be within the limits of the power time template of figure 13-2 at each frequency, under every combination of normal and extreme test conditions and at each power control level measured.

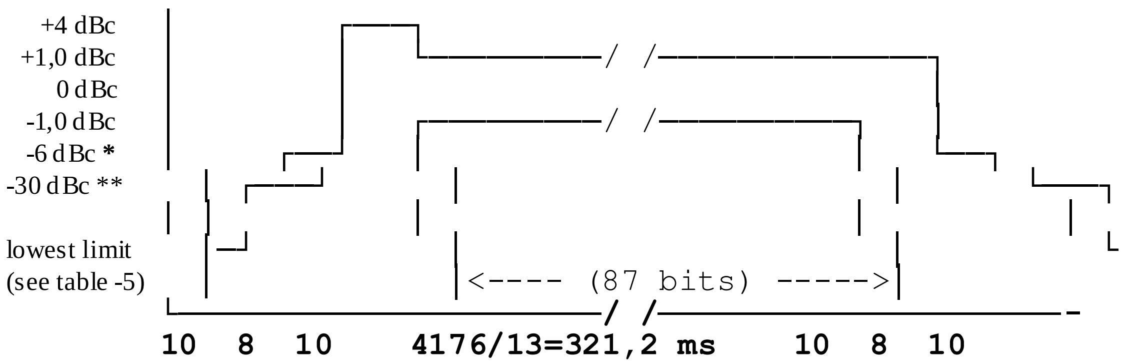


Figure 13-2: Power / time template for access burst

* For MS supporting bands other than DCS 1800 and PCS 1900:

-4 dBc for power control level 16;

-2 dBc for power control level 17;

-1 dBc for power control levels 18 and 19.

For DCS 1 800 and PCS 1 900 MS:

-4 dBc for power control level 11;

-2 dBc for power control level 12;

-1 dBc for power control levels 13, 14 and 15.

** For MS supporting bands other than DCS 1800 and PCS 1900:

-30 dBc or -17 dBm, whichever is the higher.

For DCS 1 800 and PCS 1 900 MS:

-30 dBc or -20 dBm, whichever is the higher.

h) The centre of the transmitted access burst shall be an integer number of timeslot periods less 30 bit periods relative to any CCCH midamble centre with a tolerance of ±1 bit period (±3,69 μs).

13.4 Output RF spectrum

13.4.1 Definition

The output RF spectrum is the relationship between the frequency offset from the carrier and the power, measured in a specified bandwidth and time, produced by the MS due to the effects of modulation and power ramping.

13.4.2 Conformance requirement

1. The level of the output RF spectrum due to modulation shall be no more than that given in 3GPP TS 05.05, subclause 4.2.1, table a1) for GSM 400, GSM 700, T_GSM 810, GSM 850 and GSM 900, table B.1) for DCS 1 800 or table C.1) for PCS 1 900, with the following lowest measurement limits:

   - -36 dBm below 600 kHz offset from the carrier;

- -51 dBm for GSM 400, GSM 700, T_GSM 810, GSM 850 and GSM 900 or -56 dBm for DCS 1 800 and PCS 1 900 from 600 kHz out to less than 1 800 kHz offset from the carrier;
- -46 dBm for GSM 400, GSM 700, T_GSM 810, GSM 850 and GSM 900 or -51 dBm for DCS 1 800 and PCS 1 900 at and beyond 1 800 kHz offset from the carrier;

but with the following exceptions at up to -36 dBm:

- up to three bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz in the combined range 600 kHz to 6000 kHz above and below the carrier;
- up to 12 bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz at more than 6 000 kHz offset from the carrier.

1.1 Under normal conditions; 3GPP TS 05.05, subclause 4.2.1.

1.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.2.1; 3GPP TS 05.05, annex D in subclauses D.2.1 and D.2.2.

2. The level of the output RF spectrum due to switching transients shall be no more than given in 3GPP TS 05.05, subclause 4.2.2, table "a) Mobile Station".

   2.1 Under normal conditions; 3GPP TS 05.05, subclause 4.2.2.

   2.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.2.2; 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2.

3. When allocated a channel, the power emitted by a GSM 400, GSM 900 and DCS 1 800 MS, in the band 935 MHz to 960 MHz shall be no more than -79 dBm, in the band 925 MHz to 935 MHz shall be no more than -67 dBm and in the band 1 805 MHz to 1 880 MHz shall be no more than -71 dBm except in five measurements in each of the bands 925 MHz to 960 MHz and 1 805 MHz to 1 880 MHz where exceptions at up to -36 dBm are permitted. For GSM 400 MS, in addition, the power emitted by MS, in the bands of 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz shall be no more than -67 dBm except in three measurements in each of the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz where exceptions at up to -36 dBm are permitted. For GSM 700, GSM 850 and PCS 1 900 MS, the power emitted by MS, in the band of 728 MHz to 736 MHz shall be no more than -73 dBm, in the band of 736 MHz to 746 MHz shall be no more than -79 dBm, in the band of 747 MHz to 757 MHz shall be no more than -79 dBm, in the band of 757 MHz to 763 MHz shall be no more than -73 dBm, in the band 869 MHz to 894 MHz shall be no more than -79 dBm, in the band 1 930 MHz to 1 990 MHz shall be no more than -71 dBm except in five measurements in each of the bands 728 MHz to 746 MHz, 747 MHz to 763 MHz, 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where exceptions at up to -36 dBm are permitted. Under normal conditions; 3GPP TS 45.005, subclause 4.3.3.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

13.4.3 Test purpose

1. To verify that the output RF spectrum due to modulation does not exceed conformance requirement 1.

   1.1 Under normal conditions.

   1.2 Under extreme conditions.

2. To verify that the output RF spectrum due to switching transients does not exceed conformance requirement 2 when a reasonable margin is allowed for the effect of spectrum due to modulation.

   2.1 Under normal conditions.

   2.2 Under extreme conditions.

3. To verify that the MS spurious emissions in the MS receive band do not exceed conformance requirement 3.

13.4.4 Method of test

13.4.4.1 Initial conditions

A call is set up according to the generic call set up procedure.

The SS commands the MS to hopping mode. The hopping pattern includes only three channels, namely one with an ARFCN in the Low ARFCN range, a second one with an ARFCN in the Mid ARFCN range and the third one with an ARFCN in the High ARFCN range.

NOTE 1: Although the measurement is made whilst the MS is in hopping mode, each measurement is on one single channel.

NOTE 2: This test is specified in hopping mode as a simple means of making the MS change channel, it would be sufficient to test in non hopping mode and to handover the MS between the three channels tested at the appropriate time.

NOTE 3: Mid ARFCN range for GSM 900 will use the range 63-65 ARFCN

The SS commands the MS to complete the traffic channel loop back without signalling of erased frames (see subclause 36.2.1.1). This is to set a defined random pattern for the transmitter.

The SS sends Standard Test Signal C1 (annex 5) to the MS at a level of 23 dBμVemf( ).

13.4.4.2 Procedure

NOTE: When averaging is in use during frequency hopping mode, the averaging only includes bursts transmitted when the hopping carrier corresponds to the nominal carrier of the measurement.

a) In steps b) to h) the FT is equal to the hop pattern ARFCN in the Mid ARFCN range.

b) The other settings of the spectrum analyser are set as follows:

- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 30 kHz;
- Video averaging: may be used, depending on the implementation of the test.

The video signal of the spectrum analyser is "gated" such that the spectrum generated by at least 40 of the bits 87 to 132 of the burst is the only spectrum measured. This gating may be analogue or numerical, dependent upon the design of the spectrum analyser. Only measurements during transmitted bursts on the nominal carrier of the measurement are included. The spectrum analyser averages over the gated period and over 200 or 50 such bursts, using numerical and/or video averaging.

The MS is commanded to its maximum power control level.

c) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured over 50 bursts at all multiples of 30 kHz offset from FT to < 1 800 kHz.

d) The resolution and video bandwidth on the spectrum analyser are adjusted to 100 kHz and the measurements are made at the following frequencies:

- on every ARFCN from 1 800 kHz offset from the carrier to the edge of the relevant transmit band for each measurement over 50 bursts;
- at 200 kHz intervals over the 2 MHz either side of the relevant transmit band for each measurement over 50 bursts.

For GSM 400 and DCS 1 800:

- at 200 kHz intervals over the band 925 MHz to 960 MHz for each measurement over 50 bursts;
- at 200 kHz intervals over the band 1 805 MHz to 1 880 MHz for each measurement over 50 bursts.

For GSM 900

- at 200 kHz intervals over the band 925 MHz to 960MHz for each measurement over 50 bursts;
- at 200 kHz intervals over the band 1805 MHz to 1880 MHz for each measurement over 50 bursts.

In addition for GSM 400 MS:

- at 200 kHz intervals over the band 460,4 MHz to 467,6 MHz for each measurement over 50 bursts;
- at 200 kHz intervals over the band 488,8 MHz to 496 MHz for each measurement over 50 bursts.

In addition for T-GSM 810 MS:

- at 200 kHz intervals over the band 851 MHz to 866 MHz for each measurement over 50 bursts;

For GSM 700, GSM 850 and PCS 1 900:

- at 200 kHz intervals over the band 728 MHz to 746 MHz for each measurement over 50 bursts;
- at 200 kHz intervals over the band 747 MHz to 763 MHz for each measurement over 50 bursts;
- at 200 kHz intervals over the band 869 MHz to 894 MHz for each measurement over 50 bursts;
- at 200 kHz intervals over the band 1 930 MHz to 1 990 MHz for each measurement over 50 bursts.

e) The MS is commanded to its minimum power control level. The spectrum analyser is set again as in b).

f) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured over 200 bursts at the following frequencies:

FT;

FT + 100 kHz	FT - 100 kHz;
FT + 200 kHz	FT - 200 kHz;
FT + 250 kHz	FT - 250 kHz;
FT + 200 kHz * N	FT - 200 kHz * N;

where N = 2, 3, 4, 5, 6, 7, and 8;

and FT = RF channel nominal centre frequency.

g) The spectrum analyser settings are adjusted to:

- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 100 kHz;
- Peak hold.

The spectrum analyser gating of the signal is switched off.

The MS is commanded to its maximum power control level.

h) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured at the following frequencies:

FT + 400 kHz	FT - 400 kHz;
FT + 600 kHz	FT - 600 kHz;
FT + 1,2 MHz	FT - 1,2 MHz;
FT + 1,8 MHz	FT - 1,8 MHz;

where FT = RF channel nominal centre frequency.

The duration of each measurement (at each frequency) will be such as to cover at least 10 burst transmissions at FT.

i) Step h) is repeated for power control levels 7 and 11.

j) Steps b), f), g) and h) are repeated with FT equal to the hop pattern ARFCN in the Low ARFCN range except that in step g) the MS is commanded to power control level 11 rather than maximum power.

k) Steps b), f), g) and h) are repeated with FT equal to the hop pattern ARFCN in the High ARFCN range except that in step g) the MS is commanded to power control level 11 rather than maximum power.

l) Steps a) b) f) g) and h) are repeated under extreme test conditions (annex 1, TC2.2). except that at step g) the MS is commanded to power control level 11.

13.4.5 Test requirements

For absolute measurements, performed on a temporary antenna connector, in the frequency band 450,4 MHz to 457,6 MHz, 478,8 MHz to 486 MHz, 777 MHz to 792 MHz, 824 MHz to 849 MHz, 880 MHz to 915 MHz, 1 710 MHz to 1 785 MHz, or 1 850 MHz to 1 910 MHz, the temporary antenna connector coupling factor, determined according to subclause 13.3.4.2.2 and annex 1 GC7, for the nearest relevant frequency, will be used.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 925 MHz to 960 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 900 MS. For a GSM 400, GSM 700, T-GSM 810, GSM 850, DCS 1 800 or PCS 1 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 1 805 MHz to 1 880 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for DCS 1 800 MS. For GSM 400, GSM 700, T-GSM 810, GSM 850, GSM 900 or PCS 1 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 460,4 MHz to 467,6 MHz or 488,8 MHz to 496 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 400 MS. For a GSM 700, T-GSM 810, GSM 850, GSM 900, DCS 1800 or PCS 1 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 1 930 MHz to 1 990 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for PCS 1 900 MS. For GSM 400, GSM 700, T-GSM 810, GSM 850, GSM 900 or DCS 1 800 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 728 MHz to 763 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 700 MS. For a GSM 400, T-GSM 810, GSM 850, GSM 900, DCS 1800 or PCS 1 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 851 MHz to 866 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for T-GSM 810 MS. For a GSM 400, GSM 700, GSM 850, GSM 900, DCS 1800 or PCS 1 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 869 MHz to 894 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 850 MS. For a GSM 400, GSM 700, T-GSM 810, GSM 900, DCS 1800 or PCS 1 900 MS 0 dB will be assumed.

The figures in the tables below, at the listed frequencies from the carrier (kHz), are the maximum level (dB) relative to a measurement in 30 kHz bandwidth on the carrier (reference 3GPP TS 05.05 subclause 4.2.1).

a) For the modulation sidebands out to less than 1 800 kHz offset from the carrier frequency (FT) measured in step c), f), h), j), k) and l) the measured power level in dB relative to the power level measured at FT, for all types of MS, shall not exceed the limits derived from the values shown in table 13-6 for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900, table 13-7 for DCS 1 800 or table 13-8 for PCS 1 900 according to the actual transmit power and frequency offset from FT. However any failures in the combined range 600 kHz to less than 1 800 kHz above and below the carrier may be counted towards the exceptions allowed in test requirements c) below.

Table 13-6: GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 Spectrum due to modulation out to less than 1 800 kHz offset

	power levels in dB relative to the measurement at FT				
Power level	**Frequency offset (kHz)**				
(dBm)	**0-100**	**200**	**250**	**400**	**600 to <1800**
39	+0,5	-30	-33	-60	-66
37	+0,5	-30	-33	-60	-64
35	+0,5	-30	-33	-60	-62
<= 33	+0,5	-30	-33	-60	-60
The values above are subject to the minimum absolute levels (dBm) below.					
	-36	-36	-36	-36	-51

Table 13-7: DCS 1 800 Spectrum due to modulation out to less than 1 800 kHz offset

	power levels in dB relative to the measurement at FT				
Power level	**Frequency offset (kHz)**				
(dBm)	**0-100**	**200**	**250**	**400**	**600 to <1800**
<= 36	+0,5	-30	-33	-60	-60
The values above are subject to the minimum absolute levels (dBm) below.					
	-36	-36	-36	-36	-56

Table 13-8: PCS 1 900 Spectrum due to modulation out to less than 1 800 kHz offset

	power levels in dB relative to the measurement at FT					
Power level	**Frequency offset (kHz)**					
(dBm)	**0-100**	**200**	**250**	**400**	**600 to <1200**	**1200 to <1800**
<= 33	+0,5	-30	-33	-60	-60	-60
The values above are subject to the minimum absolute levels (dBm) below.						
	-36	-36	-36	-36	-56	-56

NOTE 1: For frequency offsets between 100 kHz and 600 kHz the requirement is derived by a linear interpolation between the points identified in the table with linear frequency and power in dB relative.

b) For the modulation sidebands from 1 800 kHz offset from the carrier frequency (FT) and out to 2 MHz beyond the edge of the relevant transmit band, measured in step d), the measured power level in dB relative to the power level measured at FT, shall not exceed the values shown in table 13-7 according to the actual transmit power, frequency offset from FT and system on which the MS is designed to operate. However any failures in the combined range 1 800 kHz to 6 MHz above and below the carrier may be counted towards the exceptions allowed in test requirements c) below, and any other failures may be counted towards the exceptions allowed in test requirements d) below.

Table 13-9: Spectrum due to modulation from 1 800 kHz offset to the edge of the transmit band (wideband noise)

power levels in dB relative to the measurement at FT									
GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900				DCS 1 800			PCS 1 900		
Power	Frequency offset			Power	Frequency offset		Power	Frequency offset	
Level	kHz			level	KHz		level	kHz	
(dBm)	1 800 to	3 000 to	>= 6 000	(dBm)	1 800 to	>= 6 000	(dBm)	1 800 to	>= 6 000
	< 3 000	< 6 000			< 6 000			< 6 000	
39	-69	-71	-77	36	-71	-79	33	-68	-76
37	-67	-69	-75	34	-69	-77	32	-67	-75
35	-65	-67	-73	32	-67	-75	30	-65	-73
<= 33	-63	-65	-71	30	-65	-73	28	-63	-71
				28	-63	-71	26	-61	-69
				26	-61	-69	<= 24	-59	-67
				<= 24	-59	-67			
The values above are subject to the minimum absolute levels (dBm) below.									
	-46	-46	-46		-51	-51		-51	-51

c) Any failures (from a) and b) above) in the combined range 600 kHz to 6 MHz above and below the carrier should be re-checked for allowed spurious emissions. For each of the three ARFCN used, spurious emissions are allowed in up to three 200 kHz bands centred on an integer multiple of 200 kHz so long as no spurious emission exceeds -36 dBm. Any spurious emissions measured in a 30 kHz bandwidth which spans two 200 kHz bands can be counted towards either 200 kHz band, whichever minimizes the number of 200 kHz bands containing spurious exceptions.

d) Any failures (from b) above) beyond 6 MHz offset from the carrier should be re-checked for allowed spurious emissions. For each of the three ARFCN used, up to twelve spurious emissions are allowed so long as no spurious emission exceeds -36 dBm.

e) For GSM 400, T-GSM 810, GSM 900 and DCS 1 800 MS the spurious emissions in the bands 850 MHz to 866 MHz, 925 MHz to 935 MHz, 935 MHz to 960 MHz and 1 805 MHz to 1 880 MHz, measured in step d), shall not exceed the values shown in table 13-10 except in up to five measurements in the band 925 MHz to 960 MHz and five measurements in the band 1 805 MHz to 1 880 MHz where a level up to -36 dBm is permitted. For GSM 400 MS, in addition, the MS spurious emissions in the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz shall not exceed the value of -67 dBm, except in up to three measurements in each of the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz where a level up to -36 dBm is permitted. For GSM 700, GSM 850 and PCS 1 900 MS the spurious emissions in the bands 728 MHz to 746 MHz, 747 MHz to 763 MHz, 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz shall not exceed the values shown in table 13-10 except in up to five measurements in each of the bands 728 MHz to 746 MHz, 747 MHz to 763 MHz, 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where a level up to -36 dBm is permitted.

Table 13-10: Spurious emissions in the MS receive bands

Band (MHz)	Spurious emissions level (dBm)	
	GSM 400, T-GSM 810,, GSM 900 and DCS 1 800	GSM 700, GSM 850 and PCS 1 900
460.4 – 467.6 (GSM 400 MS only)	-67	-
488.8 - 496 (GSM 400 MS only)	-67	-
850 to 866 (T-GSM 810 MS only)	-79	-
925 to 935	-67	-
935 to 960	-79	-
1 805 to 1 880	-71	-
728 to 736	-	-73
736 to 746	-	-79
747 to 757	-	-79
757 to 763	-	-73
869 to 894	-	-79
1 930 to 1 990	-	-71

f) For the power ramp sidebands of steps h) and i) the power levels must not exceed the values shown in table 13-11 for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900, table 13-12 for DCS 1 800 or table 13-13 for PCS 1 900.

Table 13-11: GSM Spectrum due to switching transients

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1 200 kHz	1 800 kHz
39 dBm	-13 dBm	-21 dBm	-21 dBm	-24 dBm
37 dBm	-15 dBm	-21 dBm	-21 dBm	-24 dBm
35 dBm	-17 dBm	-21 dBm	-21 dBm	-24 dBm
33 dBm	-19 dBm	-21 dBm	-21 dBm	-24 dBm
31 dBm	-21 dBm	-23 dBm	-23 dBm	-26 dBm
29 dBm	-23 dBm	-25 dBm	-25 dBm	-28 dBm
27 dBm	-23 dBm	-26 dBm	-27 dBm	-30 dBm
25 dBm	-23 dBm	-26 dBm	-29 dBm	-32 dBm
23 dBm	-23 dBm	-26 dBm	-31 dBm	-34 dBm
<= +21 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

Table 13-12: DCS 1 800 Spectrum due to switching transients

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1200 kHz	1 800 kHz
36 dBm	-16 dBm	-21 dBm	-21 dBm	-24 dBm
34 dBm	-18 dBm	-21 dBm	-21 dBm	-24 dBm
32 dBm	-20 dBm	-22 dBm	-22 dBm	-25 dBm
30 dBm	-22 dBm	-24 dBm	-24 dBm	-27 dBm
28 dBm	-23 dBm	-25 dBm	-26 dBm	-29 dBm
26 dBm	-23 dBm	-26 dBm	-28 dBm	-31 dBm
24 dBm	-23 dBm	-26 dBm	-30 dBm	-33 dBm
22 dBm	-23 dBm	-26 dBm	-31 dBm	-35 dBm
<= +20 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

Table 13-13: PCS 1 900 Spectrum due to switching transients

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1 200 kHz	1 800 kHz
33 dBm	-19 dBm	-22 dBm	-22 dBm	-25 dBm
32 dBm	-20 dBm	-22 dBm	-22 dBm	-25 dBm
30 dBm	-22 dBm	-24 dBm	-24 dBm	-27 dBm
28 dBm	-23 dBm	-25 dBm	-26 dBm	-29 dBm
26 dBm	-23 dBm	-26 dBm	-28 dBm	-31 dBm
24 dBm	-23 dBm	-26 dBm	-30 dBm	-33 dBm
22 dBm	-23 dBm	-26 dBm	-31 dBm	-35 dBm
<= +20 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

NOTE 2: These figures are different from the requirements in 3GPP TS 05.05 because at higher power levels it is the modulation spectrum which is being measured using a peak hold measurement. This allowance is given in the table.

NOTE 3: The figures for table 13-11, table 13-12 and table 13-13 assume that, using the peak hold measurement, the lowest level measurable is 8 dB above the level of the modulation specification using the 30 kHz bandwidth gated average technique for 400 kHz offset from the carrier. At 600 and 1200 kHz offset the level is 6 dB above and at 1 800 kHz offset the level is 3 dB above. The figures for 1 800 kHz have assumed the 30 kHz bandwidth spectrum due to modulation specification at <1 800 kHz.

13.5 Void

13.6 Frequency error and phase error in HSCSD multislot configurations

13.6.1 Definition

The frequency error is the difference in frequency, after adjustment for the effect of the modulation and phase error, between the RF transmission from the MS and either:

- the RF transmission from the BS; or
- the nominal frequency for the ARFCN used.

The phase error is the difference in phase, after adjustment for the effect of the frequency error, between the RF transmission from the MS and the theoretical transmission according to the intended modulation.

13.6.2 Conformance requirement

1. The MS carrier frequency shall be accurate to within 0,1 ppm, or accurate to within 0,1 ppm compared to signals received from the BS:

   1.1 Under normal conditions; 3GPP TS 05.10, subclause 6.1.

   1.2 Under vibration conditions; 3GPP TS 05.10, subclause 6.1; 3GPP TS 05.05, annex D D.2.3.

   1.3 Under extreme conditions; 3GPP TS 05.10, subclause 6.1; 3GPP TS 05.05, subclause 4.4; 3GPP TS 05.05, annex D in subclauses D.2.1 and D.2.2.

2. The RMS phase error (difference between the phase error trajectory and its linear regression on the active part of the time slot) for each burst shall not be greater than 5 degrees:

   2.1 Under normal conditions; 3GPP TS 05.05, subclause 4.6.

   2.2 Under vibration conditions; 3GPP TS 05.05, subclause 4.6; 3GPP TS 05.05, annex D in subclause D.2.3.

   2.3 Under extreme conditions; 3GPP TS 05.05, subclause 4.6; 3GPP TS 05.05, annex D in subclauses D.2.1 and D.2.2.

3. The maximum peak deviation during the useful part of each burst shall not be greater than 20 degrees.

   3.1 Under normal conditions; 3GPP TS 05.05, subclause 4.6.

   3.2 Under vibration conditions; 3GPP TS 05.05, subclause 4.6; 3GPP TS 05.05, annex D in subclause D.2.3.

   3.3 Under extreme conditions; 3GPP TS 05.05, subclause 4.6; 3GPP TS 05.05, annex D in subclauses D.2.1 and D.2.2.

13.6.3 Test purpose

1. To verify that in a multislot configuration the MS carrier frequency error does not exceed 0,1 ppm:

   1.1 Under normal conditions.

   1.2 When the MS is being vibrated.

   1.3 Under extreme conditions.

NOTE: The transmit frequency accuracy of the SS is expected to be sufficient to ensure that the difference between 0,1 ppm absolute and 0,1 ppm compared to signals received from the BS would be small enough to be considered insignificant.

2 To verify that the RMS phase error on the useful part of the bursts transmitted by the MS in a multislot configuration does not exceed conformance requirement 2:

   2.1 Under normal conditions.

   2.2 When the MS is being vibrated.

   2.3 Under extreme conditions.

3 To verify that the maximum phase error on the useful part of the bursts transmitted by the MS in a multislot configuration does not exceed conformance requirement 3.

   3.1 Under normal conditions.

   3.2 When the MS is being vibrated.

   3.3 Under extreme conditions.

13.6.4 Method of test

NOTE: In order to measure the accuracy of the frequency and phase error a sampled measurement of the transmitted phase trajectory is obtained. This is compared with the theoretically expected phase trajectory. The regression line of the difference between the expected trajectory and the measured trajectory is an indication of the frequency error (assumed constant through the burst), whilst the departure of the phase differences from this trajectory is a measure of the phase error. The peak phase error is the value furthest from the regression line and the RMS phase error is the root mean square average of the phase error of all samples.

13.6.4.1 Initial conditions

A call is set up according to the generic call setup procedure for multislot HSCSD.

The SS commands the MS to hopping mode (table 13.6.1).

NOTE 1: It is not necessary to test in hopping mode but is done here as a simple means of making the MS change channel, it would be sufficient to test in non hopping mode and to make sure bursts are taken from a few different channels.

The SS activates ciphering mode.

NOTE 2: Ciphering mode is active during this test to give a pseudo-random bit stream to the modulator.

The SS sets the MS to operate in a multislot configuration with maximum number of transmitted time slots.

The SS commands the MS to complete the traffic channel multislot loop back including signalling of erased frames.

The SS generates Standard Test Signal C1 of annex 5.

Specific PICS statements:

- MS without vibration sensitive components (TSPC_No_Vibration_Sensitive_Components)

PIXIT Statements:

-

13.6.4.2 Procedure

a) For one transmitted burst on the last multislot subchannel, the SS captures the signal as a series of phase samples over the period of the burst. These samples are evenly distributed over the duration of the burst with a minimum sampling rate of 2/T, where T is the modulation symbol period. The received phase trajectory is then represented by this array of at least 294 samples.

b) The SS then calculates, from the known bit pattern and the formal definition of the modulator contained in 3GPP TS 05.04, the expected phase trajectory.

c) From a) and b) the phase trajectory error is calculated, and a linear regression line computed through this phase trajectory error. The slope of this regression line is the frequency error of the mobile transmitter relative to the simulator reference. The difference between the regression line and the individual sample points is the phase error of that point.

c.1) The sampled array of at least 294 phase measurements is represented by the vector:

$\varnothing_m = \varnothing_m(0)...\varnothing_m(n)$

where the number of samples in the array $n+1 \geq 294$.

c.2) The calculated array, at the corresponding sampling instants, is represented by the vector:

$\varnothing_c = \varnothing_c(0)...\varnothing_c(n)$.

c.3) The error array is represented by the vector:

$\varnothing_e = \{\varnothing_m(0) - \varnothing_c(0)\}.........\{\varnothing_m(n) - \varnothing_c(n)\} = \varnothing_e(0)...\varnothing_e(n)$.

c.4) The corresponding sample numbers form a vector $t = t(0)...t(n)$.

c.5) By regression theory the slope of the samples with respect to t is k where:

$$k = \frac{\sum_{j=0}^{j=n} t(j) * \varnothing_e(j)}{\sum_{j=0}^{j=n} t(j)^2}$$

c.6) The frequency error is given by $k/(360 \times \gamma)$, where γ is the sampling interval in s and all phase samples are measured in degrees.

c.7) The individual phase errors from the regression line are given by:

$\varnothing_e(j) - k \times t(j)$.

c.8) The RMS value $\varnothing_e$ of the phase errors is given by:

$$\varnothing_e(RMS) = \left[\frac{\sum_{j=0}^{j=n}\{\varnothing_e(j) - k * t(j)\}^2}{n+1}\right]^{1/2}$$

d) Steps a) to c) are repeated for 20 bursts, not necessarily contiguous.

e) The SS instructs the MS to its maximum power control level on each multislot subchannel, all other conditions remaining constant. Steps a) to d) are repeated.

f) The SS instructs the MS to the minimum power control level on each multislot subchannel, all other conditions remaining constant. Steps a) to d) are repeated.

g) The MS is hard mounted on a vibration table and vibrated at the frequency/amplitudes specified in annex 1, TC4.

During the vibration steps a) to f) are repeated.

NOTE 1: If the call is terminated when mounting the MS to the vibration table, it will be necessary to establish the initial conditions again before repeating steps a) to f).

h) The MS is re-positioned on the vibration table in the two orthogonal planes to the plane used in step g). For each of the orthogonal planes step g) is repeated.

i) Steps a) to f) are repeated under extreme test conditions (see annex 1, TC2.2).

NOTE 2: The series of samples taken to determine the phase trajectory could also be used, with different post-processing, to determine the transmitter burst characteristics of 'Transmitter output power and burst timing in multislot configuration'. Although described independently, it is valid to combine these two tests, giving both answers from single sets of captured data.

NOTE 3: Steps g) and h) are skipped if TSPC_No_Vibration_Sensitive_Components is declared as Yes

13.6.5 Test requirements

13.6.5.1 Frequency error

For all measured bursts, the frequency error, derived in step c.6), shall be less than 10E-7.

13.6.5.2 Phase error

For all measured bursts, the RMS phase error, derived in step c.8), shall not exceed 5 degrees.

For all measured bursts, each individual phase error, derived in step c.7), shall not exceed 20 degrees.

13.7 Transmitter output power and burst timing in HSCSD configurations

13.7.1 Definition

The transmitter output power is the average value of the power delivered to an artificial antenna or radiated by the MS and its integral antenna, over the time that the useful information bits of one burst are transmitted.

The transmit burst timing is the envelope of the RF power transmitted with respect to time. The timings are referenced to the transition from bit 13 to bit 14 of the Training Sequence ("midamble") before differential decoding. The timing of the modulation is referenced to the timing of the received signal from the SS.

13.7.2 Conformance requirement

1. The MS maximum output power shall be as defined in 3GPP TS 05.05, subclause 4.1.1, first table, according to its power class, with a tolerance of ±2 dB under normal conditions; 3GPP TS 05.05, subclause 4.1.1, first table. From R99 onwards, the MS maximum output power in an uplink multislot configuration shall be as defined in

3GPP TS 05.05 subclause 4.1.1, sixth table, according to its power class, with a tolerance of ±3 dB under normal conditions; 3GPP TS 05.05, subclause 4.1.1, first and sixth table. In case the MS supports the same maximum output power in an uplink multislot configuration as it supports for single slot uplink operation, the tolerance shall be ±2 dB.

2. The MS maximum output power shall be as defined in 3GPP TS 05.05, subclause 4.1.1, first table, according to its power class, with a tolerance of ±2,5 dB under extreme conditions; 3GPP TS 05.05, subclause 4.1.1, first table; 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2. From R99 onwards, the MS maximum output power in an uplink multislot configuration shall be as defined in 3GPP TS 05.05 subclause 4.1.1, sixth table, according to its power class, with a tolerance of ±4 dB under extreme conditions; 3GPP TS 05.05, subclause 4.1.1, first and sixth table; 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2. In case the MS supports the same maximum output power in an uplink multislot configuration as it supports for single slot uplink operation, the tolerance shall be ±2,5 dB.

3. The power control levels shall have the nominal output power levels as defined in 3GPP TS 05.05, subclause 4.1.1, third table (for GSM 400, GSM 700, GSM 850 and GSM 900), fourth table (for DCS 1 800) or fifth table (for PCS 1 900), from the lowest power control level up to the maximum output power corresponding to the class of the MS (for tolerance on maximum output power see conformance requirements 1), with a tolerance of ±3 dB, ±4 dB or ±5 dB under normal conditions; 3GPP TS 05.05, subclause 4.1.1, third, fourth or fifth table.

4. The power control levels shall have the nominal output power levels as defined in 3GPP TS 05.05, subclause 4.1.1, third table (for GSM 400, GSM 700, GSM 850 and GSM 900), fourth table (for DCS 1 800) or fifth table (for PCS 1 900), from the lowest power control level up to the maximum output power corresponding to the class of the MS (for tolerance on maximum output power see conformance requirements 2), with a tolerance of ±4 dB, ±5 dB or ±6 dB under extreme conditions; 3GPP TS 05.05, subclause 4.1.1, third, fourth or fifth table; 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2.

4a. From R99 onwards, the supported maximum output power for each number of uplink timeslots shall form a monotonic sequence. The maximum reduction of maximum output power from an allocation of n uplink timeslots to an allocation of n+1 uplink timeslots shall be equal to the difference of maximum permissible nominal reduction of maximum output power for the corresponding number of timeslots, as defined in 3GPP TS 05.05, subclause 4.1.1, sixth table.

5. The output power actually transmitted by the MS at consecutive power control levels shall form a monotonic sequence and the interval between power control levels shall be 2 ± 1,5 dB (1 ± 1dB between power control level 30 and 31 for PCS 1 900), from R99 onwards, in a multislot configuration, the first power control step down from the maximum output power is allowed to be in the range 0…2 dB; 3GPP TS 05.05, subclause 4.1.1.

6. The transmitted power level relative to time for a normal burst shall be within the power/time template given in 3GPP TS 05.05, annex B figure B1. In multislot configurations where the bursts in two or more consecutive time slots are actually transmitted at the same frequency, the template of annex B shall be respected at the beginning and the end of the series of consecutive bursts. The output power during the guard period between every two consecutive active timeslots shall not exceed the level allowed for the useful part of the first timeslot or the level allowed for the useful part of the second timeslot plus 3 dB, whichever is the highest:

   6.1 Under normal conditions; 3GPP TS 05.05, subclause 4.5.2.

   6.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.5.2, 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2.

7. In multislot configurations, bidirectional subchannels shall be individually power controlled; 3GPP TS 05.08, subclause 4.2.

8. When accessing a cell on the RACH and before receiving the first power command during a communication on a DCCH or TCH (after an IMMEDIATE ASSIGNMENT), all GSM and class 1and class 2 DCS 1 800 and PCS 1 900 MS shall use the power control level defined by the MS_TXPWR_MAX_CCH parameter broadcast on the BCCH of the cell, or if MS_TXPWR_MAX_CCH corresponds to a power control level not supported by the MS as defined by its power class, the MS shall act as though the closest supported power control level had been broadcast. A Class 3 DCS 1 800 MS shall use the POWER_OFFSET parameter.

9. The transmissions from the MS to the BS, measured at the MS antenna, shall be 468,75 - TA bit periods behind the transmissions received from the BS, where TA is the last timing advance received from the current serving BS. The tolerance on these timings shall be ±1 bit period:

9.1 Under normal conditions; 3GPP TS 05.10, subclause 6.4.

9.2 Under extreme conditions; 3GPP TS 05.10, subclause 6.4, 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2.

10. The transmitted power level relative to time for a random access burst shall be within the power/time template given in 3GPP TS 05.05, annex B figure B.3:

10.1 Under normal conditions; 3GPP TS 05.05, subclause 4.5.2.

10.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.5.2, 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2.

11 The MS shall use a TA value of 0 for the Random Access burst sent:

11.1 Under normal conditions; 3GPP TS 05.10, subclause 6.6.

11.2 Under extreme conditions; 3GPP TS 05.10, subclause 6.6, 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

13.7.3 Test purpose

1. To verify that the maximum output power of the MS in HSCSD multislot configuration, under normal conditions, is within conformance requirement 1.

2. To verify that the maximum output power of the MS in HSCSD multislot configuration, under extreme conditions, is within conformance requirement 2.

3. To verify that all power control levels, relevant to the class of MS, are implemented in the MS in HSCSD multislot configuration and have output power levels, under normal conditions, within conformance requirement 3.

4. To verify that all power control levels have output power levels, under extreme conditions, within conformance requirement 4.

4a. From R99 onwards: to verify that the supported maximum output power for each uplink multislot configuration is within the conformance requirement 4a.

5. To verify that the step in the output power transmitted by the MS in HSCSD multislot configuration at consecutive power control levels is within conformance requirement 5 under normal conditions.

6. To verify that the output power relative to time, when sending a normal burst is within conformance requirement 6 in HSCSD multislot configuration:

6.1 Under normal conditions.

6.2 Under extreme conditions.

7. To verify that the MS in HSCSD multislot configuration uses the maximum power control level according to its power class if commanded to a power control level exceeding its power class.

8. To verify that, for normal bursts, the MS transmissions to the BS are timed within conformance requirement 8 in HSCSD multislot configuration:

8.1 Under normal conditions.

8.2 Under extreme conditions.

9. To verify that the output power relative to time, when sending an access burst is within conformance requirement 9 in HSCSD multislot configuration:

9.1 Under normal conditions.

9.2 Under extreme conditions.

10. To verify that, for an access burst, the MS transmission to the BS is timed within conformance requirement 10 in HSCSD multislot configuration:

    10.1 Under normal conditions.

    10.2 Under extreme conditions.

11. To verify that, power is individually controlled on bidirectional HSCSD subchannels.

13.7.4 Methods of test

Two methods of test are described, separately for:

1) equipment fitted with a permanent antenna connector or fitted with a temporary test connector as a test fixture, and for

2) equipment fitted with an integral antenna, and which cannot be connected to an external antenna.

NOTE: The behaviour of the MS in the system is determined to a high degree by the antenna, and this is the only transmitter test in this EN using the integral antenna. Further studies are ongoing on improved testing on the integral antenna, taking practical conditions of MS use into account.

13.7.4.1 Method of test for equipment with a permanent or temporary antenna connector

13.7.4.1.1 Initial conditions

A call is set up by the SS according to the generic call set up procedure for HSCSD multislot configuration on a channel with ARFCN in the Mid ARFCN range, power control level set to Max power and MS to operate in its highest number of uplink slots. MS TXPWR_MAX_CCH is set to the maximum value supported by the Power Class of the Mobile under test. For DCS 1 800 mobile stations the POWER_OFFSET parameter is set to 6 dB.

Specific PICS Statements:

- GMSK_MULTISLOT_POWER_PROFILE 0..3 (TSPC_Type_GMSK_Multislot_Power_Profile x)

PIXIT statements:

-

13.7.4.1.2 Procedure

a) Measurement of normal burst transmitter output power.

   The SS takes power measurement samples evenly distributed over the duration of one burst with a sampling rate of at least 2/T, where T is the bit duration. The samples are identified in time with respect to the modulation on the burst. The SS identifies the centre of the useful 147 transmitted bits, i.e. the transition from bit 13 to bit 14 of the midamble, as the timing reference.

   The transmitter output power is calculated as the average of the samples over the 147 useful bits. This is also used as the 0 dB reference for the power/time template.

b) Measurement of normal burst timing delay.

   The burst timing delay is the difference in time between the timing reference identified in a) and the corresponding transition in the burst received by the MS immediately prior to the MS transmit burst sampled.

c) Measurement of normal burst power/time relationship.

   The array of power samples measured in a) are referenced in time to the centre of the useful transmitted bits and in power to the 0 dB reference, both identified in a).

d) Steps a) to c) are repeated on each multislot subchannel with the MS commanded to operate on each of the power control levels defined, even those not supported by the MS.

e) The SS commands the MS to the maximum power control level supported by the MS and steps a) to c) are repeated on each multislot subchannel for ARFCN in the Low and High ranges.

f) The SS commands the MS to the maximum power control level in the first multislot subchannel allocated and to the minimum power control level in the second multislot subchannel allocated. Any further timeslots allocated are to be set to the maximum power control level. Steps a) to c) and corresponding measurements on each subchannel are repeated.

g) Measurement of access burst transmitter output power.

The SS causes the MS to generate an Access Burst on an ARFCN in the Mid ARFCN range, this could be either by a handover procedure or a new request for radio resource. In the case of a handover procedure the Power Level indicated in the HANDOVER COMMAND message is the maximum power control level supported by the MS. In the case of an Access Burst the MS shall use the Power Level indicated in the MS_TXPWR_MAX_CCH parameter. If the power class of the MS is DCS 1 800 Class 3, the MS shall also use the POWER_OFFSET parameter.

The SS takes power measurement samples evenly distributed over the duration of the access burst as described in a). However, in this case the SS identifies the centre of the useful bits of the burst by identifying the transition from the last bit of the synch sequence. The centre of the burst is then five data bits prior to this point and is used as the timing reference.

The transmitter output power is calculated as the average of the samples over the 87 useful bits of the burst. This is also used as the 0 dB reference for the power/time template.

h) Measurement of access burst timing delay.

The burst timing delay is the difference in time between the timing reference identified in g) and the MS received data on the common control channel.

i) Measurement of access burst power/time relationship.

The array of power samples measured in g) is referenced in time to the centre of the useful transmitted bits and in power to the 0 dB reference, both identified in g).

j) Depending on the method used in step g) to cause the MS to send an Access Burst, the SS sends either a HANDOVER COMMAND with power control level set to 10 or it changes the System Information elements MS_TXPWR_MAX_CCH and for DCS 1 800 the POWER_OFFSET on the serving cell BCCH in order to limit the MS transmit power on the Access Burst to power control level 10 (+23 dBm for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 or +10 dBm for DCS 1 800 and PCS 1 900) and then steps g) to i) are repeated.

k) Steps a) to j) are repeated under extreme test conditions (annex 1, TC2.2) except that the repeats at step d) are only performed for power control level 10 and the minimum power control level of the MS.

13.7.4.2 Method of test for equipment with an integral antenna

NOTE: If the MS is equipped with a permanent connector, such that the antenna can be disconnected and the SS be connected directly, then the method of subclause 13.7.4.1 will be applied.

The tests in this subclause are performed on an unmodified test sample.

13.7.4.2.1 Initial conditions

The MS is placed in the anechoic shielded chamber (annex 1, GC5) or on the outdoor test site, on an isolated support, in the position for normal use, at a distance of at least 3 metres from a test antenna, connected to the SS.

NOTE: The test method described has been written for measurement in an anechoic shielded chamber. If an outdoor test site is used then, in addition, it is necessary to raise/lower the test antenna through the specified height range to maximize the received power levels from both the test sample and the substitution antenna.

A call is set up by the SS according to the generic call set up procedure on a channel with ARFCN in the Mid ARFCN range, power control level set to Max power. MS_TXPWR_MAX_CCH is set to the maximum value supported by the Power Class of the Mobile under test. For DCS 1 800 mobile stations the POWER_OFFSET parameter is set to 6 dB.

13.7.4.2.2 Procedure

a) With the initial conditions set according to subclause 13.7.4.2.1 the test procedure in subclause 13.7.4.1.2 is followed up to and including step j), except that in step a), when measurements are done at maximum power for ARFCN in the Low, Mid and High range, the measurement is made eight times with the MS rotated by $n \times 45$ degrees for all values of n in the range 0 to 7.

   The measurements taken are received transmitter output power measurements rather than transmitter output power measurements, the output power measurement values can be derived as follows.

b) Assessment of test site loss for scaling of received output power measurements.

   The MS is replaced by a half-wave dipole, resonating at the centre frequency of the transmit band, connected to an RF generator.

   The frequency of the RF signal generator is set to the frequency of the ARFCN used for the 24 measurements in step a), the output power is adjusted to reproduce the received transmitter output power averages recorded in step a).

   For each indication the power, delivered by the generator (in Watts) to the half-wave dipole, is recorded. These values are recorded in the form Pnc, where n = MS rotation and c = channel number.

   For each channel number used compute:

$$\text{Pac(Watts into dipole)} = \frac{1}{8} * \sum_{n=0}^{n=7} \text{Pnc}$$

   from which: Pac (Tx dBm) = $10\log_{10}(\text{Pac}) + 30 + 2{,}15$

   The difference, for each of the three channels, between the actual transmitter output power averaged over the 8 measurement orientations and the received transmitter output power at orientation n = 0 is used to scale the received measurement results to actual transmitter output powers for all measured power control levels and ARFCN, which can then be checked against the requirements.

c) Temporary antenna connector calibration factors (transmit).

   A modified test sample equipped with a temporary antenna connector is placed in a climatic test chamber and is linked to the SS by means of the temporary antenna connector.

   Under normal test conditions, the power measurement and calculation parts of steps a) to j) of subclause 13.7.4.1.2 are repeated except that the repeats at step d) are only performed for power control level 10 and the minimum power control level of the MS.

NOTE 1: The values noted here are related to the output transmitter carrier power levels under normal test conditions, which are known after step b). Therefore frequency dependent calibration factors that account for the effects of the temporary antenna connector can be determined.

d) Measurements at extreme test conditions.

NOTE 2: Basically the procedure for extreme conditions is:

   - the power/time template is tested in the "normal" way;
   - the radiated power is measured by measuring the difference with respect to the radiated power under normal test conditions.

   Under extreme test conditions steps a) to j) of subclause 13.7.4.1.2 are repeated except that the repeats at step d) are only performed for power control level 10 and the minimum power control level of the MS.

   The transmitter output power under extreme test conditions is calculated for each burst type, power control level and for every frequency used by adding the frequency dependent calibration factor, determined in c), to the values obtained at extreme conditions in this step.

13.7.5 Test requirements

a) The transmitter output power on each subchannel, under every combination of normal and extreme test conditions, for normal bursts and access bursts, at each frequency and for each power control level applicable to the MS power class, shall be at the relevant level shown in table 13.7-1, table 13.7-2 or table 13.7-3 within the tolerances also shown in table 13.7-1, table 13.7-2 or table 13.7-3.

GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 only - begin

Table 13.7-1: GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 transmitter output power for different power classes

Power class				Power control level	Transmitter output power (note 2)	Tolerances	
2	3	4	5		dBm	normal	extreme
·				2	39	±2 dB	±2,5 dB
·	·			3	37	±3 dB (note 1)	±4 dB (note 1)
·	·			4	35	±3 dB	±4 dB
·	·	·		5	33	±3 dB (note 1)	±4 dB (note 1)
·	·	·		6	31	±3 dB	±4 dB
·	·	·	·	7	29	±3 dB (note 1)	±4 dB (note 1)
·	·	·	·	8	27	±3 dB	±4 dB
·	·	·	·	9	25	±3 dB	±4 dB
·	·	·	·	10	23	±3 dB	±4 dB
·	·	·	·	11	21	±3 dB	±4 dB
·	·	·	·	12	19	±3 dB	±4 dB
·	·	·	·	13	17	±3 dB	±4 dB
·	·	·	·	14	15	±3 dB	±4 dB
·	·	·	·	15	13	±3 dB	±4 dB
·	·	·	·	16	11	±5 dB	±6 dB
·	·	·	·	17	9	±5 dB	±6 dB
·	·	·	·	18	7	±5 dB	±6 dB
·	·	·	·	19	5	±5 dB	±6 dB
NOTE 1: When the power control level corresponds to the power class of the MS, then the tolerances shall be 2,0 dB under normal test conditions and 2,5 dB under extreme test conditions. NOTE 2: For R99 and Rel-4, the maximum output power in a multislot configuration may be lower within the limits defined in table 13.7-1a. From Rel-5 onwards, the maximum output power in a multislot configuration may be lower within the limits defined in table 13.7-1b.							

Table 13.7-1a: R99 and Rel-4: GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

Table 13.7-1b: From Rel-5 onwards: GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	3,0
3	4,8
4	6,0
5	7,0
6	7,8
7	8,5
8	9,0

From R5 onwards, the actual supported maximum output power shall be in the range indicated by the parameter GMSK_MULTISLOT_POWER_PROFILE for n allocated uplink timeslots:

a ≤ MS maximum output power ≤ min (MAX_PWR, a + 2dB)

Where:

a = min (MAX_PWR, MAX_PWR + GMSK_MULTISLOT_POWER_PROFILE – 10log(n));

MAX_PWR equals to the MS maximum output power according to the relevant power class and

GMSK_MULTISLOT_POWER_PROFILE 0 = 0 dB;
GMSK_MULTISLOT_POWER_PROFILE 1 = 2 dB;
GMSK_MULTISLOT_POWER_PROFILE 2 = 4 dB;
GMSK_MULTISLOT_POWER_PROFILE 3 = 6 dB.

GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 only - end

DCS 1 800 only - begin

Table 13.7-2: DCS 1 800 transmitter output power for different power classes

Power class			Power control level	Transmitter output power (note 2)	Tolerances	
1	2	3		dBm	normal	extreme
		·	29	36	±2,0 dB	±2,5 dB
		·	30	34	±3,0 dB	±4,0 dB
		·	31	32	±3,0 dB	±4,0 dB
·		·	0	30	±3,0 dB (note 1)	±4 dB (note 1)
·		·	1	28	±3 dB	±4 dB
·		·	2	26	±3 dB	±4 dB
·	·	·	3	24	±3 dB (note 1)	±4 dB (note 1)
·	·	·	4	22	±3 dB	±4 dB
·	·	·	5	20	±3 dB	±4 dB
·	·	·	6	18	±3 dB	±4 dB
·	·	·	7	16	±3 dB	±4 dB
·	·	·	8	14	±3 dB	±4 dB
·	·	·	9	12	±4 dB	±5 dB
·	·	·	10	10	±4 dB	±5 dB
·	·	·	11	8	±4 dB	±5 dB
·	·	·	12	6	±4 dB	±5 dB
·	·	·	13	4	±4 dB	±5 dB
·	·	·	14	2	±5 dB	±6 dB
·	·	·	15	0	±5 dB	±6 dB

NOTE 1: When the power control level corresponds to the power class of the MS, then the tolerances shall be 2,0 dB under normal test conditions and 2,5 dB under extreme test conditions.

NOTE 2: For R99 and Rel-4, the maximum output power in a multislot configuration may be lower within the limits defined in table 13.7-2a. From Rel-5 onwards, the maximum output power in a multislot configuration may be lower within the limits defined in table 13.7-2b.

Table 13.7-2a: R99 and Rel-4: DCS 1800 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

Table 13.7-2b: From Rel-5 onwards: DCS 1800 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	3,0
3	4,8
4	6,0
5	7,0
6	7,8
7	8,5
8	9,0

From R5 onwards, the actual supported maximum output power shall be in the range indicated by the parameter GMSK_MULTISLOT_POWER_PROFILE for n allocated uplink timeslots:

a ≤ MS maximum output power ≤ min(MAX_PWR, a + 2dB)

Where:

a = min (MAX_PWR, MAX_PWR + GMSK_MULTISLOT_POWER_PROFILE – 10log(n));

MAX_PWR equals to the MS maximum output power according to the relevant power class and

GMSK_MULTISLOT_POWER_PROFILE 0 = 0 dB;
GMSK_MULTISLOT_POWER_PROFILE 1 = 2 dB;
GMSK_MULTISLOT_POWER_PROFILE 2 = 4 dB;
GMSK_MULTISLOT_POWER_PROFILE 3 = 6 dB.

DCS 1 800 only - end

PCS 1 900 only - begin

Table 13.7-3: PCS 1 900 transmitter output power for different power classes

Power class			Power control level	Transmitter output power (note 2)	Tolerances	
1	2	3		dBm	Normal	Extreme
		·	30	33	±2,0 dB	±2,5 dB
		·	31	32	±2,0 dB	±2,5 dB
·		·	0	30	±3,0 dB (note_1)	±4 dB (note_1)
·		·	1	28	±3 dB	±4 dB
·		·	2	26	±3 dB	±4 dB
·	·	·	3	24	±3 dB (note_1)	±4 dB (note_1)
·	·	·	4	22	±3 dB	±4 dB
·	·	·	5	20	±3 dB	±4 dB
·	·	·	6	18	±3 dB	±4 dB
·	·	·	7	16	±3 dB	±4 dB
·	·	·	8	14	±3 dB	±4 dB
·	·	·	9	12	±4 dB	±5 dB
·	·	·	10	10	±4 dB	±5 dB
·	·	·	11	8	±4 dB	±5 dB
·	·	·	12	6	±4 dB	±5 dB
·	·	·	13	4	±4 dB	±5 dB
·	·	·	14	2	±5 dB	±6 dB
·	·	·	15	0	±5 dB	±6 dB
NOTE 1: When the power control level corresponds to the power class of the MS, then the tolerances shall be 2,0 dB under normal test conditions and 2,5 dB under extreme test conditions.						
NOTE 2: For R99 and Rel-4, the maximum output power in a multislot configuration may be lower within the limits defined in table 13.7-3a. From Rel-5 onwards, the maximum output power in a multislot configuration may be lower within the limits defined in table 13.7-3b.						

Table 13.7-3a: R99 and Rel-4: PCS 1900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

Table 13.7-3b: From Rel-5 onwards: PCS 1900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	3,0
3	4,8
4	6,0
5	7,0
6	7,8
7	8,5
8	9,0

From R5 onwards, the actual supported maximum output power shall be in the range indicated by the parameter GMSK_MULTISLOT_POWER_PROFILE for n allocated uplink timeslots:

a ≤ MS maximum output power ≤ min(MAX_PWR, a + 2dB)

Where:

a = min (MAX_PWR, MAX_PWR + GMSK_MULTISLOT_POWER_PROFILE – 10log(n));

MAX_PWR equals to the MS maximum output power according to the relevant power class and

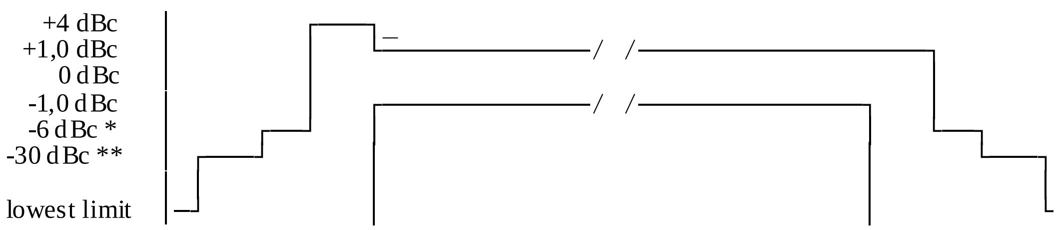
GMSK_MULTISLOT_POWER_PROFILE 0 = 0 dB;
GMSK_MULTISLOT_POWER_PROFILE 1 = 2 dB;
GMSK_MULTISLOT_POWER_PROFILE 2 = 4 dB;
GMSK_MULTISLOT_POWER_PROFILE 3 = 6 dB.

PCS 1 900 only - end

b) The difference between the transmitter output power at two adjacent power control levels, measured at the same frequency, shall not be less than 0,5 dB and not be more than 3,5 dB. For PCS 1 900 Class 3 the difference between the transmitter output power at power controls level 30 and 31, measured at the same frequency, shall not be less than 0 dB and not be more than 2 dB.

For R99 and later MS, if one or both of the adjacent output power levels are reduced according to GMSK_MULTISLOT_POWER_PROFILE X and the number of timeslots, the difference between the transmitter output power at two adjacent power control levels, measured at the same frequency, shall not be less than -1 dB and not be more than 3.5 dB.

c) The power/time relationship of the measured samples for normal bursts shall be within the limits of the power time template of figure 13.7-2 at each frequency, under every combination of normal and extreme test conditions and at each power control level measured.



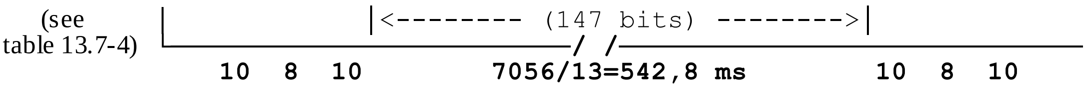


Figure 13.7-2: Power / time template for normal bursts

* For GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 MS:

-4 dBc for power control level 16;

-2 dBc for power control level 17;

-1 dBc for power control levels 18 and 19.

For DCS 1 800 and PCS 1 900 MS:

-4 dBc for power control level 11;

-2 dBc for power control level 12;

-1 dBc for power control levels 13, 14 and 15.

** For GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 MS:

-30 dBc or -17 dBm, whichever is the higher.

For DCS 1 800 and PCS 1 900 MS:

-30 dBc or -20 dBm, whichever is the higher.

Table 13.7-4: Lowest measurement limit for power / time template

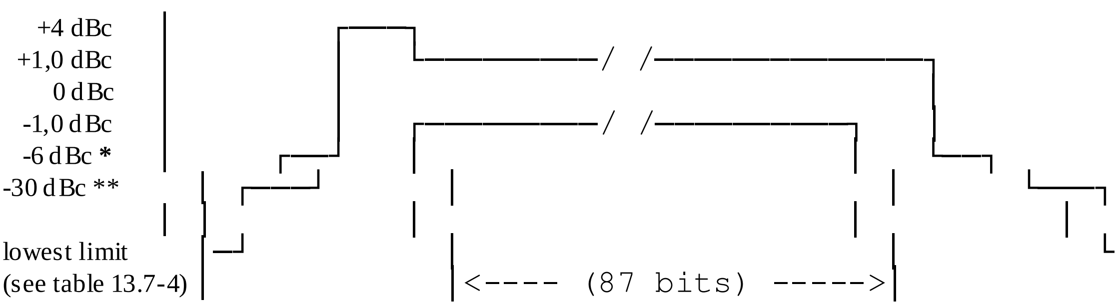
	lowest limit
GSM 400, GSM 700, T-GSM 810, GSM 850, GSM 900	-59 dBc or -54 dBm whichever is the highest, except for the timeslot preceding the active slot, for which the allowed level is -59 dBc or -36 dBm, whichever is the highest
DCS 1 800, PCS 1 900	-48 dBc or -48 dBm whichever is the highest

d) All the power control levels, for the type and power class of the MS as stated by the manufacturer, shall be implemented in the MS.

e) When the transmitter is commanded to a power control level outside of the capability corresponding to the type and power class of the MS as stated by the manufacturer, then the transmitter output power shall be within the tolerances for the closest power control level corresponding to the type and power class as stated by the manufacturer.

f) The centre of the transmitted normal burst as defined by the transition of bits 13/14 of the midamble shall be 3 timeslot periods (1 731 µs) ±1 bit period (±3,69 µs) after the centre of the corresponding received burst.

g) The power/time relationship of the measured samples for access bursts shall be within the limits of the power time template of figure 13.7-3 at each frequency, under every combination of normal and extreme test conditions and at each power control level measured.



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└──────────────────────────/ /────────────────────────-
10  8  10    4176/13=321,2 ms    10  8  10
```

Figure 13.7-3: Power / time template for access burst

* For GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 MS:

-4 dBc for power control level 16;

-2 dBc for power control level 17;

-1 dBc for power control levels 18 and 19.

For DCS 1 800 and PCS 1 900 MS:

-4 dBc for power control level 11;

-2 dBc for power control level 12;

-1 dBc for power control levels 13, 14 and 15.

** For GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 MS:

-30 dBc or -17 dBm, whichever is the higher.

For DCS 1 800 and PCS 1 900 MS:

-30 dBc or -20 dBm, whichever is the higher.

h) The centre of the transmitted access burst shall be an integer number of timeslot periods less 30 bit periods relative to any CCCH midamble centre with a tolerance of ±1 bit period (±3,69 µs).

13.8 Output RF spectrum in HSCSD multislot configuration

13.8.1 Definition

The output RF spectrum is the relationship between the frequency offset from the carrier and the power, measured in a specified bandwidth and time, produced by the MS due to the effects of modulation and power ramping.

13.8.2 Conformance requirement

1. The level of the output RF spectrum due to modulation shall be no more than that given in 3GPP TS 05.05, 4.2.1, table a) for GSM 400, GSM 700, GSM 850 and GSM 900, table b) for DCS 1 800 or table c) for PCS 1 900, with the following lowest measurement limits:

   - -36 dBm below 600 kHz offset from the carrier;

   - -51 dBm for GSM 400 and GSM 900 or -56 dBm for DCS 1 800 and PCS 1 900 from 600 kHz out to less than 1 800 kHz offset from the carrier;

   - -46 dBm for GSM 400 and GSM 900 or -51 dBm for DCS 1 800 and PCS 1 900 at and beyond 1 800 kHz offset from the carrier;

   but with the following exceptions at up to -36 dBm:

   - up to three bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz in the combined range 600 kHz to 6000 kHz above and below the carrier;

   - up to 12 bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz at more than 6 000 kHz offset from the carrier.

   1.1 Under normal conditions; 3GPP TS 05.05, subclause 4.2.1.

   1.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.2.1; 3GPP TS 05.05, annex D in subclauses D.2.1 and D.2.2.

2. The level of the output RF spectrum due to switching transients shall be no more than given in 3GPP TS 05.05, subclause 4.2.2, table "a) Mobile Station".

   2.1 Under normal conditions; 3GPP TS 05.05, subclause 4.2.2.

   2.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.2.2; 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2.

3. When allocated a channel, the power emitted by a GSM 400, GSM 900 and DCS 1 800 MS, in the band 935 MHz to 960 MHz shall be no more than -79 dBm, in the band 925 MHz to 935 MHz shall be no more than -67 dBm and in the band 1 805 MHz to 1 880 MHz shall be no more than -71 dBm except in five measurements in each of the bands 925 MHz to 960 MHz and 1 805 MHz to 1 880 MHz where exceptions at up to -36 dBm are permitted. For GSM 400 MS, in addition, the power emitted by MS, in the bands of 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz shall be no more than -67 dBm except in three measurements in each of the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz where exceptions at up to -36 dBm are permitted. For PCS 1 900 MS, the power emitted by MS, in the band 869 MHz to 894 MHz shall be no more than -79 dBm, in the band 1 930 MHz to 1 990 MHz shall be no more than -71 dBm except in five measurements in each of the bands 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where exceptions at up to -36 dBm are permitted. For GSM 700 and GSM 850, the power emitted by MS, in the band 747 MHz to 757 MHz shall be no more than –79 dBm, in the band of 757 MHz to 762 MHz shall be no more than –73 dBm, in the band 869 MHz to 894 MHz shall be no more than –79 dBm, in the band 1 930 MHz to 1 990 MHz shall be no more than –71 dBm except in five measurements in each of the bands 747 MHz to 762 MHz, 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where exceptions at up to –36 dBm are permitted. Under normal conditions; 3GPP TS 05.05, subclause 4.3.3.

13.8.3 Test purpose

1. To verify that the output RF spectrum due to modulation does not exceed conformance requirement 1 in the multislot configurations.

   1.1 Under normal conditions.

   1.2 Under extreme conditions.

2. To verify that the output RF spectrum due to switching transients does not exceed conformance requirement 2 in the multislot configurations when a reasonable margin is allowed for the effect of spectrum due to modulation.

   2.1 Under normal conditions.

   2.2 Under extreme conditions.

3. To verify that the MS spurious emissions in the MS receive band do not exceed conformance requirement 3 in the multislot configurations.

13.8.4 Method of test

13.8.4.1 Initial conditions

A call is set up according to the generic call set up procedure for multislot HSCSD.

The SS commands the MS to hopping mode. The hopping pattern includes only three channels, namely one with an ARFCN in the Low ARFCN range, a second one with an ARFCN in the Mid ARFCN range and the third one with an ARFCN in the High ARFCN range.

NOTE 1: Although the measurement is made whilst the MS is in hopping mode, each measurement is on one single channel.

NOTE 2: This test is specified in hopping mode as a simple means of making the MS change channel, it would be sufficient to test in non hopping mode and to handover the MS between the three channels tested at the appropriate time.

The SS sends Standard Test Signal C1 (annex 5) to the MS at a level of 23 dBμVemf( ).

The SS sets the MS to operate in a multislot configuration where is maximum number of transmitting timeslots. Maximum power level is set in all channels.

13.8.4.2 Procedure

NOTE: When averaging is in use during frequency hopping mode, the averaging only includes bursts transmitted when the hopping carrier corresponds to the nominal carrier of the measurement.

a) In steps b) to h) the FT is equal to the hop pattern ARFCN in the Mid ARFCN range.

b) The other settings of the spectrum analyser are set as follows:

- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 30 kHz;
- Video averaging: may be used, depending on the implementation of the test.

The video signal of the spectrum analyser is "gated" such that the spectrum generated by at least 40 of the bits 87 to 132 of the burst in one of the active time slots is the only spectrum measured. This gating may be analogue or numerical, dependent upon the design of the spectrum analyser. Only measurements during transmitted bursts on the nominal carrier of the measurement are included. The spectrum analyser averages over the gated period and over 200 or 50 such bursts, using numerical and/or video averaging.

c) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured over 50 bursts at all multiples of 30 kHz offset from FT to < 1 800 kHz.

d) The resolution and video bandwidth on the spectrum analyser are adjusted to 100 kHz and the measurements are made at the following frequencies:

- on every ARFCN from 1 800 kHz offset from the carrier to the edge of the relevant transmit band for each measurement over 50 bursts.
- at 200 kHz intervals over the 2 MHz either side of the relevant transmit band for each measurement over 50 bursts.

For GSM 400, GSM 900 and DCS 1 800:

- at 200 kHz intervals over the band 925 MHz to 960 MHz for each measurement over 50 bursts.
- at 200 kHz intervals over the band 1 805 MHz to 1 880 MHz for each measurement over 50 bursts.
- in addition for GSM 400 MS:
- at 200 kHz intervals over the band 460,4 MHz to 467,6 MHz for each measurement over 50 bursts.
- at 200 kHz intervals over the band 488,8 MHz to 496 MHz for each measurement over 50 bursts.

For GSM 700 and GSM 850:

- at 200 kHz intervals over the band 747 MHz to 762 MHz for each measurement over 50 bursts.
- at 200 kHz intervals over the band 869 MHz to 894 MHz for each measurement over 50 bursts.
- at 200 kHz intervals over the band 1 930 MHz to 1 990 MHz for each measurement over 50 bursts.

For PCS 1 900:

- at 200 kHz intervals over the band 869 MHz to 894 MHz for each measurement over 50 bursts.
- at 200 kHz intervals over the band 1 930 MHz to 1 990 MHz for each measurement over 50 bursts.

e) The MS is commanded to its minimum power control level. The spectrum analyser is set again as in b).

f) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured over 200 bursts at the following frequencies:

FT;

FT + 100 kHz FT - 100 kHz;

FT + 200 kHz FT - 200 kHz;

FT + 250 kHz FT - 250 kHz;

FT + 200 kHz * N FT - 200 kHz × N;

where N = 2, 3, 4, 5, 6, 7, and 8;

and FT = RF channel nominal centre frequency.

g) Steps a) to f) is repeated except that in step a) the spectrum analyzer is gated so that the burst of the next active time slot is measured.

h) The spectrum analyser settings are adjusted to:

- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 100 kHz;
- Peak hold.

The spectrum analyser gating of the signal is switched off.

The MS is commanded to its maximum power control level in every transmitted time slot.

i) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured at the following frequencies:

FT + 400 kHz FT - 400 kHz;

FT + 600 kHz FT - 600 kHz;

FT + 1,2 MHz FT - 1,2 MHz;

FT + 1,8 MHz FT - 1,8 MHz;

where FT = RF channel nominal centre frequency.

The duration of each measurement (at each frequency) will be such as to cover at least 10 burst transmissions at FT.

j) Step i) is repeated for power control levels 7 and 11.

k) Steps b), f), h) and i) are repeated with FT equal to the hop pattern ARFCN in the Low ARFCN range except that in step h) the MS is commanded to power control level 11 rather than maximum power.

l) Steps b), f), h) and i) are repeated with FT equal to the hop pattern ARFCN in the High ARFCN range except that in step h) the MS is commanded to power control level 11 rather than maximum power.

m) Steps a) b) f) h), and i) are repeated under extreme test conditions (annex 1, TC2.2). except that at step h) the MS is commanded to power control level 11.

13.8.5 Test requirements

For absolute measurements, performed on a temporary antenna connector, in the frequency band 450,4 MHz to 457,6 MHz, 478,8 MHz to 486 MHz, 777 MHz to 792 MHz, 824 MHz to 849 MHz, 880 MHz to 915 MHz, 1 710 MHz to 1 785 MHz or 1 850 MHz to 1 910 MHz, the temporary antenna connector coupling factor, determined according to subclause 13.3.4.2.2 and annex 1 GC7, for the nearest relevant frequency, will be used.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 925 MHz to 960 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 900 MS. For a GSM 400, GSM 700, GSM 850 or DCS 1 800 or PCS 1 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 1 805 MHz to 1 880 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for DCS 1 800 MS. For GSM 400, GSM 700, GSM 850, GSM 900 or PCS 1 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 460,4 MHz to 467,6 MHz or 488,8 MHz to 496 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 400 MS. For a GSM 700, GSM 850, GSM 900, DCS 1 800 or PCS 1 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 747 MHz to 762 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 700 MS. For a GSM 400, GSM 850, GSM 900 or DCS 1 800 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 869 MHz to 894 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 850 MS. For a GSM 400, GSM 700, GSM 900 or DCS 1 800 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 1 930 MHz to 1 990 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for PCS 1 900 MS. For GSM 400, GSM 900 or DCS 1 800 MS 0 dB will be assumed.

The figures in the tables below, at the listed frequencies from the carrier (kHz), are the maximum level (dB) relative to a measurement in 30 kHz bandwidth on the carrier (reference 3GPP TS 05.05 subclause 4.2.1).

a) For the modulation sidebands out to less than 1 800 kHz offset from the carrier frequency (FT) measured in step c), f), i), k), l) and m) the measured power level in dB relative to the power level measured at FT, for all types of MS, shall not exceed the limits derived from the values shown in table 1 for GSM 400, GSM 700, GSM 850 and GSM 900, table 2 for DCS 1 800 or table 3 for PCS 1 900 according to the actual transmit power and frequency offset from FT. However any failures in the combined range 600 kHz to less than 1 800 kHz above and below the carrier may be counted towards the exceptions allowed in test requirements c) below.

Table 1: GSM 400, GSM 700, GSM 850 and GSM 900 Spectrum due to modulation out to less than 1 800 kHz offset

	power levels in dB relative to the measurement at FT				
Power level	**Frequency offset (kHz)**				
(dBm)	**0-100**	**200**	**250**	**400**	**600 to <1 800**
39	+0,5	-30	-33	-60	-66
37	+0,5	-30	-33	-60	-64
35	+0,5	-30	-33	-60	-62
<= 33	+0,5	-30	-33	-60	-60
The values above are subject to the minimum absolute levels (dBm) below.					
	-36	-36	-36	-36	-51

Table 2: DCS 1 800 Spectrum due to modulation out to less than 1 800 kHz offset

	power levels in dB relative to the measurement at FT				
Power level	**Frequency offset (kHz)**				
(dBm)	**0-100**	**200**	**250**	**400**	**600 to <1 800**
<= 36	+0,5	-30	-33	-60	-60
The values above are subject to the minimum absolute levels (dBm) below.					
	-36	-36	-36	-36	-56

Table 3: PCS 1 900 Spectrum due to modulation out to less than 1 800 kHz offset

	power levels in dB relative to the measurement at FT					
Power level	Frequency offset (kHz)					
(dBm)	0-100	200	250	400	600 to <1 200	1 200 to <1 800
<= 33	+0,5	-30	-33	-60	-60	-60
The values above are subject to the minimum absolute levels (dBm) below.						
	-36	-36	-36	-36	-56	-56

NOTE 1: For frequency offsets between 100 kHz and 600 kHz the requirement is derived by a linear interpolation between the points identified in the table with linear frequency and power in dB relative.

b) For the modulation sidebands from 1 800 kHz offset from the carrier frequency (FT) and out to 2 MHz beyond the edge of the relevant transmit band, measured in step d), the measured power level in dB relative to the power level measured at FT, shall not exceed the values shown in table 4 according to the actual transmit power, frequency offset from FT and system on which the MS is designed to operate. However any failures in the combined range 1 800 kHz to 6 MHz above and below the carrier may be counted towards the exceptions allowed in test requirements c) below, and any other failures may be counted towards the exceptions allowed in test requirements d) below.

Table 4: Spectrum due to modulation from 1 800 kHz offset to the edge of the transmit band (wideband noise)

power levels in dB relative to the measurement at FT									
GSM 400, GSM 700, GSM 850 and GSM 900				DCS 1 800			PCS 1 900		
Power	Frequency offset			Power	Frequency offset		Power	Frequency offset	
Level	kHz			Level	KHz		level	KHz	
(dBm)	1 800 to	3 000 to	>= 6 000	(dBm)	1 800 to	>= 6 000	(dBm)	1 800 to	>= 6 000
	< 3 000	< 6 000			< 6 000			< 6 000	
39	-69	-71	-77	36	-71	-79	33	-68	-76
37	-67	-69	-75	34	-69	-77	32	-67	-75
35	-65	-67	-73	32	-67	-75	30	-65	-73
<= 33	-63	-65	-71	30	-65	-73	28	-63	-71
				28	-63	-71	26	-61	-69
				26	-61	-69	<= 24	-59	-67
				<= 24	-59	-67			
The values above are subject to the minimum absolute levels (dBm) below.									
	-46	-46	-46		-51	-51		-51	-51

c) Any failures (from a) and b) above) in the combined range 600 kHz to 6 MHz above and below the carrier should be re-checked for allowed spurious emissions. For each of the three ARFCN used, spurious emissions are allowed in up to three 200 kHz bands centred on an integer multiple of 200 kHz so long as no spurious emission exceeds -36 dBm. Any spurious emissions measured in a 30 kHz bandwidth which spans two 200 kHz bands can be counted towards either 200 kHz band, whichever minimizes the number of 200 kHz bands containing spurious exceptions.

d) Any failures (from b) above) beyond 6 MHz offset from the carrier should be re-checked for allowed spurious emissions. For each of the three ARFCN used, up to twelve spurious emissions are allowed so long as no spurious emission exceeds -36 dBm.

e) For GSM 400, GSM 900 and DCS 1 800 MS spurious emissions in the bands 925 MHz to 935 MHz, 935 MHz to 960 MHz and 1 805 MHz to 1 880 MHz, measured in step d), shall not exceed the values shown in table 5 except in up to five measurements in the band 925 MHz to 960 MHz and five measurements in the band 1 805 MHz to 1 880 MHz where a level up to -36 dBm is permitted. For GSM 400 MS, in addition, the MS spurious emissions in the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz shall not exceed the value of –67 dBm, except in up to three measurements in each of the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz where a level up to -36 dBm is permitted. For GSM 700 and GSM 850 the spurious emissions in the bands 747 MHz to 757 MHz, 757 MHz to 762 MHz and 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz shall not exceed the values shown in table 4 except in up to five measurements in each of the bands 747 MHz to 762 MHz and 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where a level up to

-36 dBm is permitted. For PCS 1 900 MS the spurious emissions in the bands 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz shall not exceed the values shown in table 5 except in up to five measurements in each of the bands 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where a level up to -36 dBm is permitted.

Table 5: Spurious emissions in the MS receive bands

Band (MHz)	Spurious emissions level (dBm)	
	GSM 400, GSM 900 and DCS 1 800	GSM 700, GSM 850 and PCS 1 900
925 to 935	-67	
935 to 960	-79	
1 805 to 1 880	-71	
747 to 757		-79
757 to 762		-73
869 to 894		-79
1 930 to 1 990		-71

f) For the power ramp sidebands of steps h), i) and k) the power levels must not exceed the values shown in table 6 for GSM 400, GSM 700, GSM 850 and GSM 900, table 7 for DCS 1 800 or table 8 for PCS 1 900.

Table 6: GSM Spectrum due to switching transients

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1 200 kHz	1 800 kHz
39 dBm	-13 dBm	-21 dBm	-21 dBm	-24 dBm
37 dBm	-15 dBm	-21 dBm	-21 dBm	-24 dBm
35 dBm	-17 dBm	-21 dBm	-21 dBm	-24 dBm
33 dBm	-19 dBm	-21 dBm	-21 dBm	-24 dBm
31 dBm	-21 dBm	-23 dBm	-23 dBm	-26 dBm
29 dBm	-23 dBm	-25 dBm	-25 dBm	-28 dBm
27 dBm	-23 dBm	-26 dBm	-27 dBm	-30 dBm
25 dBm	-23 dBm	-26 dBm	-29 dBm	-32 dBm
23 dBm	-23 dBm	-26 dBm	-31 dBm	-34 dBm
<= +21 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

Table 7: DCS 1 800 Spectrum due to switching transients

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1 200 kHz	1 800 kHz
36 dBm	-16 dBm	-21 dBm	-21 dBm	-24 dBm
34 dBm	-18 dBm	-21 dBm	-21 dBm	-24 dBm
32 dBm	-20 dBm	-22 dBm	-22 dBm	-25 dBm
30 dBm	-22 dBm	-24 dBm	-24 dBm	-27 dBm
28 dBm	-23 dBm	-25 dBm	-26 dBm	-29 dBm
26 dBm	-23 dBm	-26 dBm	-28 dBm	-31 dBm
24 dBm	-23 dBm	-26 dBm	-30 dBm	-33 dBm
22 dBm	-23 dBm	-26 dBm	-31 dBm	-35 dBm
<= +20 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

Table 8: PCS 1 900 Spectrum due to switching transients

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1 200 kHz	1 800 kHz
33 dBm	-19 dBm	-22 dBm	-22 dBm	-25 dBm
32 dBm	-20 dBm	-22 dBm	-22 dBm	-25 dBm
30 dBm	-22 dBm	-24 dBm	-24 dBm	-27 dBm
28 dBm	-23 dBm	-25 dBm	-26 dBm	-29 dBm
26 dBm	-23 dBm	-26 dBm	-28 dBm	-31 dBm
24 dBm	-23 dBm	-26 dBm	-30 dBm	-33 dBm
22 dBm	-23 dBm	-26 dBm	-31 dBm	-35 dBm
<= +20 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

NOTE 2: These figures are different from the requirements in 3GPP TS 05.05 because at higher power levels it is the modulation spectrum which is being measured using a peak hold measurement. This allowance is given in the table.

NOTE 3: The figures for table 6, table 7 and table 8 assume that, using the peak hold measurement, the lowest level measurable is 8 dB above the level of the modulation specification using the 30 kHz bandwidth gated average technique for 400 kHz offset from the carrier. At 600 kHz and 1 200 kHz offset the level is 6 dB above and at 1 800 kHz offset the level is 3 dB above. The figures for 1 800 kHz have assumed the 30 kHz bandwidth spectrum due to modulation specification at < 1 800 kHz.

13.9 Output RF spectrum for MS supporting the R-GSM band

13.9.1 Definition

The output RF spectrum is the relationship between the frequency offset from the carrier and the power, measured in a specified bandwidth and time, produced by the MS due to the effects of modulation and power ramping.

13.9.2 Conformance requirement

1. The level of the output RF spectrum due to modulation shall be no more than that given in 3GPP TS 05.05, subclause 4.2.1, table a) for R-GSM 900 with the following lowest measurement limits:

   - -36 dBm below 600 kHz offset from the carrier;
   - -51 dBm for R-GSM 900 from 600 kHz out to less than 1 800 kHz offset from the carrier;
   - -46 dBm for R-GSM 900 at and beyond 1 800 kHz offset from the carrier;

   but with the following exceptions at up to -36 dBm:

   - up to three bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz in the combined range 600 kHz to 6000 kHz above and below the carrier;
   - up to 12 bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz at more than 6 000 kHz offset from the carrier.

   1.1 Under normal conditions; 3GPP TS 05.05, subclause 4.2.1.

   1.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.2.1; 3GPP TS 05.05, annex D in subclauses D.2.1 and D.2.2.

2. The level of the output RF spectrum due to switching transients shall be no more than given in 3GPP TS 05.05, subclause 4.2.2, table "a) Mobile Station:".

   2.1 Under normal conditions; 3GPP TS 05.05, subclause 4.2.2.

   2.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.2.2; 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2.

3. When allocated a channel, the power emitted by the MS, in the band 935 MHz to 960 MHz shall be no more than -79 dBm, in the band 925 MHz to 935 MHz shall be no more than -67 dBm, in the band 921 MHz to 925 MHz shall be no more than -60 dBm and in the band 1 805 MHz to 1 880 MHz shall be no more than -71 dBm except in five measurements in each of the bands 925 MHz to 960 MHz and 1 805 MHz to 1 880 MHz where exceptions at up to -36 dBm are permitted. Under normal conditions; 3GPP TS 05.05, subclause 4.3.3.

13.9.3 Test purpose

1. To verify that the output RF spectrum due to modulation does not exceed conformance requirement 1.

   1.1 Under normal conditions.

   1.2 Under extreme conditions.

2. To verify that the output RF spectrum due to switching transients does not exceed conformance requirement 2 when a reasonable margin is allowed for the effect of spectrum due to modulation.

   2.1 Under normal conditions.

   2.2 Under extreme conditions.

3. To verify that the MS spurious emissions in the MS receive band do not exceed conformance requirement 3.

13.9.4 Method of test

13.9.4.1 Initial conditions

A call is set up according to the generic call set up procedure.

The SS commands the MS to hopping mode. The hopping pattern includes only three channels, namely one with an ARFCN in the Low R-GSM ARFCN range, a second one with an ARFCN in the Mid ARFCN range and the third one with an ARFCN in the High ARFCN range.

NOTE 1: Although the measurement is made whilst the MS is in hopping mode, each measurement is on one single channel.

NOTE 2: This test is specified in hopping mode as a simple means of making the MS change channel, it would be sufficient to test in non hopping mode and to handover the MS between the three channels tested at the appropriate time.

The SS commands the MS to complete the traffic channel loop back without signalling of erased frames (see subclause 36.2.1.1). This is to set a defined random pattern for the transmitter.

The SS sends Standard Test Signal C1 (annex 5) to the MS at a level of 23 dBμVemf( ).

13.9.4.2 Procedure

NOTE: When averaging is in use during frequency hopping mode, the averaging only includes bursts transmitted when the hopping carrier corresponds to the nominal carrier of the measurement.

a) In steps b) to h) the FT is equal to the hop pattern ARFCN in the Mid ARFCN range.

b) The other settings of the spectrum analyser are set as follows:

- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 30 kHz;
- Video averaging: may be used, depending on the implementation of the test.

The video signal of the spectrum analyser is "gated" such that the spectrum generated by at least 40 of the bits 87 to 132 of the burst is the only spectrum measured. This gating may be analogue or numerical, dependent upon the design of the spectrum analyser. Only measurements during transmitted bursts on the nominal carrier of the measurement are included. The spectrum analyser averages over the gated period and over 200 or 50 such bursts, using numerical and/or video averaging.

The MS is commanded to its maximum power control level.

c) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured over 50 bursts at all multiples of 30 kHz offset from FT to < 1 800 kHz.

d) The resolution and video bandwidth on the spectrum analyser are adjusted to 100 kHz and the measurements are made at the following frequencies:

- on every ARFCN from 1 800 kHz offset from the carrier to the edge of the relevant transmit band for each measurement over 50 bursts.
- at 200 kHz intervals over the 2 MHz either side of the relevant transmit band for each measurement over 50 bursts.
- at 200 kHz intervals over the band 921 MHz to 960 MHz for each measurement over 50 bursts.
- at 200 kHz intervals over the band 1 805 MHz to 1 880 MHz for each measurement over 50 bursts.

e) The MS is commanded to its minimum power control level. The spectrum analyser is set again as in b).

f) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured over 200 bursts at the following frequencies:

FT;

FT + 100 kHz	FT - 100 kHz;
FT + 200 kHz	FT - 200 kHz;
FT + 250 kHz	FT - 250 kHz;
FT + 200 kHz × N	FT - 200 kHz × N;

where N = 2, 3, 4, 5, 6, 7, and 8;

and FT = RF channel nominal centre frequency.

g) The spectrum analyser settings are adjusted to:

- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 100 kHz;
- Peak hold.

The spectrum analyser gating of the signal is switched off.

The MS is commanded to its maximum power control level.

h) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured at the following frequencies:

FT + 400 kHz	FT - 400 kHz;
FT + 600 kHz	FT - 600 kHz;
FT + 1,2 MHz	FT - 1,2 MHz;
FT + 1,8 MHz	FT - 1,8 MHz;

where FT = RF channel nominal centre frequency.

The duration of each measurement (at each frequency) will be such as to cover at least 10 burst transmissions at FT.

i) Step h) is repeated for power control levels 7 and 11.

j) Steps b), f), g) and h) are repeated with FT equal to the hop pattern ARFCN in the Low R-GSM ARFCN range except that in step g) the MS is commanded to power control level 11 rather than maximum power.

k) Steps b), f), g) and h) are repeated with FT equal to the hop pattern ARFCN in the High ARFCN range except that in step g) the MS is commanded to power control level 11 rather than maximum power.

l) Steps a), b), f), g) and h) are repeated under extreme test conditions (annex 1, TC2.2). except that at step g) the MS is commanded to power control level 11.

13.9.5 Test requirements

For absolute measurements, performed on a temporary antenna connector, in the frequency band 876 MHz to 915 MHz or 1 710 MHz to 1 785 MHz, the temporary antenna connector coupling factor, determined according to subclause 13.3.4.2.2 and annex 1 GC7, for the nearest relevant frequency, will be used.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 921 MHz to 960 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 900 MS

For absolute measurements, performed on a temporary antenna connector, in the frequency band 1 805 MHz to 1 880 MHz for R-GSM 900 MS 0 dB will be assumed.

The figures in the tables below, at the listed frequencies from the carrier (kHz), are the maximum level (dB) relative to a measurement in 30 kHz bandwidth on the carrier (reference 3GPP TS 05.05 subclause 4.2.1).

a) For the modulation sidebands out to less than 1 800 kHz offset from the carrier frequency (FT) measured in step c), f), h), j), k) and l) the measured power level in dB relative to the power level measured at FT, for all types of MS, shall not exceed the limits derived from the values shown in table 13.9-1 for R-GSM 900 according to the actual transmit power and frequency offset from FT. However any failures in the combined range 600 kHz to less than 1 800 kHz above and below the carrier may be counted towards the exceptions allowed in test requirements c) below.

Table 13.9-1a: R-GSM 900 Spectrum due to modulation out to less than 1 800 kHz offset

	power levels in dB relative to the measurement at FT				
Power level	Frequency offset (kHz)				
(dBm)	0-100	200	250	400	600 to <1 800
39	+0,5	-30	-33	-60	-66
37	+0,5	-30	-33	-60	-64
35	+0,5	-30	-33	-60	-62
<= 33	+0,5	-30	-33	-60	-60
The values above are subject to the minimum absolute levels (dBm) below.					
	-36	-36	-36	-36	-51

NOTE 1: For frequency offsets between 100 kHz and 600 kHz the requirement is derived by a linear interpolation between the points identified in the table with linear frequency and power in dB relative.

b) For the modulation sidebands from 1 800 kHz offset from the carrier frequency (FT) and out to 2 MHz beyond the edge of the relevant transmit band, measured in step d), the measured power level in dB relative to the power level measured at FT, shall not exceed the values shown in table 13.9-2 according to the actual transmit power, frequency offset from FT and system on which the MS is designed to operate. However any failures in the combined range 1 800 kHz to 6 MHz above and below the carrier may be counted towards the exceptions allowed in test requirements c) below, and any other failures may be counted towards the exceptions allowed in test requirements d) below.

Table 13.9-2: Spectrum due to modulation from 1 800 kHz offset to the edge of the transmit band (wideband noise)

Power levels in dB relative to the measurement at FT			
R-GSM 900			
Power level (dBm)	Frequency offset kHz		
	1 800 to < 3 000	3 000 to < 6 000	>= 6 000
39	-69	-71	-77
37	-67	-69	-75
35	-65	-67	-73
<= 33	-63	-65	-71
The values above are subject to the minimum absolute levels (dBm) below			
	-46	-46	-46

c) Any failures (from a) and b) above) in the combined range 600 kHz to 6 MHz above and below the carrier should be re-checked for allowed spurious emissions. For each of the three ARFCN used, spurious emissions are allowed in up to three 200 kHz bands centred on an integer multiple of 200 kHz so long as no spurious emission exceeds -36 dBm. Any spurious emissions measured in a 30 kHz bandwidth which spans two 200 kHz bands can be counted towards either 200 kHz band, whichever minimizes the number of 200 kHz bands containing spurious exceptions.

d) Any failures (from b) above) beyond 6 MHz offset from the carrier should be re-checked for allowed spurious emissions. For each of the three ARFCN used, up to twelve spurious emissions are allowed so long as no spurious emission exceeds -36 dBm.

e) The MS spurious emissions in the bands 921 MHz to 925, 925 MHz to 935 MHz, 935 MHz to 960 MHz and 1 805 MHz to 1 880 MHz, measured in step d), for all types of MS, shall not exceed the values shown in table 13.9-3 except in up to five measurements in the band 925 to 960 MHz and five measurements in the band 1 805 MHz to 1 880 MHz where a level up to -36 dBm is permitted.

Table 13.9-3: Spurious emissions in the R-GSM MS receive bands

Band (MHz)	Spurious emissions level (dBm)
921 to 925	-60
925 to 935	-67
935 to 960	-79
1 805 to 1 880	-71

f) For the power ramp sidebands of steps h) and i) the power levels must not exceed the values shown in table 13.9-4 for GSM 900.

Table 13.9-4: R-GSM Spectrum due to switching transients

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1 200 kHz	1 800 kHz
39 dBm	-13 dBm	-21 dBm	-21 dBm	-24 dBm
37 dBm	-15 dBm	-21 dBm	-21 dBm	-24 dBm
35 dBm	-17 dBm	-21 dBm	-21 dBm	-24 dBm
33 dBm	-19 dBm	-21 dBm	-21 dBm	-24 dBm
31 dBm	-21 dBm	-23 dBm	-23 dBm	-26 dBm
29 dBm	-23 dBm	-25 dBm	-25 dBm	-28 dBm
27 dBm	-23 dBm	-26 dBm	-27 dBm	-30 dBm
25 dBm	-23 dBm	-26 dBm	-29 dBm	-32 dBm
23 dBm	-23 dBm	-26 dBm	-31 dBm	-34 dBm
<= +21 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

NOTE 2: These figures are different from the requirements in 3GPP TS 05.05 because at higher power levels it is the modulation spectrum which is being measured using a peak hold measurement. This allowance is given in the table.

NOTE 3: The figures for table 13.9-4 assume that, using the peak hold measurement, the lowest level measurable is 8 dB above the level of the modulation specification using the 30 kHz bandwidth gated average technique for 400 kHz offset from the carrier. At 600 and 1200 kHz offset the level is 6 dB above and at 1 800 kHz offset the level is 3 dB above. The figures for 1 800 kHz have assumed the 30 kHz bandwidth spectrum due to modulation specification at < 1 800 kHz.

13.10 Void

13.11 Void

13.12 Void

13.13 Void

13.14 Void

13.15 Void

13.16 GPRS transmitter tests

13.16.1 Frequency error and phase error in GPRS multislot configuration

13.16.1.1 Definition

The frequency error is the difference in frequency, after adjustment for the effect of the modulation and phase error, between the RF transmission from the MS and either:

- the RF transmission from the BS; or
- the nominal frequency for the ARFCN used.

The phase error is the difference in phase, after adjustment for the effect of the frequency error, between the RF transmission from the MS and the theoretical transmission according to the intended modulation.

13.16.1.2 Conformance requirement

1. The MS carrier frequency shall be accurate to within 0,1 ppm compared to signals received from the BS.

    1.1 Under normal conditions; 3GPP TS 05.10, subclause 6.1.

    1.2 Under vibration conditions; 3GPP TS 05.10, subclause 6.1; 3GPP TS 05.05, annex D subclause D.2.3.

    1.3 Under extreme conditions; 3GPP TS 05.10, subclause 6.1; 3GPP TS 05.05, subclause 4.4; 3GPP TS 05.05, annex D subclauses D.2.1 and D.2.2.

2. The RMS phase error (difference between the phase error trajectory and its linear regression on the active part of the time slot) for each burst shall not be greater than 5 degrees.

    2.1 Under normal conditions; 3GPP TS 05.05, subclause 4.6.

    2.2 Under vibration conditions; 3GPP TS 05.05, subclause 4.6; 3GPP TS 05.05, annex D D.2.3.

    2.3 Under extreme conditions; 3GPP TS 05.05, subclause 4.6; 3GPP TS 05.05, annex D D.2.1, D.2.2.

3. The maximum peak deviation during the useful part of each burst shall not be greater than 20 degrees.

    3.1 Under normal conditions; 3GPP TS 05.05, subclause 4.6.

    3.2 Under vibration conditions; 3GPP TS 05.05, subclause 4.6; 3GPP TS 05.05, annex D subclause D.2.3.

3.3 Under extreme conditions; 3GPP TS 05.05, subclause 4.6; 3GPP TS 05.05, annex D subclauses D.2.1 and D.2.2.

13.16.1.3 Test purpose

1. To verify that in a multislot configuration the MS carrier frequency error does not exceed 0.1 ppm:

   1.1 Under normal conditions.

   1.2 When the MS is being vibrated.

   1.3 Under extreme conditions.

2. To verify that the RMS phase error on the useful parts of the bursts transmitted by the MS in a multislot configuration does not exceed conformance requirement 2:

   2.1 Under normal conditions.

   2.2 When the MS is being vibrated.

   2.3 Under extreme conditions.

3. To verify that the maximum phase error on the useful parts of the bursts transmitted by the MS in a multislot configuration does not exceed conformance requirement 3:

   3.1 Under normal conditions.

   3.2 When the MS is being vibrated.

   3.3 Under extreme conditions.

13.16.1.4 Method of the test

NOTE: In order to measure the accuracy of the frequency and phase error a sampled measurement of the transmitted phase trajectory is obtained. This is compared with the theoretically expected phase trajectory. The regression line of the difference between the expected trajectory and the measured trajectory is an indication of the frequency error (assumed constant through the burst), whilst the departure of the phase differences from this trajectory is a measure of the phase error. The peak phase error is the value furthest from the regression line and the RMS phase error is the root mean square average of the phase error of all samples.

13.16.1.4.1 Initial conditions

The test shall be run under the default GPRS conditions defined in clause 40, with power control parameter ALPHA (α) set to 0.

The SS commands the MS to hopping mode (table 13.6.1, 3GPP TS 11.10).

NOTE: It is not necessary to test in hopping mode but is done here as a simple means of making the MS change channel, it would be sufficient to test in non hopping mode and to make sure bursts are taken from a few different channels.

The MS shall be operated with its highest number of uplink slots.

The Test Mode defined in 3GPP TS 04.14 (subclause 5.4) will be utilised. If the MS is capable of both:

Mode (a) transmitting pseudo-random data sequence in RLC data blocks;

Mode (b) transmitting looped-back RLC data blocks;

then Mode (a) will be used.

If Mode (b) is used then the SS sends the pseudo-random data sequence specified for Mode (a) on the downlink for loopback on the uplink.

For the procedure described below, the initial power value of each active timeslot shall be set to a mid-range power value.

Specific PICS statements:

- MS without vibration sensitive components (TSPC_No_Vibration_Sensitive_Components)

PIXIT Statements:

-

13.16.1.4.2 Procedure

a) For one transmitted burst on the last slot of the multislot configuration, the SS captures the signal as a series of phase samples over the period of the burst. These samples are evenly distributed over the duration of the burst with a minimum sampling rate of 2/T, where T is the modulation symbol period. The received phase trajectory is then represented by this array of at least 294 samples.

b) The SS then calculates, from the known bit pattern and the formal definition of the modulator contained in 3GPP TS 05.04, the expected phase trajectory.

c) From a) and b) the phase trajectory error is calculated, and a linear regression line computed through this phase trajectory error. The slope of this regression line is the frequency error of the mobile transmitter relative to the simulator reference. The difference between the regression line and the individual sample points is the phase error of that point.

c.1) The sampled array of at least 294 phase measurements is represented by the vector:

$\varnothing_m = \varnothing_m(0) \ldots \varnothing_m(n)$

where the number of samples in the array $n+1 \geq 294$.

c.2) The calculated array, at the corresponding sampling instants, is represented by the vector:

$\varnothing_c = \varnothing_c(0) \ldots \varnothing_c(n)$.

c.3) The error array is represented by the vector:

$\varnothing_e = \{\varnothing_m(0) - \varnothing_c(0)\} \ldots\ldots\ldots \{\varnothing_m(n) - \varnothing_c(n)\} = \varnothing_e(0) \ldots \varnothing_e(n)$.

c.4) The corresponding sample numbers form a vector $t = t(0) \ldots t(n)$.

c.5) By regression theory the slope of the samples with respect to t is k where:

$$k = \frac{\sum_{j=0}^{j=n} t(j) * \varnothing_e(j)}{\sum_{j=0}^{j=n} t(j)^2}$$

c.6) The frequency error is given by k/(360 * g), where g is the sampling interval in s and all phase samples are measured in degrees.

c.7) The individual phase errors from the regression line are given by:

$\varnothing_e(j) - k*t(j)$.

c.8) The RMS value $\varnothing_e$ of the phase errors is given by:

$$\varnothing_e(RMS) = \left[\frac{\sum_{j=0}^{j=n} \{\varnothing_e(j) - k * t(j)\}^2}{n+1} \right]^{\frac{1}{2}}$$

d) Steps a) to c) are repeated for 20 bursts, not necessarily contiguous.

e) The SS instructs the MS to its maximum power control level by setting the power control parameter ALPHA (α) to 0 and GAMMA_TN (Γ_{CH}) for each timeslot to the desired power level in the Packet Uplink Assignment message (Closed Loop Control, see 3GPP TS 05.08, clause B.2), all other conditions remaining constant. Steps a) to d) are repeated.

f) The SS instructs the MS to the minimum power control level, all other conditions remaining constant. Steps a) to d) are repeated.

g) The MS is hard mounted on a vibration table and vibrated at the frequency/amplitudes specified in annex 1, TC4.

During the vibration steps a) to f) are repeated.

NOTE 1: If the call is terminated when mounting the MS to the vibration table, it will be necessary to establish the initial conditions again before repeating steps a) to f).

h) The MS is re-positioned on the vibration table in the two orthogonal planes to the plane used in step g). For each of the orthogonal planes step g) is repeated.

i) Steps a) to f) are repeated under extreme test conditions (see annex 1, TC2.2).

NOTE 2: Steps g) and h) are skipped if TSPC_No_Vibration_Sensitive_Components is declared as Yes

13.16.1.5.1 Frequency error

For all measured bursts, the frequency error, derived in step c.6), shall be less than 10E-7.

13.16.1.5.2 Phase error

For all measured bursts, the RMS phase error, derived in step c.8), shall not exceed 5 degrees.

For all measured bursts, each individual phase error, derived in step c.7), shall not exceed 20 degrees.

13.16.2 Transmitter output power in GPRS multislot configuration

13.16.2.1 Definition

The transmitter output power is the average value of the power delivered to an artificial antenna or radiated by the MS and its integral antenna, over the time that the useful information bits of one burst are transmitted.

13.16.2.2 Conformance requirement

1. The MS maximum output power shall be as defined in 3GPP TS 05.05, subclause 4.1.1, first table, according to its power class, with a tolerance of ±2 dB under normal conditions; 3GPP TS 05.05, subclause 4.1.1, first table. From R99 onwards, the MS maximum output power in an uplink multislot configuration shall be as defined in 3GPP TS 05.05 subclause 4.1.1, sixth table, according to its power class, with a tolerance of ±3 dB under normal conditions; 3GPP TS 05.05, subclause 4.1.1, first and sixth table. In case the MS supports the same maximum output power in an uplink multislot configuration as it supports for single slot uplink operation, the tolerance shall be ±2 dB.

2. The MS maximum output power shall be as defined in 3GPP TS 05.05, subclause 4.1.1, first table, according to its power class, with a tolerance of ±2,5 dB under extreme conditions; 3GPP TS 05.05, subclause 4.1.1, first table; 3GPP TS 05.05 annex D subclauses D.2.1 and D.2.2. From R99 onwards, the MS maximum output power in an uplink multislot configuration shall be as defined in 3GPP TS 05.05 subclause 4.1.1, sixth table, according to its power class, with a tolerance of ±4 dB under extreme conditions; 3GPP TS 05.05, subclause 4.1.1, first and sixth table; 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2. In case the MS supports the same maximum output power in an uplink multislot configuration as it supports for single slot uplink operation, the tolerance shall be ±2,5 dB.

3. The power control levels shall have the nominal output power levels as defined in 3GPP TS 05.05, subclause 4.1.1, third table (for GSM 400, GSM 700, GSM 850 and GSM 900), fourth table (for DCS 1 800) or fifth table (for PCS 1 900), from the lowest power control level up to the maximum output power corresponding to the class of the MS (for tolerance on maximum output power see conformance requirements 1), with a tolerance of ±3 dB, ±4 dB or ±5 dB under normal conditions; 3GPP TS 05.05, subclause 4.1.1, third, fourth or fifth table.

4. The power control levels shall have the nominal output power levels as defined in 3GPP TS 05.05, subclause 4.1.1, third table (for GSM 400, GSM 700, GSM 850 and GSM 900), fourth table (for DCS 1 800) or fifth table (for PCS 1 900), from the lowest power control level up to the maximum output power corresponding to the class of the MS (for tolerance on maximum output power see conformance requirements 2), with a tolerance of ±4 dB, ±5 dB or ±6 dB under extreme conditions; 3GPP TS 05.05, subclause 4.1.1, third, fourth or fifth table; 3GPP TS 05.05 annex D subclauses D.2.1 and D.2.2.

4a. From R99 onwards, the supported maximum output power for each number of uplink timeslots shall form a monotonic sequence. The maximum reduction of maximum output power from an allocation of n uplink timeslots to an allocation of n+1 uplink timeslots shall be equal to the difference of maximum permissible nominal reduction of maximum output power for the corresponding number of timeslots, as defined in 3GPP TS 05.05, subclause 4.1.1, sixth table.

5. The output power actually transmitted by the MS at consecutive power control levels shall form a monotonic sequence and the interval between power control levels shall be 2 ± 1,5 dB (1 ± 1dB between power control level 30 and 31 for PCS 1 900), from R99 onwards, in a multislot configuration, the first power control step down from the maximum output power is allowed to be in the range 0…2 dB; 3GPP TS 05.05, subclause 4.1.1.

6. The transmitted power level relative to time for a normal burst shall be within the power/time template given in 3GPP TS 05.05, annex B figure B1. In multislot configurations where the bursts in two or more consecutive time slots are actually transmitted at the same frequency the template of annex B shall respected during the useful part of each burst and at the beginning and the end of the series of consecutive bursts. The output power during the guard period between every two consecutive active timeslots shall not exceed the level allowed for the useful part of the first timeslot or the level allowed for the useful part of the second timeslot plus 3 dB, whichever is the highest:

   6.1 Under normal conditions; 3GPP TS 05.05, subclause 4.5.2.

   6.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.5.2, 3GPP TS 05.05 annex D subclauses D.2.1 and D.2.2.

7. When accessing a cell on the PRACH or RACH and before receiving the first power control parameters during packet transfer on PDCH, all GSM and class 1 and class 2 DCS 1 800 and PCS 1 900 MS shall use the power control level defined by the GPRS_MS_TXPWR_MAX_CCH parameter broadcast on the PBCCH or MS_TXPWR_MAX_CCH parameter broadcast on the BCCH of the cell. When MS_TXPWR_MAX_CCH is received on the BCCH, a class 3 DCS 1800 MS shall add to it the value POWER_OFFSET broadcast on the BCCH. If MS_TXPWR_MAX_CCH or the sum defined by: MS_TXPWR_MAX_CCH plus POWER_OFFSET corresponds to a power control level not supported by the MS as defined by its power class, the MS shall act as though the closest supported power control level had been broadcast.

8. The transmitted power level relative to time for a Random Access burst shall be within the power/time template given in 3GPP TS 05.05, annex B figure B.3:

   8.1 Under normal conditions; 3GPP TS 05.05, subclause 4.5.2.

   8.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.5.2, 3GPP TS 05.05 annex D subclauses D.2.1 and D.2.2.

On a multislot uplink configuration the MS may restrict the interslot output power control range to a 10 dB window, on a TDMA frame basis. On those timeslots where the ordered power level is more than 10 dB lower than the applied power level of the highest power timeslot, the MS shall transmit at a lowest possible power level within 10 dB range from the highest applied power level, if not transmitting at the actual ordered power level.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

13.16.2.3 Test purpose

1. To verify that the maximum output power of the MS in GPRS multislot configuration, under normal conditions, is within conformance requirement 1.

2. To verify that the maximum output power of the MS in GPRS multislot configuration, under extreme conditions, is within conformance requirement 2.

3. To verify that all nominal output power levels, relevant to the class of MS, are implemented in the MS in GPRS multislot configuration and have output power levels, under normal conditions, within conformance requirement 3.

4. To verify that all nominal output power levels ,relevant to the class of MS, are implemented in the MS in GPRS multislot configuration and have output power levels, under extreme conditions, within conformance requirement 4.

4a. From R99 onwards: to verify that the supported maximum output power for each uplink multislot configuration is within the conformance requirement 4a.

5. To verify that the step in the output power transmitted by the MS in GPRS multislot configuration at consecutive power control levels is within conformance requirement 5 under normal conditions.

6. To verify that the output power relative to time, when sending a normal burst is within conformance requirement 6 in GPRS multislot configuration:

   6.1 Under normal conditions.

   6.2 Under extreme conditions.

7. To verify that the MS in GPRS multislot configuration uses the maximum power control level according to its power class if commanded to a power control level exceeding its power class.

8. To verify that the output power relative to time, when sending an access burst is within conformance requirement 8 in GPRS multislot configuration:

   8.1 Under normal conditions.

   8.2 Under extreme conditions.

13.16.2.4 Methods of test

Two methods of test are described, separately for:

1) equipment fitted with a permanent antenna connector or fitted with a temporary test connector as a test fixture; and for

2) equipment fitted with an integral antenna, and which cannot be connected to an external antenna.

NOTE: The behaviour of the MS in the system is determined to a high degree by the antenna, and this is the only transmitter test in this ETS using the integral antenna. Further studies are ongoing on improved testing on the integral antenna, taking practical conditions of MS use into account.

13.16.2.4.1 Method of test for equipment with a permanent or temporary antenna connector

13.16.2.4.1.1 Initial conditions

The test shall be run under the default GPRS conditions defined in clause 40 with an ARFCN in the mid ARFCN range.

The MS shall be operated with its highest number of uplink slots.

The Test Mode defined in 3GPP TS 04.14 (subclause 5.4) will be utilised. If the MS is capable of both:

Mode (a) transmitting pseudo-random data sequence in RLC data blocks;

Mode (b) transmitting looped-back RLC data blocks;

then Mode (a) will be used.

If Mode (b) is used then the SS sends the pseudo-random data sequence specified for Mode (a) on the downlink for loopback on the uplink.

The SS controls the power level by setting the concerned time slot's power control parameter ALPHA (α) to 0 and GAMMA_TN (Γ_{CH}) to the desired power level in the Packet Uplink Assignment message (Closed Loop Control, see 3GPP TS 05.08, clause B.2) GPRS_ MS TXPWR_MAX_CCH / MS TXPWR_MAX_CCH is set to the maximum value supported by the Power Class of the Mobile under test. For DCS 1 800 mobile stations the POWER_OFFSET parameter is set to 6 dB.

Specific PICS Statements:

- MS using reduced interslot dynamic range in multislot configurations (TSPC_Addinfo_Red_IntSlotRange_Mult_Conf)
- GMSK_MULTISLOT_POWER_PROFILE 0..3 (TSPC_Type_GMSK_Multislot_Power_Profile_x)

PIXIT statements:

-

13.16.2.4.1.2 Procedure

a) Measurement of normal burst transmitter output power.

The SS takes power measurement samples evenly distributed over the duration of one burst with a sampling rate of at least 2/T, where T is the bit duration. The samples are identified in time with respect to the modulation on the burst. The SS identifies the centre of the useful 147 transmitted bits, i.e. the transition from bit 13 to bit 14 of the midamble, as the timing reference.

The transmitter output power is calculated as the average of the samples over the 147 useful bits. This is also used as the 0 dB reference for the power/time template.

b) Measurement of normal burst power/time relationship

The array of power samples measured in a) are referenced in time to the centre of the useful transmitted bits and in power to the 0 dB reference, both identified in a).

c) Steps a) to b) are repeated on each timeslot within the multislot configuration with the MS commanded to operate on each of the nominal output power levels defined in tables 13.16.2-1, 13.16.2-2 and 13.16.2-3, and in step a) only on one nominal output power higher than supported by the MS.

NOTE: Power control levels 0 and 1 are excluded for bands other than DCS 1800 and PCS 1900 since these power control levels can not be set by GAMMA_TN.

d) The SS commands the MS to the maximum power control level supported by the MS and steps a) to b) are repeated on each timeslot within the multislot configuration for ARFCN in the Low and High ranges.

e) The SS commands the MS to the maximum power control level in the first timeslot allocated within the multislot configuration and to the minimum power control level in the second timeslot allocated. Any further timeslots allocated are to be set to the maximum power control level. Steps a) to b) and corresponding measurements on each timeslot within the multislot configuration are repeated.

f) Measurement of access burst transmitter output power

The SS causes the MS to generate an Access Burst on an ARFCN in the Mid ARFCN range, this could be either by a cell re-selection or a new request for radio resource. In the case of a cell re-selection procedure the Power Level indicated in the PSI3 message is the maximum power control level supported by the MS. In the case of an Access Burst the MS shall use the Power Level indicated in the GPRS_MS_TXPWR_MAX_CCH parameter. If the power class of the MS is DCS 1 800 Class 3 and the Power Level is indicated by the MS_TXPWR_MAX_CCH parameter, the MS shall also use the POWER_OFFSET parameter.

The SS takes power measurement samples evenly distributed over the duration of the access burst as described in a). However, in this case the SS identifies the centre of the useful bits of the burst by identifying the transition from the last bit of the synch sequence. The centre of the burst is then five data bits prior to this point and is used as the timing reference.

The transmitter output power is calculated as the average of the samples over the 87 useful bits of the burst. This is also used as the 0 dB reference for the power/time template.

g) Measurement of access burst power/time relationship

The array of power samples measured in f) is referenced in time to the centre of the useful transmitted bits and in power to the 0 dB reference, both identified in f).

h) Depending on the method used in step f) to cause the MS to send an Access Burst, the SS sends either a PACKET CELL CHANGE ORDER along with power control level set to 10 in PSI3 parameter GPRS_MS_TXPWR_MAX_CCH or it changes the (Packet) System Information elements (GPRS_)MS_TXPWR_MAX_CCH and for DCS 1 800 the POWER_OFFSET on the serving cell PBCCH/BCCH in order to limit the MS transmit power on the Access Burst to power control level 10 (+23 dBm for bands other than DCS 1800 and PCS 1900 or +10 dBm for DCS 1 800 and PCS 1 900) and then steps f) to g) are repeated.

i) Steps a) to h) are repeated under extreme test conditions (annex 1, TC2.2) except that the repeats at step c) are only performed for power control level 10 and the minimum nominal output power level supported by the MS.

13.16.2.4.2 Method of test for equipment with an integral antenna

NOTE: If the MS is equipped with a permanent connector, such that the antenna can be disconnected and the SS be connected directly, then the method of subclause 13.16.2.4.1 will be applied.

The tests in this subclause are performed on an unmodified test sample.

13.16.2.4.2.1 Initial conditions

The MS is placed in the anechoic shielded chamber (annex 1, GC5) or on the outdoor test site, on an isolated support, in the position for normal use, at a distance of at least 3 metres from a test antenna, connected to the SS.

NOTE: The test method described has been written for measurement in an anechoic shielded chamber. If an outdoor test site is used then, in addition, it is necessary to raise/lower the test antenna through the specified height range to maximize the received power levels from both the test sample and the substitution antenna.

The Initial Conditions for the test are defined in subclause 13.16.2.4.1.1.

13.16.2.4.2.2 Procedure

a) With the initial conditions set according to subclause 13.16.2.4.2.1 the test procedure in subclause 13.16.2.4.1.2 is followed up to and including step h), except that in step a), when measurements are done at maximum power for ARFCN in the Low, Mid and High range, the measurement is made eight times with the MS rotated by n*45 degrees for all values of n in the range 0 to 7.

   The measurements taken are received transmitter output power measurements rather than transmitter output power measurements, the output power measurement values can be derived as follows.

b) Assessment of test site loss for scaling of received output power measurements.

   The MS is replaced by a half-wave dipole, resonating at the centre frequency of the transmit band, connected to an RF generator.

   The frequency of the RF signal generator is set to the frequency of the ARFCN used for the 24 measurements in step a), the output power is adjusted to reproduce the received transmitter output power averages recorded in step a).

   For each indication the power, delivered by the generator (in Watts) to the half-wave dipole, is recorded. These values are recorded in the form Pnc, where n = MS rotation and c = channel number.

   For each channel number used compute:

$$\text{Pac(Watts into dipole)} = \frac{1}{8} * \sum_{n=0}^{n=7} \text{Pnc}$$

   from which: Pac (Tx dBm) = $10\log_{10}$(Pac) + 30 + 2,15

   The difference, for each of the three channels, between the actual transmitter output power averaged over the 8 measurement orientations and the received transmitter output power at orientation n = 0 is used to scale the received measurement results to actual transmitter output powers for all measured power control levels and ARFCN, which can then be checked against the requirements.

c) Temporary antenna connector calibration factors (transmit)

A modified test sample equipped with a temporary antenna connector is placed in a climatic test chamber and is linked to the SS by means of the temporary antenna connector.

Under normal test conditions, the power measurement and calculation parts of steps a) to j) of 13.16.2.4.1.2 are repeated except that the repeats at step d) are only performed for power control level 10 and the minimum nominal output power level supported by the MS.

NOTE 1: The values noted here are related to the output transmitter carrier power levels under normal test conditions, which are known after step b). Therefore frequency dependent calibration factors that account for the effects of the temporary antenna connector can be determined.

d) Measurements at extreme test conditions.

NOTE 2: Basically the procedure for extreme conditions is:

- the power/time template is tested in the "normal" way;
- the radiated power is measured by measuring the difference with respect to the radiated power under normal test conditions.

Under extreme test conditions steps a) to h) of subclause 13.16.2.4.1.2 are repeated except that the repeats at step d) are only performed for power control level 10 and the minimum nominal output power level supported by the MS.

The transmitter output power under extreme test conditions is calculated for each burst type, power control level and for every frequency used by adding the frequency dependent calibration factor, determined in c), to the values obtained at extreme conditions in this step.

13.16.2.5 Test requirements

a) The transmitter output power, under every combination of normal and extreme test conditions, for normal bursts and access bursts, at each frequency and for each power control level applicable to the MS power class, shall be at the relevant level shown in table 13.16.2-1, table 13.16.2-2 or table 13.16.2-3 within the tolerances also shown in table 13.16.2-1, table 13.16.2-2 or table 13.16.2-3.

Bands other than DCS 1800 and PCS 1900 - begin

Table 13.16.2-1: Bands other than DCS 1800 and PCS 1900 transmitter output power for different power classes

Power class				Power control level (note 4)	GAMMA_TN (Γ_{CH})	Transmitter output power (note 2,3)	Tolerances	
2	3	4	5			dBm	normal	extreme
·				2	0	39	±2 dB	±2,5 dB
·	·			3	1	37	±3 dB (note 1)	±4 dB (note 1)
·	·			4	2	35	±3 dB	±4 dB
·	·	·		5	3	33	±3 dB (note 1)	±4 dB (note 1)
·	·	·		6	4	31	±3 dB	±4 dB
·	·	·	·	7	5	29	±3 dB (note 1)	±4 dB (note 1)
·	·	·	·	8	6	27	±3 dB	±4 dB
·	·	·	·	9	7	25	±3 dB	±4 dB
·	·	·	·	10	8	23	±3 dB	±4 dB
·	·	·	·	11	9	21	±3 dB	±4 dB
·	·	·	·	12	10	19	±3 dB	±4 dB
·	·	·	·	13	11	17	±3 dB	±4 dB
·	·	·	·	14	12	15	±3 dB	±4 dB
·	·	·	·	15	13	13	±3 dB	±4 dB
·	·	·	·	16	14	11	±5 dB	±6 dB
·	·	·	·	17	15	9	±5 dB	±6 dB
·	·	·	·	18	16	7	±5 dB	±6 dB
·	·	·	·	19	17	5	±5 dB	±6 dB

NOTE1: When the power control level corresponds to the power class of the MS, then the tolerances shall be 2,0 dB under normal test conditions and 2,5 dB under extreme test conditions.

NOTE 2: For R99 and Rel-4, the maximum output power in a multislot configuration must be lower within the limits defined in table 13.16.2-1a. From Rel-5 onwards, the maximum output power in a multislot configuration may be lower within the limits defined in table 13.16.2-1b.

NOTE 3: For a MS using reduced interslot dynamic range in multislot configurations, the MS may restrict the interslot output power control range to a 10 dB window, on a TDMA frame basis. On those timeslots where the ordered power level is more than 10 dB lower than the applied power level of the highest power timeslot, the MS shall transmit at a lowest possible power level within 10 dB range from the highest applied power level, if not transmitting at the actual ordered power level.

NOTE 4: There is no requirement to test power control levels 20-31.

Table 13.16.2-1a: R99 and Rel-4: Bands other than DCS 1800 and PCS 1900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

Table 13.16.2-1b: From Rel-5 onwards: Bands other than DCS 1800 and PCS 1900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	3,0
3	4,8
4	6,0
5	7,0
6	7,8
7	8,5
8	9,0

From R5 onwards, the actual supported maximum output power shall be in the range indicated by the parameter GMSK_MULTISLOT_POWER_PROFILE for n allocated uplink timeslots:

$a \leq$ MS maximum output power $\leq$ min(MAX_PWR, a + 2dB)

Where:

a = min (MAX_PWR, MAX_PWR + GMSK_MULTISLOT_POWER_PROFILE – 10log(n));

MAX_PWR equals to the MS maximum output power according to the relevant power class and

GMSK_MULTISLOT_POWER_PROFILE 0 = 0 dB;
GMSK_MULTISLOT_POWER_PROFILE 1 = 2 dB;
GMSK_MULTISLOT_POWER_PROFILE 2 = 4 dB;
GMSK_MULTISLOT_POWER_PROFILE 3 = 6 dB.

Bands other than DCS 1800 and PCS 1900 - end

DCS 1 800 only - begin

Table 13.16.2-2: DCS 1 800 transmitter output power for different power classes

Power class			**Power control level (note 4)**	**GAMMA_TN (Γ_{CH}**	**Transmitter output power** (note 2,3)	**Tolerances**	
1	**2**	**3**			**dBm**	**normal**	**extreme**
		·	29	0	36	±2,0 dB	±2,5 dB
		·	30	1	34	±3,0 dB	±4,0 dB
		·	31	2	32	±3,0 dB	±4,0 dB
·		·	0	3	30	±3,0 dB (note_1)	±4 dB (note_1)
·		·	1	4	28	±3 dB	±4 dB
·		·	2	5	26	±3 dB	±4 dB
·	·	·	3	6	24	±3 dB (note_1)	±4 dB (note_1)
·	·	·	4	7	22	±3 dB	±4 dB
·	·	·	5	8	20	±3 dB	±4 dB
·	·	·	6	9	18	±3 dB	±4 dB
·	·	·	7	10	16	±3 dB	±4 dB
·	·	·	8	11	14	±3 dB	±4 dB
·	·	·	9	12	12	±4 dB	±5 dB
·	·	·	10	13	10	±4 dB	±5 dB
·	·	·	11	14	8	±4 dB	±5 dB
·	·	·	12	15	6	±4 dB	±5 dB
·	·	·	13	16	4	±4 dB	±5 dB
·	·	·	14	17	2	±5 dB	±6 dB
·	·	·	15	18	0	±5 dB	±6 dB

NOTE1: When the power control level corresponds to the power class of the MS, then the tolerances shall be 2,0 dB under normal test conditions and 2,5 dB under extreme test conditions.

NOTE 2: For R99 and Rel-4, the maximum output power in a multislot configuration must be lower within the limits defined in table 13.16.2-2a. From Rel-5 onwards, the maximum output power in a multislot configuration may be lower within the limits defined in table 13.16.2-2b.

NOTE 3: For a MS using reduced interslot dynamic range in multislot configurations, the MS may restrict the interslot output power control range to a 10 dB window, on a TDMA frame basis. On those timeslots where the ordered power level is more than 10 dB lower than the applied power level of the highest power timeslot, the MS shall transmit at a lowest possible power level within 10 dB range from the highest applied power level, if not transmitting at the actual ordered power level.

NOTE 4: There is no requirement to test power control levels 16-28.

Table 13.16.2-2a: R99 and Rel-4: DCS 1 800 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

Table 13.16.2-2b: From Rel-5 onwards: DCS 1 800 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	3,0
3	4,8
4	6,0
5	7,0
6	7,8
7	8,5
8	9,0

From R5 onwards, the actual supported maximum output power shall be in the range indicated by the parameter GMSK_MULTISLOT_POWER_PROFILE for n allocated uplink timeslots:

a ≤ MS maximum output power ≤ min(MAX_PWR, a + 3dB)

Where:

a = min (MAX_PWR, MAX_PWR + GMSK_MULTISLOT_POWER_PROFILE – 10log(n));

MAX_PWR equals to the MS maximum output power according to the relevant power class and

GMSK_MULTISLOT_POWER_PROFILE 0 = 0 dB;
GMSK_MULTISLOT_POWER_PROFILE 1 = 2 dB;
GMSK_MULTISLOT_POWER_PROFILE 2 = 4 dB;
GMSK_MULTISLOT_POWER_PROFILE 3 = 6 dB.

DCS 1 800 only - end

PCS 1 900 only – begin

Table 13.16.2-3: PCS 1 900 transmitter output power for different power classes

Power class			Power control level (note 4)	GAMMA_TN (Γ_{CH})	Transmitter output power (note 2,3)	Tolerances	
1	2	3			dBm	Normal	Extreme
		·	30	1	33	±2,0 dB	±2,5 dB
		·	31	2	32	±2,0 dB	±2,5 dB
·		·	0	3	30	±3,0 dB (note 1)	±4 dB (note 1)
·		·	1	4	28	±3 dB	±4 dB
·		·	2	5	26	±3 dB	±4 dB
·	·	·	3	6	24	±3 dB (note 1)	±4 dB (note 1)
·	·	·	4	7	22	±3 dB	±4 dB
·	·	·	5	8	20	±3 dB	±4 dB
·	·	·	6	9	18	±3 dB	±4 dB
·	·	·	7	10	16	±3 dB	±4 dB
·	·	·	8	11	14	±3 dB	±4 dB
·	·	·	9	12	12	±4 dB	±5 dB
·	·	·	10	13	10	±4 dB	±5 dB
·	·	·	11	14	8	±4 dB	±5 dB
·	·	·	12	15	6	±4 dB	±5 dB
·	·	·	13	16	4	±4 dB	±5 dB
·	·	·	14	17	2	±5 dB	±6 dB
·	·	·	15	18	0	±5 dB	±6 dB

NOTE 1: When the power control level corresponds to the power class of the MS, then the tolerances shall be 2,0 dB under normal test conditions and 2,5 dB under extreme test conditions.

NOTE 2: For R99 and Rel-4, the maximum output power in a multislot configuration must be lower within the limits defined in table 13.16.2-3a. From Rel-5 onwards, the maximum output power in a multislot configuration may be lower within the limits defined in table 13.16.2-3b.

NOTE 3: For a MS using reduced interslot dynamic range in multislot configurations, the MS may restrict the interslot output power control range to a 10 dB window, on a TDMA frame basis. On those timeslots where the ordered power level is more than 10 dB lower than the applied power level of the highest power timeslot, the MS shall transmit at a lowest possible power level within 10 dB range from the highest applied power level, if not transmitting at the actual ordered power level.

NOTE 4: There is no requirement to test power control levels 16-29.

Table 13.16.2-3a: R99 and Rel-4: PCS 1 900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

Table 13.16.2-3b: From Rel-5 onwards: PCS 1 900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	3,0
3	4,8
4	6,0
5	7,0
6	7,8
7	8,5
8	9,0

From R5 onwards, the actual supported maximum output power shall be in the range indicated by the parameter GMSK_MULTISLOT_POWER_PROFILE for n allocated uplink timeslots:

a ≤ MS maximum output power ≤ min(MAX_PWR, a + 3dB)

Where:

a = min (MAX_PWR, MAX_PWR + GMSK_MULTISLOT_POWER_PROFILE – 10log(n));

MAX_PWR equals to the MS maximum output power according to the relevant power class and

GMSK_MULTISLOT_POWER_PROFILE 0 = 0 dB;
GMSK_MULTISLOT_POWER_PROFILE 1 = 2 dB;
GMSK_MULTISLOT_POWER_PROFILE 2 = 4 dB;
GMSK_MULTISLOT_POWER_PROFILE 3 = 6 dB.

PCS 1 900 only - end

b) The difference between the transmitter output power at two adjacent power control levels, measured at the same frequency, shall not be less than 0,5 dB and not be more than 3,5 dB. For PCS 1 900 Class 3 the difference between the transmitter output power at power controls level 30 and 31, measured at the same frequency, shall not be less than 0 dB and not be more than 2 dB.

   For R99 and Rel-4 MS, if one or both of the adjacent output power levels are reduced according to the number of timeslots, the difference between the transmitter output power at two adjacent power control levels, measured at the same frequency, shall not be less than -1dB and not be more than 3.5 dB.

   For R5 onwards, if one or both of the adjacent output power levels are reduced according to GMSK_MULTISLOT_POWER_PROFILE X and the number of timeslots, the difference between the transmitter output power at two adjacent power control levels, measured at the same frequency, shall not be less than -1dB and not be more than 3.5 dB.

c) The power/time relationship of the measured samples for normal bursts shall be within the limits of the power time template of figure 13-7-2 (3GPP TS 51.010) at each frequency, under every combination of normal and extreme test conditions and at each power control level measured.

```
 +4 dBc    ¦            +---+_
+1,0 dBc   ¦            ¦    +------------/  /-----------------+
```

```
       0 dBc     ¦           ¦                                            ¦
    -1,0 dBc     ¦           ¦    +-------------/ /--------------+    ¦
     -6 dBc *    ¦      +--+   ¦                                      ¦    +--+
-30 dBc **       ¦ +---+          ¦                                      ¦       +---+
                 ¦ ¦              ¦                                      ¦            ¦
lowest limit     ¦-+              ¦                                      ¦            +
    (see         ¦                ¦<-------- (147 bits) -------->¦
table 13.16.2-4) +-------------------------/ /-----------------------------
                    10   8   10        7056/13=542,8 µs        10   8   10
```

Figure 13.16.2-1: Power / time template for normal bursts

* For bands other than DCS 1800 and PCS 1900 MS:

-4 dBc for power control level 16;

-2 dBc for power control level 17;

-1 dBc for power control levels 18 and 19.

For DCS 1 800 and PCS 1 900 MS:

-4 dBc for power control level 11;

-2 dBc for power control level 12;

-1 dBc for power control levels 13, 14 and 15.

** For bands other than DCS 1800 and PCS 1900 MS:

-30 dBc or -17 dBm, whichever is the higher.

For DCS 1 800 and PCS 1 900MS:

-30 dBc or -20 dBm, whichever is the higher.

Table 13.16.2-4: Lowest measurement limit for power / time template

	lowest limit
Bands other than DCS 1800 and PCS 1900	-59 dBc or -54 dBm whichever is the highest, except for the timeslot preceding the active slot, for which the allowed level is -59 dBc or -36 dBm, whichever is the highest
DCS 1 800 PCS 1 900	-48 dBc or -48 dBm whichever is the highest

d) All the power control levels, for the type and power class of the MS as stated by the manufacturer, shall be implemented in the MS.

e) When the transmitter is commanded to a power control level outside of the capability corresponding to the type and power class of the MS as stated by the manufacturer, then the transmitter output power shall be within the tolerances for the closest power control level corresponding to the type and power class as stated by the manufacturer.

f) The power/time relationship of the measured samples for access bursts shall be within the limits of the power time template of figure 13-7-3 at each frequency, under every combination of normal and extreme test conditions and at each power control level measured.

```
+4 dBc     ¦              +---+
```

```
+1,0 dBc      ¦         ¦    +---------/ /-------------+
  0 dBc       ¦         ¦                              ¦
 -1,0 dBc     ¦         ¦    +---------/ /----------+  ¦
 -6 dBc *     ¦      +--+   ¦                       ¦   +--+
-30 dBc **     ¦ +---+    ¦                       ¦       +---+
              ¦ ¦         ¦                       ¦           ¦
lowest limit   ¦-+          ¦                       ¦           +
(see table 13.16.2-4) ¦       ¦<---- (87 bits) ----->¦
              +--------------------/ /--------------------
              10  8  10    4176/13=321,2 µs    10  8  10
```

Figure 13.16.2-2: Power / time template for access burst

* For bands other than DCS 1800 and PCS 1900 MS:

-4 dBc for power control level 16;

-2 dBc for power control level 17;

-1 dBc for power control levels 18 and 19.

For DCS 1 800 and PCS 1 900 MS:

-4 dBc for power control level 11;

-2 dBc for power control level 12;

-1 dBc for power control levels 13, 14 and 15.

** For bands other than DCS 1800 and PCS 1900 MS:

-30 dBc or -17 dBm, whichever is the higher.

For DCS 1 800 and PCS 1 900 MS:

-30 dBc or -20 dBm, whichever is the higher.

13.16.3 Output RF spectrum in GPRS multislot configuration

13.16.3.1 Definition

The output RF spectrum is the relationship between the frequency offset from the carrier and the power, measured in a specified bandwidth and time, produced by the MS due to the effects of modulation and power ramping.

13.16.3.2 Conformance requirement

1. The level of the output RF spectrum due to modulation shall be no more than that given in 3GPP TS 05.05, subclause 4.2.1, table a) for GSM 400, GSM 700, GSM 850 and GSM 900, table b) for DCS 1 800 or table c) for PCS 1 900, with the following lowest measurement limits:

   - -36 dBm below 600 kHz offset from the carrier;

   - -51 dBm for GSM 400, GSM 700, GSM 850 and GSM 900 or -56 dBm for DCS 1 800 and PCS 1 900 from 600 kHz out to less than 1 800 kHz offset from the carrier;

   - -46 dBm for GSM 400, GSM 700, GSM 850 and GSM 900 or -51 dBm for DCS 1 800 and PCS 1 900 at and beyond 1 800 kHz offset from the carrier;

but with the following exceptions at up to -36 dBm:

- up to three bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz in the combined range 600 kHz to 6 000 kHz above and below the carrier;
- up to 12 bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz at more than 6 000 kHz offset from the carrier.

1.1 Under normal conditions; 3GPP TS 05.05, subclause 4.2.1.

1.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.2.1; 3GPP TS 05.05, annex D subclauses D.2.1 and D.2.2.

2. The level of the output RF spectrum due to switching transients shall be no more than given in 3GPP TS 05.05, subclause 4.2.2, table "a) Mobile Station".

   2.1 Under normal conditions; 3GPP TS 05.05, subclause 4.2.2.

   2.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.2.2; 3GPP TS 05.05 annex D subclause D.2.1 and D.2.2.

3. When allocated a channel, the power emitted by a GSM 400, GSM 900 and DCS 1 800 MS, in the band 935 MHz to 960 MHz shall be no more than -79 dBm, in the band 925 MHz to 935 MHz shall be no more than -67 dBm and in the band 1 805 MHz to 1 880 MHz shall be no more than -71 dBm except in five measurements in each of the bands 925 MHz to 960 MHz and 1 805 MHz to 1 880 MHz where exceptions at up to -36 dBm are permitted. For GSM 400 MS, in addition, the power emitted by MS, in the bands of 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz shall be no more than -67 dBm except in three measurements in each of the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz where exceptions at up to -36 dBm are permitted. For GSM 700 and GSM 850, the power emitted by MS, in the band of 728 MHz to 736 MHz shall be no more than -73 dBm, in the band of 736 MHz to 746 MHz shall be no more than -79 dBm, in the band of 747 MHz to 757 MHz shall be no more than -79 dBm, in the band of 757 MHz to 763 MHz shall be no more than –73 dBm, in the band 869 MHz to 894 MHz shall be no more than -79 dBm, in the band 1 930 MHz to 1 990 MHz shall be no more than -71 dBm except in five measurements in each of the bands 728 MHz to 746 MHz, 747 MHz to 763 MHz, 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where exceptions at up to -36 dBm are permitted. For PCS 1 900 MS, the power emitted by MS, in the band 869 MHz to 894 MHz shall be no more than -79 dBm, in the band 1 930 MHz to 1 990 MHz shall be no more than -71 dBm except in five measurements in each of the bands 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where exceptions at up to -36 dBm are permitted. Under normal conditions; 3GPP TS 45.005, subclause 4.3.3.

13.16.3.3 Test purpose

1. To verify that the output RF spectrum due to modulation does not exceed conformance requirement 1 in the GPRS multislot configurations.

   1.1 Under normal conditions.

   1.2 Under extreme conditions.

2. To verify that the output RF spectrum due to switching transients does not exceed conformance requirement 2 in the GPRS multislot configurations when a reasonable margin is allowed for the effect of spectrum due to modulation.

   2.1 Under normal conditions.

   2.2 Under extreme conditions.

3. To verify that the MS spurious emissions in the MS receive band do not exceed conformance requirement 3 in the GPRS multislot configurations.

13.16.3.4 Method of test

13.16.3.4.1 Initial conditions

The test shall be run under the default GPRS conditions defined in clause 40, with power control parameter ALPHA (α) set to 0.

The MS shall be operated with its highest number of uplink slots.

The Test Mode defined in 3GPP TS 04.14 (subclause 5.4) will be utilised. If the MS is capable of both:

Mode (a) transmitting pseudo-random data sequence in RLC data blocks;

Mode (b) transmitting looped-back RLC data blocks;

then Mode (a) will be used.

If Mode (b) is used then the SS sends the pseudo-random data sequence specified for Mode (a) on the downlink for loopback on the uplink. The SS shall use a level of 23 dBµVemf( ).

The SS commands the MS to hopping mode. The hopping pattern includes only three channels, namely one with an ARFCN in the Low ARFCN range, a second one with an ARFCN in the Mid ARFCN range and the third one with an ARFCN in the High ARFCN range.

NOTE 1: Although the measurement is made whilst the MS is in hopping mode, each measurement is on one single channel.

NOTE 2: This test is specified in hopping mode as a simple means of making the MS change channel, it would be sufficient to test in non hopping mode and to cell re-select the MS between the three channels tested at the appropriate time.

NOTE 3: Mid ARFCN range for GSM 900 will use the range 63-65 ARFCN

13.16.3.4.2 Procedure

NOTE: When averaging is in use during frequency hopping mode, the averaging only includes bursts transmitted when the hopping carrier corresponds to the nominal carrier of the measurement.

a) In steps b) to h) the FT is equal to the hop pattern ARFCN in the Mid ARFCN range.

b) The other settings of the spectrum analyser are set as follows:

- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 30 kHz;
- Video averaging: may be used, depending on the implementation of the test.

The video signal of the spectrum analyser is "gated" such that the spectrum generated by at least 40 of the bits 87 to 132 of the burst in one of the active time slots is the only spectrum measured. This gating may be analogue or numerical, dependent upon the design of the spectrum analyser. Only measurements during transmitted bursts on the nominal carrier of the measurement are included. The spectrum analyser averages over the gated period and over 200 or 50 such bursts, using numerical and/or video averaging.

The MS is commanded to its maximum power control level in every transmitted time slot.

c) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured over 50 bursts at all multiples of 30 kHz offset from FT to < 1 800 kHz.

d) The resolution and video bandwidth on the spectrum analyser are adjusted to 100 kHz and the measurements are made at the following frequencies:

on every ARFCN from 1 800 kHz offset from the carrier to the edge of the relevant transmit band for each measurement over 50 bursts.

at 200 kHz intervals over the 2 MHz either side of the relevant transmit band for each measurement over 50 bursts.

For GSM 400 and DCS 1 800:

at 200 kHz intervals over the band 925 MHz to 960 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 1 805 MHz to 1 880 MHz for each measurement over 50 bursts.

For GSM 900

at 200 kHz intervals over the band 925 MHz to 960MHz for each measurement over 50 bursts;

at 200 kHz intervals over the band 1805 MHz to 1880 MHz for each measurement over 50 bursts.

In addition for GSM 400 MS:

at 200 kHz intervals over the band 460,4 MHz to 467,6 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 488,8 MHz to 496 MHz for each measurement over 50 bursts.

For GSM 700 and GSM 850:

at 200 kHz intervals over the band 728MHz to 746 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 747MHz to 763 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 869 MHz to 894 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 1 930 MHz to 1 990 MHz for each measurement over 50 bursts.

For PCS 1 900:

at 200 kHz intervals over the band 869 MHz to 894 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 1 930 MHz to 1 990 MHz for each measurement over 50 bursts.

e) The MS is commanded to its minimum power control level. The spectrum analyser is set again as in b).

f) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured over 200 bursts at the following frequencies:

FT;

FT + 100 kHz	FT - 100 kHz;
FT + 200 kHz	FT - 200 kHz;
FT + 250 kHz	FT - 250 kHz;
FT + 200 kHz * N	FT - 200 kHz * N;

where N = 2, 3, 4, 5, 6, 7, and 8;

and FT = RF channel nominal centre frequency.

g) Steps a) to f) is repeated except that in step a) the spectrum analyzer is gated so that the burst of the next active time slot is measured.

h) The spectrum analyser settings are adjusted to:

- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 100 kHz;
- Peak hold.

The spectrum analyser gating of the signal is switched off.

The MS is commanded to its maximum power control level in every transmitted time slot.

i) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured at the following frequencies:

FT + 400 kHz	FT - 400 kHz;
FT + 600 kHz	FT - 600 kHz;
FT + 1,2 MHz	FT - 1,2 MHz;
FT + 1,8 MHz	FT - 1,8 MHz;

where FT = RF channel nominal centre frequency.

The duration of each measurement (at each frequency) will be such as to cover at least 10 burst transmissions at FT.

j) Step i) is repeated for power control levels 7 and 11.

k) Steps b), f), h) and i) are repeated with FT equal to the hop pattern ARFCN in the Low ARFCN range except that in step h) the MS is commanded to power control level 11 rather than maximum power.

l) Steps b), f), h) and i) are repeated with FT equal to the hop pattern ARFCN in the High ARFCN range except that in step h) the MS is commanded to power control level 11 rather than maximum power.

m) Steps a) b) f) h), and i) are repeated under extreme test conditions (annex 1, TC2.2). except that at step h) the MS is commanded to power control level 11.

13.16.3.5 Test requirements

For absolute measurements, performed on a temporary antenna connector, in the frequency band 450,4 MHz to 457,6 MHz, 478,8 MHz to 486 MHz, 777 MHz to 792 MHz, 824 MHz to 849 MHz, 880 MHz to 915 MHz, 1 710 MHz to 1 785 MHz, or 1 850 MHz to 1 910 MHz, the temporary antenna connector coupling factor, determined according to subclause 13.3.4.2.2 and annex 1 GC7, for the nearest relevant frequency, will be used.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 925 MHz to 960 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 900 MS. For a GSM 400, GSM 700, GSM 850, DCS 1 800 or PCS 1 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 1 805 MHz to 1 880 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for DCS 1 800 MS. For a GSM 400, GSM 700, GSM 850, GSM 900 or PCS 1 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 460,4 MHz to 467,6 MHz or 488.8 to 496 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 400 MS. For a GSM 700, GSM 850, GSM 900, DCS 1800 or PCS 1 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 728 MHz to 763 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 700 MS. For a GSM 400, GSM 850, GSM 900 or DCS 1800 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 869 MHz to 894 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 850 MS. For a GSM 400, GSM 700, GSM 900 or DCS 1800 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 1 930 MHz to 1 990 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for PCS 1 900 MS. For GSM 400, GSM 900 or DCS 1 800 MS 0 dB will be assumed.

The figures in the tables below, at the listed frequencies from the carrier (kHz), are the maximum level (dB) relative to a measurement in 30 kHz bandwidth on the carrier (reference 3GPP TS 05.05 subclause 4.2.1).

a) For the modulation sidebands out to less than 1 800 kHz offset from the carrier frequency (FT) measured in step c), f), i), k), l) and m) the measured power level in dB relative to the power level measured at FT, for all types of MS, shall not exceed the limits derived from the values shown in table 13.16.3-1 for GSM 400, GSM 700, GSM 850 and GSM 900, table 13.16.3-2 for DCS 1 800 or table 13.16.3-3 for PCS 1 900 according to the actual transmit power and frequency offset from FT. However any failures in the combined range 600 kHz to less than 1 800 kHz above and below the carrier may be counted towards the exceptions allowed in test requirements c) below.

Table 13.16.3-1: GSM 400, GSM 700, GSM 850 and GSM 900 Spectrum due to modulation out to less than 1 800 kHz offset

	power levels in dB relative to the measurement at FT				
Power level	**Frequency offset (kHz)**				
(dBm)	**0-100**	**200**	**250**	**400**	**600 to < 1 800**
39	+0,5	-30	-33	-60	-66
37	+0,5	-30	-33	-60	-64
35	+0,5	-30	-33	-60	-62
<= 33	+0,5	-30	-33	-60	-60
The values above are subject to the minimum absolute levels (dBm) below.					
	-36	-36	-36	-36	-51

Table 13.16.3-2: DCS 1 800 Spectrum due to modulation out to less than 1 800 kHz offset

	power levels in dB relative to the measurement at FT				
Power level	**Frequency offset (kHz)**				
(dBm)	**0-100**	**200**	**250**	**400**	**600 to < 1 800**
<= 36	+0,5	-30	-33	-60	-60
The values above are subject to the minimum absolute levels (dBm) below.					
	-36	-36	-36	-36	-56

Table 13.16.3-3: PCS 1 900 Spectrum due to modulation out to less than 1 800 kHz offset

	power levels in dB relative to the measurement at FT					
Power level	**Frequency offset (kHz)**					
(dBm)	**0-100**	**200**	**250**	**400**	**600 to < 1 200**	**1 200 to < 1 800**
<= 33	+0,5	-30	-33	-60	-60	-60
The values above are subject to the minimum absolute levels (dBm) below.						
	-36	-36	-36	-36	-56	-56

NOTE 1: For frequency offsets between 100 kHz and 600 kHz the requirement is derived by a linear interpolation between the points identified in the table with linear frequency and power in dB relative.

b) For the modulation sidebands from 1 800 kHz offset from the carrier frequency (FT) and out to 2 MHz beyond the edge of the relevant transmit band, measured in step d), the measured power level in dB relative to the power level measured at FT, shall not exceed the values shown in table 13.16.3-4 according to the actual transmit power, frequency offset from FT and system on which the MS is designed to operate. However any failures in the combined range 1 800 kHz to 6 MHz above and below the carrier may be counted towards the exceptions allowed in test requirements c) below, and any other failures may be counted towards the exceptions allowed in test requirements d) below.

Table 13.16.3-4: Spectrum due to modulation from 1 800 kHz offset to the edge of the transmit band (wideband noise)

power levels in dB relative to the measurement at FT									
GSM 400, GSM 700, GSM 850 and GSM 900				DCS 1 800			PCS 1 900		
Power	Frequency offset			Power	Frequency offset		Power	Frequency offset	
Level	kHz			level	KHz		level	KHz	
(dBm)	1 800 to	3 000 to	>= 6 000	(dBm)	1 800 to	>= 6 000	(dBm)	1 800 to	>= 6 000
	< 3 000	< 6 000			< 6 000			< 6 000	
39	-69	-71	-77	36	-71	-79	33	-68	-76
37	-67	-69	-75	34	-69	-77	32	-67	-75
35	-65	-67	-73	32	-67	-75	30	-65	-73
<= 33	-63	-65	-71	30	-65	-73	28	-63	-71
				28	-63	-71	26	-61	-69
				26	-61	-69	<= 24	-59	-67
				<= 24	-59	-67			
The values above are subject to the minimum absolute levels (dBm) below.									
	-46	-46	-46		-51	-51		-51	-51

c) Any failures (from a) and b) above) in the combined range 600 kHz to 6 MHz above and below the carrier should be re-checked for allowed spurious emissions. For each of the three ARFCN used, spurious emissions are allowed in up to three 200 kHz bands centred on an integer multiple of 200 kHz so long as no spurious emission exceeds -36 dBm. Any spurious emissions measured in a 30 kHz bandwidth which spans two 200 kHz bands can be counted towards either 200 kHz band, whichever minimizes the number of 200 kHz bands containing spurious exceptions.

d) Any failures (from b) above) beyond 6 MHz offset from the carrier should be re-checked for allowed spurious emissions. For each of the three ARFCN used, up to twelve spurious emissions are allowed so long as no spurious emission exceeds -36 dBm.

e) For GSM 400, GSM 900 and DCS 1 800 MS the MS spurious emissions in the bands 925 MHz to 935 MHz, 935 MHz to 960 MHz and 1 805 MHz to 1 880 MHz, measured in step d), shall not exceed the values shown in table 13.16.3-5 except in up to five measurements in the band 925 MHz to 960 MHz and five measurements in the band 1 805 MHz to 1 880 MHz where a level up to -36 dBm is permitted. For GSM 400 MS, in addition, the MS spurious emissions in the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz shall not exceed the value of -67 dBm, except in up to three measurements in each of the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz where a level up to -36 dBm is permitted. For GSM 700 and GSM 850 the spurious emissions in the bands 728 MHz to 746 MHz 747 MHz to 763 MHz, 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz shall not exceed the values shown in table 13.16.3-4 except in up to five measurements in each of the bands 728 MHz to 746 MHz, 747 MHz to 763 MHz, 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where a level up to -36 dBm is permitted. For PCS 1 900 MS the spurious emissions in the bands 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz shall not exceed the values shown in table 13.16.3-5 except in up to five measurements in each of the bands 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where a level up to -36 dBm is permitted.

Table 13.16.3-5: Spurious emissions in the MS receive bands

Band (MHz)	Spurious emissions level (dBm)	
	GSM 400, GSM 900 and DCS 1 800	GSM 700 GSM 850 PCS 1 900
925 to 935	-67	
935 to 960	-79	
1805 to 1880	-71	
728 to 736		-73
736 to 746		-79
747 to 757		-79
757 to763		-73
869 to 894		-79
1930 to 1990		-71

f) For the power ramp sidebands of steps h), i) and k) the power levels must not exceed the values shown in table 13.16.3-6 for GSM 400, GSM 700, GSM 850 and GSM 900, table 13.16.3-7 for DCS 1 800 or table 13.16.3-8 for PCS 1 900.

Table 13.16.3-6: GSM Spectrum due to switching transients

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1200 kHz	1 800 kHz
39 dBm	-13 dBm	-21 dBm	-21 dBm	-24 dBm
37 dBm	-15 dBm	-21 dBm	-21 dBm	-24 dBm
35 dBm	-17 dBm	-21 dBm	-21 dBm	-24 dBm
33 dBm	-19 dBm	-21 dBm	-21 dBm	-24 dBm
31 dBm	-21 dBm	-23 dBm	-23 dBm	-26 dBm
29 dBm	-23 dBm	-25 dBm	-25 dBm	-28 dBm
27 dBm	-23 dBm	-26 dBm	-27 dBm	-30 dBm
25 dBm	-23 dBm	-26 dBm	-29 dBm	-32 dBm
23 dBm	-23 dBm	-26 dBm	-31 dBm	-34 dBm
<= +21 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

Table 13.16.3-7: DCS 1 800 Spectrum due to switching transients

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1 200 kHz	1 800 kHz
36 dBm	-16 dBm	-21 dBm	-21 dBm	-24 dBm
34 dBm	-18 dBm	-21 dBm	-21 dBm	-24 dBm
32 dBm	-20 dBm	-22 dBm	-22 dBm	-25 dBm
30 dBm	-22 dBm	-24 dBm	-24 dBm	-27 dBm
28 dBm	-23 dBm	-25 dBm	-26 dBm	-29 dBm
26 dBm	-23 dBm	-26 dBm	-28 dBm	-31 dBm
24 dBm	-23 dBm	-26 dBm	-30 dBm	-33 dBm
22 dBm	-23 dBm	-26 dBm	-31 dBm	-35 dBm
<= +20 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

Table 13.16.3-8: PCS 1 900 Spectrum due to switching transients

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1 200 kHz	1 800 kHz
33 dBm	-19 dBm	-22 dBm	-22 dBm	-25 dBm
32 dBm	-20 dBm	-22 dBm	-22 dBm	-25 dBm
30 dBm	-22 dBm	-24 dBm	-24 dBm	-27 dBm
28 dBm	-23 dBm	-25 dBm	-26 dBm	-29 dBm
26 dBm	-23 dBm	-26 dBm	-28 dBm	-31 dBm
24 dBm	-23 dBm	-26 dBm	-30 dBm	-33 dBm
22 dBm	-23 dBm	-26 dBm	-31 dBm	-35 dBm
<= +20 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

NOTE 2: These figures are different from the requirements in 3GPP TS 05.05 because at higher power levels it is the modulation spectrum which is being measured using a peak hold measurement. This allowance is given in the table.

NOTE 3: The figures for table 13.16.3-6, table 13.16.3-7 and table 13.16.3-8 assume that, using the peak hold measurement, the lowest level measurable is 8 dB above the level of the modulation specification using the 30 kHz bandwidth gated average technique for 400 kHz offset from the carrier. At 600 and 1 200 kHz offset the level is 6 dB above and at 1 800 kHz offset the level is 3 dB above. The figures for 1 800 kHz have assumed the 30 kHz bandwidth spectrum due to modulation specification at < 1 800 kHz.

13.17 EGPRS transmitter tests

13.17.1 Frequency error and Modulation accuracy in EGPRS Configuration

13.17.1.1 Definition

The frequency error is the difference in frequency, after adjustment for the effect of the modulation accuracy between the RF transmission from the MS and either:

- the RF transmission from the BS; or
- the nominal frequency for the ARFCN used.

Modulation Accuracy.

For GMSK, the modulation accuracy of the transmitted signal is described as the phase accuracy (phase error) of the GMSK modulated signal. The phase error for GSMK modulation is the difference in phase, after adjustment for the effect of the frequency error, between the RF transmission from the MS and the theoretical transmission according to the intended modulation.

Since the conformance requirement, test procedure and test requirement for GMSK modulation accuracy (RMS Phase error and maximum peak deviation) are defined in subclause 13.16.1 for GPRS MS, being thereby defined also for all EGPRS MS in that section, only 8PSK modulation accuracy conformance requirement, test procedure and test requirement are defined in this subclause.

For 8-PSK, the error vector between the vector representing the transmitted signal and the vector representing the error-free modulated signal defines modulation accuracy. The magnitude of the error vector is called Error Vector Magnitude (EVM). Origin suppression is defined to be the ratio of the carrier leakage to the modulated signal.

13.17.1.2 Conformance requirement

1. The carrier frequency under 8PSK modulation shall be accurate to within 0,2 ppm for GSM 400 and 0,1 ppm for all other bands compared to signals received from the BS.

   1.1 Under normal conditions; 3GPP TS 05.10, subclause 6.1.

   1.2 Under extreme conditions; 3GPP TS 05.10, subclause 6.1; 3GPP TS 05.05, subclause 4.4; 3GPP TS 05.05, annex D subclauses D.2.1 and D.2.2.

2. The RMS EVM over the useful part of any burst of the 8-PSK modulated signal shall not exceed.

   2.1 9,0% Under normal conditions; 3GPP TS 05.05, subclause 4.6.2.1

   2.2 10,0% Under extreme conditions; 3GPP TS 05.05, subclause 4.6; 3GPP TS 05.05, annex D subclauses D.2.1 and D.2.2.

3. The peak EVM values averaged over at least 200 bursts of the 8PSK modulated signal shall be ≤ 30 %.

   3.1 Under normal conditions; 3GPP TS 05.05, subclause 4.6.2.3.

   3.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.6.2.3; 3GPP TS 05.05, annex D subclauses D.2.1 and D.2.2.

4. The 95:th-percentile value of any burst of the 8-PSK modulated signal shall be ≤ 15 %.

   4.1 Under normal conditions; 3GPP TS 05.05, subclause 4.6.2.4.

   4.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.6.2.4; 3GPP TS 05.05, annex D subclauses D.2.1 and D.2.2.

5. The Origin Offset Suppression for any 8PSK modulated signal shall exceed 30 dB.

   5.1 Under normal conditions; 3GPP TS 05.05, subclause 4.6.2.2.

   5.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.6.2.2; 3GPP TS 05.05, annex D subclauses D.2.1 and D.2.2.

13.17.1.3 Test purpose

To verify that the carrier frequency error does not exceed conformance requirement 1:

1.1 Under normal conditions.

1.2 Under extreme conditions.

To verify that the RMS EVM over the useful part of the burst, excluding tail bits, transmitted by the MS does not exceed conformance requirement 2:

2.1 Under normal conditions.

2.2 Under extreme conditions.

To verify that the peak EVM values over the useful part of the burst, excluding tail bits, transmitted by the MS does not exceed conformance requirement 3:

3.1 Under normal conditions.

3.2 Under extreme conditions.

To verify that the 95:th percentile EVM over the useful part of any burst, excluding tail bits, does not exceed conformance requirement 4:

4.1 Under normal conditions.

4.2 Under extreme conditions.

To verify that the origin offset suppression does exceed conformance requirement 5:

5.1 Under normal conditions.

5.2 Under extreme conditions.

13.17.1.4 Method of the test

Initial conditions

The test shall be run under the default EGPRS conditions defined in clause 50, with power control parameter ALPHA (α) set to 0.

The SS shall command the MS to hopping mode (for the choice of frequencies in the frequency hopping mode, see subclause 6.2 and tables 6-1 and 6-2).

NOTE: It is not necessary to test in hopping mode but is done here as a simple means of making the MS change channel, it would be sufficient to test in non hopping mode and to make sure bursts are taken from a few different channels.

The MS shall be operated with its highest number of uplink slots.

The Test Mode defined in 3GPP TS 04.14 subclause 5.4 shall be utilised.

If the MS is capable of both:

Mode (a) transmitting pseudo-random data sequence in RLC data blocks;

Mode (b) transmitting looped-back RLC data blocks;

then Mode (a) will be used.

For the 8PSK procedure described below, the initial power value of each active timeslot shall be set to a mid-range power value.

13.17.1.4.2 Test procedure

Procedure for 8PSK Frequency error and modulation accuracy measurements

a) For one transmitted burst on the last slot of the multislot configuration, the SS captures the transmitted signal by taking at least four samples per symbol. The transmitted signal is modelled by:

$$Y(t) = C1\{R(t) + D(t) + C0\}W^t$$

R(t) is defined to be an ideal transmitter signal.

D(t) is the residual complex error on signal R(t).

C0 is a constant origin offset representing carrier feed through.

C1 is a complex constant representing the arbitrary phase and output power of the transmitter.

$W = e^{\alpha + j2\pi f}$ accounts for both a frequency offset of "$2\pi f$" radians per second phase rotation and an amplitude change of "α" nepers per second.

The symbol timing phase of Y(t) is aligned with R(t).

b) The SS shall generate the ideal transmitter signal as a reference. The ideal transmitter signal can be constructed from a priori knowledge of the transmitted symbols or from the demodulated symbols of the transmitted burst. In the latter case, unknown symbols shall be detected with an error rate sufficiently small to ensure the accuracy of the measurement equipment (see annex 5).

c)

c.1) The transmitted signal Y(t) is compensated in amplitude, frequency and phase by multiplying with the factor:

$$W^{-t}/C1$$

The values for W and C1 are determined using an iterative procedure. $W(\alpha,f)$, C1 and C0 are chosen to minimise the RMS value of EVM on a burst-by-burst basis.

c.2) After compensation, Y(t) is passed through the specified measurement filter (3GPP TS 05.05, subclause 4.6.2) to produce the signal:

$$Z(k) = S(k) + E(k) + C0$$

where:

S(k) is the ideal transmitter signal observed through the measurement filter;

$k = \text{floor}(t/T_s)$, where $T_s = 1/270.833$ kHz corresponding to the symbol times.

c.3) The error vector is defined to be:

$$E(k) = Z(k) - C0 - S(k)$$

It is measured and calculated for each instant k over the useful part of the burst excluding tail bits. The RMS vector error is defined as:

$$\text{RMS EVM} = \sqrt{\sum_{k\in K}|E(k)|^2 \Big/ \sum_{k\in K}|S(k)|^2}$$

c.4) Steps c.1) to c.3) are repeated with successive approximations of $W(\alpha,f)$, C1 and C0 until the minimum value of RMS EVM is found. The minimised value of RMS EVM and the final values for C1, C0 and f are noted. (f represents the frequency error of the burst).

d) For each symbol in the useful part of the burst excluding tail bits, the SS shall calculate the error vector magnitude as:

$$EVM(k) = \sqrt{\frac{|E(k)|^2}{\frac{\sum_{k \in K} |S(k)|^2}{N}}}$$

The peak value of symbol EVM in the useful part of the burst, excluding tail bits, is noted.

e) The SS shall calculate the value for Origin Offset Suppression for the burst as:

$$OOS = \left(\frac{|C_o|^2}{\frac{1}{N} \sum_{k \in K} |S(k)|^2} \right)$$

f) Steps a) to e) are repeated for a total of 200 bursts.

g) The peak values of symbol EVM noted in step d) are averaged for the 200 measured bursts.

h) The origin offset suppression values derived in step e) are averaged for the 200 measured bursts. The resulting average is converted to log format.

$$OOS(dB) = -10\log(OOS)$$

i) From the distribution of symbol EVM values calculated in step d) for the 200 measured bursts, the SS shall determine the 95: the percentile value.

j) The SS instructs the MS to its maximum power control level by setting the power control parameter ALPHA (α) to 0 and GAMMA_TN (Γ_{CH}) for each timeslot to the desired power level in the Packet Uplink Assignment or Packet Timeslot Reconfigure message (Closed Loop Control, see 3GPP TS 05.08, clause B.2), all other conditions remaining constant. Steps a) to i) are repeated.

k) The SS instructs the MS to the minimum power control level, all other conditions remaining constant. Steps a) to i) are repeated.

l) Steps a) to i) are repeated under extreme test conditions (see annex 1, TC2.2).

13.17.1.5 Test Requirements

1. For all measured bursts, the frequency error, derived in step c.4), shall be less than 10E-7.
2. For all measured bursts, the RMS EVM, derived in step c.3) shall not exceed 9.0 % under normal conditions and 10.0% under extreme conditions.
3. The (averaged) value of peak EVM derived in step g) shall not exceed 30 %.
4. The 95:th percentile value derived in step i) shall not exceed 15 %.
5. The origin offset suppression derived in subclause 13.17.1.4.2 step h) shall exceed 30 dB for MS.

13.17.1a Frequency error and Modulation accuracy in EGPRS2A Configuration

13.17.1a.1 Definition

The frequency error is the difference in frequency, after adjustment for the effect of the modulation accuracy between the RF transmission from the MS and either:

- the RF transmission from the BS; or
- the nominal frequency for the ARFCN used.

Modulation Accuracy.

For GMSK, the modulation accuracy of the transmitted signal is described as the phase accuracy (phase error) of the GMSK modulated signal. The phase error for GSMK modulation is the difference in phase, after adjustment for the effect of the frequency error, between the RF transmission from the MS and the theoretical transmission according to the intended modulation.

Since the conformance requirement, test procedure and test requirement for GMSK modulation accuracy (RMS Phase error and maximum peak deviation) are defined in subclause 13.16.1 for GPRS MS, being thereby defined also for all EGPRS MS in that section and 8PSK modulation accuracy conformance requirement, test procedure and test requirement are defined in subclause 13.17.1, only 16QAM modulation accuracy conformance requirement, test procedure and test requirement are defined in this subclause.

For 16QAM, the error vector between the vector representing the transmitted signal and the vector representing the error-free modulated signal defines modulation accuracy. The magnitude of the error vector is called Error Vector Magnitude (EVM). Origin suppression is defined to be the ratio of the carrier leakage to the modulated signal.

13.17.1a.2 Conformance requirement

1. The carrier frequency under 16QAM modulation shall be accurate to within 0,2 ppm for GSM 400 and 0,1 ppm for all other bands compared to signals received from the SS.

   1.1 Under normal conditions; 3GPP TS 45.010, subclause 6.1.

   1.2 Under extreme conditions; 3GPP TS 45.010, subclause 6.1; 3GPP TS 45.005, subclause 4.4; 3GPP TS 45.005, annex D subclauses D.2.1 and D.2.2.

2. The RMS EVM over the useful part of any burst of the 16QAM modulated signal shall not exceed.

   2.1 7,0% Under normal conditions; 3GPP TS 45.005, subclause 4.6.2.1

   2.2 8,0% Under extreme conditions; 3GPP TS 45.005, subclause 4.6; 3GPP TS 45.005, annex D subclauses D.2.1 and D.2.2.

3. The peak EVM values averaged over at least 200 bursts of the 16QAM modulated signal shall be ≤ 30 %.

   3.1 Under normal conditions; 3GPP TS 45.005, subclause 4.6.2.3.

   3.2 Under extreme conditions; 3GPP TS 45.005, subclause 4.6.2.3; 3GPP TS 45.005, annex D subclauses D.2.1 and D.2.2.

4. The 95:th-percentile value of any burst of the 16QAM modulated signal shall be ≤ 15 %.

   4.1 Under normal conditions; 3GPP TS 45.005, subclause 4.6.2.4.

   4.2 Under extreme conditions; 3GPP TS 45.005, subclause 4.6.2.4; 3GPP TS 45.005, annex D subclauses D.2.1 and D.2.2.

5. The Origin Offset Suppression for any 16QAM modulated signal shall exceed 30 dB.

   5.1 Under normal conditions; 3GPP TS 45.005, subclause 4.6.2.2.

   5.2 Under extreme conditions; 3GPP TS 45.005, subclause 4.6.2.2; 3GPP TS 45.005, annex D subclauses D.2.1 and D.2.2.

13.17.1a.3 Test purpose

To verify that the carrier frequency error does not exceed conformance requirement 1:

1.1 Under normal conditions.

1.2 Under extreme conditions.

To verify that the RMS EVM over the useful part of the burst, excluding tail bits, transmitted by the MS does not exceed conformance requirement 2:

2.1 Under normal conditions.

2.2 Under extreme conditions.

To verify that the peak EVM values over the useful part of the burst, excluding tail bits, transmitted by the MS does not exceed conformance requirement 3:

3.1 Under normal conditions.

3.2 Under extreme conditions.

To verify that the 95:th percentile EVM over the useful part of any burst, excluding tail bits, does not exceed conformance requirement 4:

4.1 Under normal conditions.

4.2 Under extreme conditions.

To verify that the origin offset suppression does exceed conformance requirement 5:

5.1 Under normal conditions.

5.2 Under extreme conditions.

13.17.1a.4 Method of the test

Initial conditions

The test shall be run under the default EGPRS conditions defined in clause 50, with power control parameter ALPHA (α) set to 0.

The SS shall command the MS to hopping mode (for the choice of frequencies in the frequency hopping mode, see subclause 6.2 and tables 6-1 and 6-2).

NOTE: It is not necessary to test in hopping mode but is done here as a simple means of making the MS change channel, it would be sufficient to test in non hopping mode and to make sure bursts are taken from a few different channels.

The MS shall be operated with its highest number of uplink slots.

The Test Mode defined in 3GPP TS 44.014 subclause 5.4 shall be utilised.

If the MS is capable of both:

Mode (a) transmitting pseudo-random data sequence in RLC data blocks;

Mode (b) transmitting looped-back RLC data blocks;

then Mode (a) will be used.

For the 16QAM procedure described below, the initial power value of each active timeslot shall be set to a mid-range power value.

13.17.1a.4.2 Test procedure

Procedure for 16QAM Frequency error and modulation accuracy measurements

a) For one transmitted burst on the last slot of the multislot configuration, the SS captures the transmitted signal by taking at least four samples per symbol. The transmitted signal is modelled by:

$$Y(t) = C1\{R(t) + D(t) + C0\}W^t$$

R(t) is defined to be an ideal transmitter signal.

D(t) is the residual complex error on signal R(t).

C0 is a constant origin offset representing carrier feed through.

C1 is a complex constant representing the arbitrary phase and output power of the transmitter.

$W = e^{\alpha + j2\pi f}$ accounts for both a frequency offset of "$2\pi f$" radians per second phase rotation and an amplitude change of "α" nepers per second.

The symbol timing phase of Y(t) is aligned with R(t).

b) The SS shall generate the ideal transmitter signal as a reference. The ideal transmitter signal can be constructed from a priori knowledge of the transmitted symbols or from the demodulated symbols of the transmitted burst. In the latter case, unknown symbols shall be detected with an error rate sufficiently small to ensure the accuracy of the measurement equipment (see annex 5).

c)

c.1) The transmitted signal Y(t) is compensated in amplitude, frequency and phase by multiplying with the factor:

$$W^{-t}/C1$$

The values for W and C1 are determined using an iterative procedure. $W(\alpha,f)$, C1 and C0 are chosen to minimise the RMS value of EVM on a burst-by-burst basis.

c.2) After compensation, Y(t) is passed through the specified measurement filter (3GPP TS 45.005, subclause 4.6.2) to produce the signal:

$$Z(k) = S(k) + E(k) + C0$$

where:

S(k) is the ideal transmitter signal observed through the measurement filter;

$k = \text{floor}(t/T_s)$, where $T_s = 1/270.833$ kHz corresponding to the symbol times.

c.3) The error vector is defined to be:

$$E(k) = Z(k) - C0 - S(k)$$

It is measured and calculated for each instant k over the useful part of the burst excluding tail bits. The RMS vector error is defined as:

$$\text{RMS EVM} = \sqrt{\sum_{k \in K} |E(k)|^2 \Big/ \sum_{k \in K} |S(k)|^2}$$

c.4) Steps c.1) to c.3) are repeated with successive approximations of $W(\alpha,f)$, C1 and C0 until the minimum value of RMS EVM is found. The minimised value of RMS EVM and the final values for C1, C0 and f are noted. (f represents the frequency error of the burst).

d) For each symbol in the useful part of the burst excluding tail bits, the SS shall calculate the error vector magnitude as:

$$EVM(k) = \sqrt{\frac{|E(k)|^2}{\frac{\sum_{k \in K} |S(k)|^2}{N}}}$$

The peak value of symbol EVM in the useful part of the burst, excluding tail bits, is noted.

e) The SS shall calculate the value for Origin Offset Suppression for the burst as:

$$OOS = \left(\frac{|C_o|^2}{\frac{1}{N}\sum_{k \in K} |S(k)|^2} \right)$$

f) Steps a) to e) are repeated for a total of 200 bursts.

g) The peak values of symbol EVM noted in step d) are averaged for the 200 measured bursts.

h) The origin offset suppression values derived in step e) are averaged for the 200 measured bursts. The resulting average is converted to log format.

$$OOS(dB) = -10\log(OOS)$$

i) From the distribution of symbol EVM values calculated in step d) for the 200 measured bursts, the SS shall determine the 95: the percentile value.

j) The SS instructs the MS to its maximum power control level by setting the power control parameter ALPHA (α) to 0 and GAMMA_TN (Γ_{CH}) for each timeslot to the desired power level in the Packet Uplink Assignment or Packet Timeslot Reconfigure message (Closed Loop Control, see 3GPP TS 45.008, clause B.2), all other conditions remaining constant. Steps a) to i) are repeated.

k) The SS instructs the MS to the minimum power control level, all other conditions remaining constant. Steps a) to i) are repeated.

l) Steps a) to i) are repeated under extreme test conditions (see annex 1, TC2.2).

13.17.1.5 Test Requirements

1. For all measured bursts, the frequency error, derived in step c.4), shall be less than 0,2ppm for GSM400 and 0,1ppm for all other bands compared to the signal received from the SS.

2. For all measured bursts, the RMS EVM, derived in step c.3) shall not exceed 7,0 % under normal conditions and 8,0% under extreme conditions.

3. The (averaged) value of peak EVM derived in step g) shall not exceed 30 %.

4. The 95:th percentile value derived in step i) shall not exceed 15 %.

5. The origin offset suppression derived in subclause 13.17.1a.4.2 step h) shall exceed 30 dB for MS.

13.17.2 Frequency error under multipath and interference conditions

13.17.2.1 Definition

The frequency error under multipath and interference conditions is a measure of the ability of the MS to maintain frequency synchronization with the received signal under conditions of Doppler shift, multipath reception and interference.

13.17.2.2 Conformance requirement

1. The MS carrier frequency error for each burst shall be accurate to within 0,1 ppm for GSM 700, GSM 850, GSM 900, DCS 1800, PCS 1 900 and 0,2 ppm for GSM 400 compared to signals received from the BS for signal levels down to 3 dB below the reference sensitivity level.

   1.1 Under normal conditions; 3GPP TS 05.10, subclauses 6 and 6.1.

   1.2 Under extreme conditions; 3GPP TS 05.10, subclauses 6 and 6.1; 3GPP TS 05.05 annex D subclauses D.2.1 and D.2.2.

2. The MS carrier frequency error for each burst shall be accurate to within 0,1 ppm, for GSM 700, GSM 850, GSM 900, DCS 1800 and PCS 1 900 and 0,2 ppm for GSM 400 compared to signals received from the BS for 3 dB less carrier to interference ratio than the reference interference ratios; 3GPP TS 05.10, subclauses 6 and 6.1.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

13.17.2.3 Test purpose

1. To verify that the MS carrier frequency error at the PDTCH input level for reference performance, under conditions of multipath and Doppler shift does not exceed 0,1 ppm for GSM 700, T-GSM 810, GSM 850, GSM 900, DCS 1 800 and PCS 1 900 and 0,2 ppm for GSM 400 + the frequency error due to the Doppler shift of the received signal and the assessment error in the MS.

   1.1 Under normal conditions.

   1.2 Under extreme conditions.

NOTE 1: Although the conformance requirement states that frequency synchronization should be maintained for input signals 3 dB below PDTCH input level for reference performance. Due to the Radio Link Failure counter this test condition cannot be established. Hence all tests in this subclause are conducted at PDTCH input level for reference performance.

2. To verify that the MS carrier frequency error, under interference conditions and TUlow fading profile, does not exceed 0,1 ppm for GSM 700, T-GSM 810, GSM 850, GSM 900, DCS 1 800 and PCS 1 900 and 0,2 ppm for GSM 400 + the frequency error due to the Doppler shift of the received signal and the assessment error in the MS.

NOTE 2: The test adds the effect of Doppler shift to the requirements as the conformance requirement refers to signals input to the MS receiver whereas the frequency reference for measurement will not take account of the Doppler shift.

13.17.2.4 Method of test

This test uses the same measurement process as test 13.16.1 for GMSK modulated uplink transmission and 13.17.1 for 8PSK modulated uplink transmission for the MS operating under various RF conditions.

NOTE: The BA list sent on the BCCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCH but if they are provided none will be within 5 channels of the ARFCN used for the serving BCCH or PDTCH.

EGPRS Switched Radio Loopback Mode (3GPP TS 04.14, subclause 5.5) shall be utilised. This is since 8PSK modulated transmission is applied in the downlink during the test and EGPRS Switched Radio Loopback Mode is the only mandatory test mode for EGPRS MS that implements different modulations between concurrent downlink and uplink transmission. This test requires such test mode capability since an EGPRS MS is also allowed to support only GMSK modulated uplink transmission.

13.17.2.4.1 Initial conditions

The test shall be run under the default EGPRS conditions defined in clause 50 on an ARFCN in the Mid range, with power control parameter ALPHA (α) set to 0. The level of the serving cell BCCH is set to 10 dB above the input signal level at reference sensitivity performance for PDTCH/MCS-5 applicable to the type of MS and the fading function set to RA. The SS waits 30 s for the MS to stabilize to these conditions. The SS commands the MS to transmit at maximum power.

13.17.2.4.2 Procedure

a) The SS transmits packets under static conditions, using MCS-5 coding. The SS is set up to capture the first burst transmitted by the MS during the uplink TBF. EGPRS Switched Radio Block Loop Back Mode is initiated by the SS according to the procedure defined in 3GPP TS 04.14; 5.5.1 on a PDTCH/MCS-5 channel in the mid ARFCN range. The PDTCH level is set to 10 dB above the input signal level at reference sensitivity performance for PDTCH/MCS-5 applicable to the type of MS and the fading function is set to RA. 8PSK modulated downlink transmission shall be utilised.

b) The SS calculates the frequency accuracy of the captured burst as described in test 13.16.1 for MS capable of only GMSK modulated transmission in the uplink. For MS capable of both GMSK and 8PSK modulated transmission in the uplink the frequency accuracy of the captured burst shall be calculated as described in the test 13.17.1.

c) The SS sets the serving cell BCCH and PDTCH to the PDTCH input signal level at reference sensitivity performance for PDTCH/MCS-5 applicable to the type of MS, still with the fading function set to RA and then waits 30 s for the MS to stabilize to these conditions.

d) The SS shall capture subsequent bursts from the traffic channel in the manner described in test 13.16.1 or test 13.17.1.

NOTE: Due to the very low signal level at the MS receiver input the MS receiver is liable to error. The "looped back" bits are therefore also liable to error, and hence the SS does not know the expected bit sequence. The SS will have to demodulate the received signal to derive (error free) the transmitter burst bit pattern. Using this bit pattern the SS can calculate the expected phase trajectory according to the definition within 3GPP TS 05.04.

e) The SS calculates the frequency accuracy of the captured burst as described in test 13.16.1 or test 13.17.1.

f) Steps d) and e) are repeated for 5 traffic channel bursts spaced over a period of not less than 20 s.

g) Both downlink and uplink TBFs are terminated. The initial conditions are established again and steps a) to f) are repeated but with the fading function set to HT200 for GSM 400, HT120 for GSM700 and HT100 for all other bands.

h) The initial conditions are established again and steps a) to f) are repeated but with the fading function set to TU100 for GSM 400, TU60 for GSM700 and TU50 for all other bands.

i) The initial conditions are established again and steps a) and b) are repeated but with the following differences:

- the levels of the BCCH and PDTCH are set to – 72,5 dBm + Corr. Corr = the correction factor for reference performance according to Spec 45.005 subclause 6.2.
  - two further independent 8-PSK modulated interfering signals are sent on the same nominal carrier frequency as the BCCH and PDTCH and at a level 20,5 dB below the level of the PDTCH and modulated with random data, including the midamble.
  - the fading function for all channels including the interfering signals is set to TUlow.
  - the SS waits 100 s for the MS to stabilize to these conditions.

j) Repeat steps d) to f), except that at step f) the measurement period must be extended to 200 s and the number of measurements increased to 20.

k) The initial conditions are established again and steps a) to j) are repeated for ARFCN in the Low ARFCN range.

l) The initial conditions are established again and steps a) to j) are repeated for ARFCN in the High ARFCN range.

m) Repeat step h) under extreme test conditions (see annex 1, TC2.2).

13.17.2.5 Test requirements

The frequency error, with reference to the SS carrier frequency as measured in repeats of step e), for each measured burst shall be less than the values shown in table 13.17-1.

Table 13.17-1: Requirements for frequency error under multipath, Doppler shift and interference conditions

GSM 400		T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Propagation condition	**Permitted frequency error**	**Propagation condition**	**Permitted frequency error**	**Propagation condition**	**Permitted frequency error**
RA500	±300 Hz	RA250	±300 Hz	RA130	±400 Hz
HT200	±180 Hz	HT100	±180 Hz	HT100	±350 Hz
TU100	±160 Hz	TU50	±160 Hz	TU50	±260 Hz
TU6	±230 Hz	TU3	±230 Hz	TU1,5	±320 Hz

GSM 700	
Propagation condition	Permitted frequency error
RA 300 HT 120 TU 60 TU 3.6	±300 Hz ±180 Hz ±160 Hz ±230 Hz

13.17.2a Frequency error under multipath and interference conditions for EGPRS2A configuration

13.17.2a.1 Definition

The frequency error under multipath and interference conditions is a measure of the ability of the MS to maintain frequency synchronization with the received signal under conditions of Doppler shift, multipath reception and interference.

Since the conformance requirements, test procedures and test requirement for frequency error under multipath and interference conditions for 8PSK modulation are defined in sub clause 13.17.2 only 16QAM modulation specific requirements and procedures are handled in this sub clause.

13.17.2a.2 Conformance requirement

1. The MS carrier frequency error under 16QAM modulation for each burst shall be accurate to within 0,1 ppm for GSM 700, GSM 850, GSM 900, DCS 1800, PCS 1 900 and 0,2 ppm for GSM 400 compared to signals received from the BS for signal levels down to 3 dB below the reference sensitivity level.

   1.1 Under normal conditions; 3GPP TS 45.010, subclauses 6 and 6.1.

   1.2 Under extreme conditions; 3GPP TS 45.010, subclauses 6 and 6.1; 3GPP TS 45.005 annex D subclauses D.2.1 and D.2.2.

2. The MS carrier frequency error under 16QAM modulation for each burst shall be accurate to within 0,1 ppm, for GSM 700, GSM 850, GSM 900, DCS 1800 and PCS 1 900 and 0,2 ppm for GSM 400 compared to signals received from the BS for 3 dB less carrier to interference ratio than the reference interference ratios; 3GPP TS 45.010, subclauses 6 and 6.1.

3GPP TS 45.005 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

13.17.2a.3 Test purpose

1. To verify that the MS carrier frequency error at the PDTCH input level for reference performance, under conditions of multipath and Doppler shift does not exceed 0,1 ppm for GSM 700, T-GSM 810, GSM 850, GSM 900, DCS 1 800 and PCS 1 900 and 0,2 ppm for GSM 400 + the frequency error due to the Doppler shift of the received signal and the assessment error in the MS.

   1.1 Under normal conditions.

   1.2 Under extreme conditions.

NOTE 1: Although the conformance requirement states that frequency synchronization should be maintained for input signals 3 dB below PDTCH input level for reference performance. Due to the Radio Link Failure counter this test condition cannot be established. Hence all tests in this subclause are conducted at PDTCH input level for reference performance.

2. To verify that the MS carrier frequency error, under interference conditions and TUlow fading profile, does not exceed 0,1 ppm for GSM 700, T-GSM 810, GSM 850, GSM 900, DCS 1 800 and PCS 1 900 and 0,2 ppm for GSM 400 + the frequency error due to the Doppler shift of the received signal and the assessment error in the MS.

NOTE 2: The test adds the effect of Doppler shift to the requirements as the conformance requirement refers to signals input to the MS receiver whereas the frequency reference for measurement will not take account of the Doppler shift.

13.17.2a.4 Method of test

This test uses the same measurement process as test 13.16.1 for GMSK modulated uplink transmission and 13.17.1a for 16QAM modulated uplink transmission for the MS operating under various RF conditions.

NOTE: The BA list sent on the BCCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCH but if they are provided none will be within 5 channels of the ARFCN used for the serving BCCH or PDTCH.

EGPRS Switched Radio Loopback Mode (3GPP TS 44.014, sub clause 5.5) with 16QAM uplink and 16QAM downlink TBF shall be utilised.

13.17.2a.4.1 Initial conditions

The test shall be run under the default EGPRS conditions defined in clause 50 on an ARFCN in the Mid range, with power control parameter ALPHA (α) set to 0. The level of the serving cell BCCH is set to 10 dB above the input signal level at reference sensitivity performance for PDTCH/DAS-applicable to the type of MS and the fading function set to RA. The SS waits 30 s for the MS to stabilize to these conditions. The SS commands the MS to transmit at maximum power.

13.17.2a.4.2 Test procedure

Procedure for 16QAM frequency error under multipath and interference conditions

a) The SS transmits packets under static conditions, using DAS-8 coding. The SS is set up to capture the first burst transmitted by the MS during the uplink TBF. EGPRS Switched Radio Block Loop Back Mode is initiated by the SS according to the procedure defined in 3GPP TS44.014 section 5.5.1 on a PDTCH/DAS-8 channel in the mid ARFCN range. The PDTCH level is set to 10 dB above the input signal level at reference sensitivity performance for PDTCH/ DAS-8 applicable to the type of MS and the fading function is set to RA. 16QAM modulated downlink transmission shall be utilised.

b) The SS calculates the frequency accuracy of the captured burst as described in test 13.17.1a.

c) The SS sets the serving cell BCCH and PDTCH to the PDTCH input signal level at reference sensitivity performance for PDTCH/ DAS-8, still with the fading function set to RA and then waits 30 s for the MS to stabilize to these conditions.

d) The SS shall capture subsequent bursts from the traffic channel in the manner described in test 13.17.1a.

NOTE: Due to the very low signal level at the MS receiver input the MS receiver is liable to error. The "looped back" bits are therefore also liable to error, and hence the SS does not know the expected bit sequence. The SS will have to demodulate the received signal to derive (error free) the transmitter burst bit pattern. Using this bit pattern the SS can calculate the expected phase trajectory according to the definition within 3GPP TS 45.004.

e) The SS calculates the frequency accuracy of the captured burst as described in test 13.17.1a.

f) Steps d) and e) are repeated for 5 traffic channel bursts spaced over a period of not less than 20 seconds.

g) Both downlink and uplink TBFs are terminated. The initial conditions are established again and steps a) to f) are repeated but with the fading function set to HT200 for GSM 400, HT120 for GSM700 and HT100 for all other bands.

h) Both downlink and uplink TBFs are terminated. The initial conditions are established again and steps a) to f) are repeated but with the fading function set to TU100 for GSM 400, TU60 for GSM700 and TU50 for all other bands.

i) Both downlink and uplink TBFs are terminated. The initial conditions are established again and steps a) and b) are repeated but with the following differences:

- the levels of the BCCH and PDTCH are set to – 72,5 dBm + Corr. Corr = the correction factor for reference performance according to Spec 45.005 sub clause 6.2.

- two further independent 16QAM modulated interfering signals are sent on the same nominal carrier frequency as the BCCH and PDTCH and at a level 20,5 dB below the level of the PDTCH and modulated with random data, including the midamble.

- the fading function for all channels including the interfering signals is set to TUlow.

- the SS waits 100 s for the MS to stabilize to these conditions.

j) Repeat steps d) to f), except that at step f) the measurement period must be extended to 200 s and the number of measurements increased to 20.

k) The initial conditions are established again and steps a) to j) are repeated for ARFCN in the Low ARFCN range.

l) The initial conditions are established again and steps a) to j) are repeated for ARFCN in the High ARFCN range.

m) Repeat step h) under extreme test conditions (see annex 1, TC2.2).

13.17.2a.5 Test requirements

The frequency error, with reference to the SS carrier frequency as measured in repeats of step e), for each measured burst shall be less than the values shown in table 13.17.2a-1.

Table 13.17.2a-1: Requirements for frequency error under multipath, Doppler shift and interference conditions

GSM 400		T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Propagation condition	**Permitted frequency error**	**Propagation condition**	**Permitted frequency error**	**Propagation condition**	**Permitted frequency error**
RA500	±300 Hz	RA250	±300 Hz	RA130	±400 Hz
HT200	±180 Hz	HT100	±180 Hz	HT100	±350 Hz
TU100	±160 Hz	TU50	±160 Hz	TU50	±260 Hz
TU6	±230 Hz	TU3	±230 Hz	TU1,5	±320 Hz

GSM 700	
Propagation condition	**Permitted frequency error**
RA 300	±300 Hz
HT 120	±180 Hz
TU 60	±160 Hz
TU 3.6	±230 Hz

13.17.3 EGPRS Transmitter output power

13.17.3.1 Definition

The transmitter output power is the average value of the power delivered to an artificial antenna or radiated by the MS and its integral antenna, over the time that the useful information bits of one burst are transmitted.

Since the conformance requirement, test procedure and test requirement of GSMK modulated signal's output power are defined in subclause 13.16.2 for GPRS MS, being thereby defined also for all EGPRS MS in that section, only 8PSK modulated signal's output power conformance requirement, test procedure and test requirements are defined in this subclause.

13.17.3.2 Conformance requirement

1. The MS maximum output power for 8-PSK modulated signal shall be as defined in 3GPP TS 05.05, subclause 4.1.1, second table, according to its power class, with a tolerances of ±2 dB, ±3 dB, +3/-4 dB defined under normal conditions in the 3GPP TS 05.05, subclause 4.1.1, second table. From R99 onwards, the MS maximum output power in an uplink multislot configuration shall be as defined in 3GPP TS 05.05 subclause 4.1.1, sixth table, according to its power class, with a tolerance of ±3 dB under normal conditions; 3GPP TS 05.05, subclause 4.1.1, second and sixth table. In case the MS supports the same maximum output power in an uplink multislot configuration as it supports for single slot uplink operation, the tolerance shall be ±2 dB.

2. The MS maximum output power for 8-PSK modulated signal shall be as defined in 3GPP TS 05.05, subclause 4.1.1, second table, according to its power class, with a tolerances of ±2,5 dB, ±4 dB, +4/-4,5 dB defined under extreme conditions in the 3GPP TS 05.05, subclause 4.1.1, second table. From R99 onwards, the MS maximum output power in an uplink multislot configuration shall be as defined in 3GPP TS 05.05 subclause 4.1.1, sixth table, according to its power class, with a tolerance of ±4 dB under extreme conditions; 3GPP TS 05.05, subclause 4.1.1, second and sixth table; 3GPP TS 05.05 annex D in subclauses D.2.1 and D.2.2. In case the MS supports the same maximum output power in an uplink multislot configuration as it supports for single slot uplink operation, the tolerance shall be ±2,5 dB.

3. The power control levels for 8-PSK shall have the nominal output power levels as defined in 3GPP TS 05.05, subclause 4.1.1, third table (for GSM 400, GSM 700, GSM 850 and GSM 900), fourth table (for DCS 1 800) or fifth table (for PCS 1 900), from the lowest power control level up to the maximum output power corresponding to the class of the MS (for tolerance on maximum output power see conformance requirement 1), with a tolerance of ±2 dB,±3 dB, 4 dB or 5 dB under normal conditions; 3GPP TS 05.05, subclause 4.1.1, third, fourth or fifth table.

4. The power control levels for 8-PSK shall have the nominal output power levels as defined in 3GPP TS 05.05, subclause 4.1.1, third table (for GSM 400, GSM 700, GSM 850 and GSM 900), fourth table (for DCS 1 800) or fifth table (for PCS 1 900), from the lowest power control level up to the maximum output power corresponding to the class of the MS (for tolerance on maximum output power see conformance requirements 2), with a tolerance of ±2,5 dB, ±4 dB, 5 dB or 6 dB under extreme conditions; 3GPP TS 05.05, subclause 4.1.1, third, fourth or fifth table; 3GPP TS 05.05 annex D subclauses D.2.1 and D.2.2.

4a. From R99 onwards, the supported maximum output power for each number of uplink timeslots shall form a monotonic sequence. The maximum reduction of maximum output power from an allocation of n uplink timeslots to an allocation of n+1 uplink timeslots shall be equal to the difference of maximum permissible nominal reduction of maximum output power for the corresponding number of timeslots, as defined in 3GPP TS 05.05, subclause 4.1.1, sixth table.

5. For 8-PSK, the output power actually transmitted by the MS at consecutive power control levels shall form a monotonic sequence and the interval between power control levels shall be 2 ± 1,5 dB; 3GPP TS 05.05, subclause 4.1.1, from R99 onwards, in a multislot configuration, the first power control step down from the maximum output power is allowed to be in the range 0…2 dB

6. The transmitted power level relative to time for a normal burst shall be within the power/time template given in 3GPP TS 05.05, annex B bottom figure for 8PSK modulated signal. In the case of Multislot Configurations where the bursts in two or more consecutive time slots are actually transmitted at the same frequency, the template of annex B shall be respected during the useful part of each burst and at the beginning and the end of the series of consecutive bursts. The output power during the guard period between every two consecutive active timeslots shall not exceed the level allowed for the useful part of the first timeslot, or the level allowed for the useful part of the second timeslot plus 3 dB, whichever is the highest.

   6.1 Under normal conditions; 3GPP TS 05.05, subclause 4.5.2.

   6.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.5.2, 3GPP TS 05.05 annex D subclauses D.2.1 and D.2.2.

On a multislot uplink configuration the MS may restrict the interslot output power control range to a 10 dB window, on a TDMA frame basis. On those timeslots where the ordered power level is more than 10 dB lower than the applied power level of the highest power timeslot, the MS shall transmit at a lowest possible power level within 10 dB range from the highest applied power level, if not transmitting at the actual ordered power level.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

13.17.3.3 Test purpose

1. To verify that the maximum output power of the 8PSK modulated signal of the EGPRS MS, under normal conditions, is within conformance requirement 1.

2. To verify that the maximum output power of the 8PSK modulated signal of the EGPRS MS, under extreme conditions, is within conformance requirement 2.

3. To verify that the maximum output power of the 8-PSK modulated signal of the EGPRS MS capable of 8PSK multislot configuration in the uplink, under normal conditions, is within conformance requirement 1.

4. To verify that the maximum output power of the 8-PSK modulated signal of the EGPRS MS capable of 8PSK multislot configuration in the uplink, under extreme conditions, is within conformance requirement 2.

4a. From R99 onwards: to verify that the supported maximum output power for each uplink multislot configuration is within the conformance requirement 4a.

5. To verify that all nominal output power levels, relevant to the power class of the EGPRS MS for 8PSK modulation, are implemented in the MS and have output power levels, under normal conditions, within conformance requirement 3.

6. To verify that all nominal output power levels, relevant to the power class of the EGPRS MS for 8PSK modulation, are implemented in the MS capable of 8PSK multislot configuration in the uplink and have the output power levels, under normal conditions, within conformance requirement 3.

7. To verify that all nominal output power levels, relevant to the power class of the EGPRS MS for 8PSK modulation, have output power levels, under extreme conditions, within conformance requirement 4.

8. To verify that all nominal output power levels, relevant to the power class of the EGPRS MS for 8PSK modulation, have output power levels in 8PSK multislot configuration in the uplink, under extreme conditions, within conformance requirement 4.

9. To verify that the step in the output power transmitted by the EGPRS MS at consecutive power control levels for 8PSK modulated signals is within conformance requirement 5 under normal conditions.

10. To verify that the step in the output power transmitted by the EGPRS MS capable of multislot 8PSK configuration in the uplink at consecutive power control levels for 8PSK modulated signals is within conformance requirement 5.

11. To verify that the output power relative to time, when sending a normal burst of the 8-PSK modulated signal is within conformance requirement 6:

    11.1 Under normal conditions.

    11.2 Under extreme conditions.

12. To verify that the output power relative to time, when sending a normal burst of 8PSK modulated signal is within conformance requirement 6 for EGPRS MS capable of 8PSK multislot configuration in the uplink:

    12.1 Under normal conditions.

    12.2 Under extreme conditions.

NOTE: For EGPRS MS capable of 8PSK multislot configuration in the uplink, the tests are executed only for multislot configuration.

13.17.3.4 Methods of test

Two methods of test are described, separately for:

1) equipment fitted with a permanent antenna connector or fitted with a temporary test connector as a test fixture; and for

2) equipment fitted with an integral antenna, and which cannot be connected to an external antenna.

NOTE: The behaviour of the MS in the system is determined to a high degree by the antenna, and this is the only transmitter test in this ETS using the integral antenna. Further studies are ongoing on improved testing on the integral antenna, taking practical conditions of MS use into account.

13.17.3.4.1 Method of test for equipment with a permanent or temporary antenna connector

13.17.3.4.1.1 Initial conditions

The test shall be run under the default EGPRS conditions defined in clause 50 with an ARFCN in the mid ARFCN range.

The Test Mode defined in 3GPP TS 04.14 subclause 5.4 shall be utilised. If the MS is capable of both:

Mode (a) transmitting pseudo-random data sequence in RLC data blocks;

Mode (b) transmitting looped-back RLC data blocks.

Then Mode (a) will be used. The SS orders the MS to transmit on the uplink with 8PSK modulation, on a mid range ARFCN, power control level set to Max power and MS to operate in its highest number of uplink slots.

The SS controls the power level by setting the concerned timeslot's power control parameter ALPHA (α) to 0 and GAMMA_TN (Γ_{CH}) to the desired power level in the Packet Uplink Assignment or Packet Time Slot Reconfigure message (Closed Loop Control, see 3GPP TS 05.08, clause B.2) GPRS_ MS TXPWR_MAX_CCH / MS TXPWR_MAX_CCH is set to the maximum value supported by the Power Class of the Mobile under test. For DCS 1 800 mobile stations the POWER_OFFSET parameter is set to 6 dB.

Specific PICS Statements:

- MS using reduced interslot dynamic range in multislot configurations (TSPC_Addinfo_Red_IntSlotRange_Mult_Conf).
- 8-PSK_MULTISLOT_POWER_PROFILE 0..3 (TSPC_Type_8-PSK_Multislot_Power_Profile_x)

PIXIT statements:

-

13.17.3.4.1.2 Test procedure

a) Measurement of normal burst transmitter output power

   For 8PSK, power may be determined by applying the technique described for GMSK in subclause 13.16.2.4.1.2; step a) and then averaging over multiple bursts to achieve sufficient accuracy (see annex 5). Alternatively, an estimation technique based on a single burst which can be demonstrated to yield the same result as the long term average may be used. The long term average or the estimate of long term average is used as the 0dB reference for the power/time template.

b) Measurement of normal burst power/time relationship. The array of power samples measured in a) are referenced in time to the centre of the useful transmitted symbols and in power to the 0 dB reference, both identified in a).

c) Steps a) to b) are repeated on each timeslot within the multislot configuration with the MS commanded to operate on each of the nominal output power levels defined in tables 13.17.3-1, 13.17.3-2 and 13.17.3-3.

   NOTE: Power control levels 0 and 1 are excluded for bands other than DCS 1800 and PCS 1900 since these power control levels can not be set by GAMMA_TN.

d) The SS commands the MS to the maximum power control level supported by the MS and steps a) to b) are repeated on each timeslot within the multislot configuration for ARFCN in the Low and High ranges.

e) The SS commands the MS to the maximum power control level in the first timeslot allocated within the multislot configuration and to the minimum power control level in the second timeslot allocated. Any further timeslots allocated are to be set to the maximum power control level. Steps a) to b) and corresponding measurements on each timeslot within the multislot configuration are repeated. This step is only applicable to MS which support more than one uplink time slot.

f) Steps a) to e) are repeated under extreme test conditions (annex 1, TC2.2) except that the repeats at step c) are only performed for power control level 10 and the minimum nominal output power level supported by the MS.

13.17.3.4.2 Method of test for equipment with an integral antenna

NOTE: If the MS is equipped with a permanent connector, such that the antenna can be disconnected and the SS be connected directly, then the method of subclause 13.17.3.4.1 will be applied.

The tests in this subclause are performed on an unmodified test sample.

13.17.3.4.2.1 Initial conditions

The MS is placed in the anechoic shielded chamber (annex 1, GC5) or on the outdoor test site, on an isolated support, in the position for normal use, at a distance of at least 3 metres from a test antenna, connected to the SS.

NOTE: The test method described has been written for measurement in an anechoic shielded chamber. If an outdoor test site is used then, in addition, it is necessary to raise/lower the test antenna through the specified height range to maximize the received power levels from both the test sample and the substitution antenna.

The initial conditions for the MS are defined in subclause 13.17.3.4.1.1

13.17.3.4.2.2 Test procedure

a) With the initial conditions set according to subclause 13.17.3.4.2.1 the test procedure in subclause 13.17.3.4.1.2 is followed up to and including step e), except that in step a), when measurements are done at maximum power for ARFCN in the Low, Mid and High range, the measurement is made eight times with the MS rotated by n*45 degrees for all values of n in the range 0 to 7.

   The measurements taken are received transmitter output power measurements rather than transmitter output power measurements, the output power measurement values can be derived as follows.

b) Assessment of test site loss for scaling of received output power measurements.

   The MS is replaced by a half-wave dipole, resonating at the centre frequency of the transmit band, connected to an RF generator.

   The frequency of the RF signal generator is set to the frequency of the ARFCN used for the 24 measurements in step a), the output power is adjusted to reproduce the received transmitter output power averages recorded in step a).

   For each indication the power, delivered by the generator (in Watts) to the half-wave dipole, is recorded. These values are recorded in the form Pnc, where n = MS rotation and c = channel number.

   For each channel number used compute:

$$\text{Pac(Watts into dipole)} = \frac{1}{8} * \sum_{n=0}^{n=7} \text{Pnc}$$

   from which: Pac (Tx dBm) = $10\log_{10}$(Pac) + 30 + 2,15

   The difference, for each of the three channels, between the actual transmitter output power averaged over the 8 measurement orientations and the received transmitter output power at orientation n = 0 is used to scale the received measurement results to actual transmitter output powers for all measured power control levels and ARFCN, which can then be checked against the requirements.

c) Temporary antenna connector calibration factors (transmit)

   A modified test sample equipped with a temporary antenna connector is placed in a climatic test chamber and is linked to the SS by means of the temporary antenna connector.

   Under normal test conditions, the power measurement and calculation parts of steps a) to e) of subclause 13.17.3.4.1.2 are repeated except that the repeats at step d) are only performed for power control level 10 and the minimum nominal output power level supported by the MS.

NOTE 1: The values noted here are related to the output transmitter carrier power levels under normal test conditions, which are known after step b). Therefore frequency dependent calibration factors that account for the effects of the temporary antenna connector can be determined.

d) Measurements at extreme test conditions.

NOTE 2: Basically the procedure for extreme conditions is:

- the power/time template is tested in the "normal" way;

- the radiated power is measured by measuring the difference with respect to the radiated power under normal test conditions.

Under extreme test conditions steps a) to e) of subclause 13.17.3.4.1.2 are repeated except that the repeats at step d) are only performed for power control level 10 and the minimum nominal output power level supported by the MS.

The transmitter output power under extreme test conditions is calculated for each burst type, power control level and for every frequency used by adding the frequency dependent calibration factor, determined in c), to the values obtained at extreme conditions in this step.

13.17.3.5 Test requirements

a) The transmitter output power for the 8-PSK modulated signals, under every combination of normal and extreme test conditions, for normal bursts, at each frequency and for each power control level applicable to the MS power class, shall be at the relevant level shown in table 13.17.3-1 or table 13.17.3-2 within the tolerances also shown in table 13.17.3-1 or table 13.17.3-2.

b) Void

Bands other than DCS 1800 and PCS 1900 beginning

Table 13.17.3-1: Bands other than DCS 1800 and PCS 1900 transmitter output power for different power classes 8PSK Modulated Signals

Power class			Power control level (note 3)	GAMMA_TN (Γ_{CH})	Transmitter output power (note 1,2)	Tolerances	
E1	**E2**	**E3**					
·			2-5	0-3	33	±2 dB	±2.5dB
			6	4	31	±3 dB	±4 dB
			7	5	29	±3 dB	±4 dB
	·		8	6	27	±3 dB	±4 dB
	·		9	7	25	±3 dB	±4 dB
	·	·	10	8	23	±3 dB	±4 dB
	·	·	11	9	21	±3 dB	±4 dB
	·	·	12	10	19	±3 dB	±4 dB
	·	·	13	11	17	±3 dB	±4 dB
	·	·	14	12	15	±3 dB	±4 dB
	·	·	15	13	13	±3 dB	±4 dB
	·	·	16	14	11	±5 dB	±6 dB
	·	·	17	15	9	±5 dB	±6 dB
	·	·	18	16	7	±5 dB	±6 dB
	·	·	19	17	5	±5 dB	±6 dB

NOTE 1: For R99 and Rel-4, the maximum output power in a multislot configuration must be lower within the limits defined in table 13.17.3-1a. From Rel-5 onwards, the maximum output power in a multislot configuration may be lower within the limits defined in table 13.17.3-1b.

NOTE 2: For a MS using reduced interslot dynamic range in multislot configurations, the MS may restrict the interslot output power control range to a 10 dB window, on a TDMA frame basis. On those timeslots where the ordered power level is more than 10 dB lower than the applied power level of the highest power timeslot, the MS shall transmit at a lowest possible power level within 10 dB range from the highest applied power level, if not transmitting at the actual ordered power level.

NOTE 3: There is no requirement to test power control levels 20-31.

Table 13.17.3-1a: R99 and Rel-4: Bands other than DCS 1800 and PCS 1900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

Table 13.17.3-1b: From Rel-5 onwards: Bands other than DCS 1800 and PCS 1900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	3,0
3	4,8
4	6,0
5	7,0
6	7,8
7	8,5
8	9,0

From R5 onwards, the actual supported maximum output power shall be in the range indicated by the parameter 8-PSK_MULTISLOT_POWER_PROFILE for n allocated uplink timeslots:

a ≤ MS maximum output power ≤ min(MAX_PWR, a + 2dB)

Where:

a = min (MAX_PWR, MAX_PWR + 8-PSK _MULTISLOT_POWER_PROFILE – 10log(n));

MAX_PWR equals to the MS maximum output power according to the relevant power class and

8-PSK_MULTISLOT_POWER_PROFILE 0 = 0 dB;
8-PSK_MULTISLOT_POWER_PROFILE 1 = 2 dB;
8-PSK_MULTISLOT_POWER_PROFILE 2 = 4 dB;
8-PSK_MULTISLOT_POWER_PROFILE 3 = 6 dB.

Bands other than DCS 1800 and PCS 1900 - end

DCS 1 800 and PCS 1 900 - beginning

Table 13.17.3-2: DCS 1 800 and PCS 1 900 transmitter output power for different power classes 8-PSK Modulated Signals

Power class			Power control level (note 3)	GAMMA_TN (Γ_{CH})	Transmitter output power (note 1,2)	Tolerances	
E1	E2	E3				NORMAL	EXTREME
·			29,0 *)	0-3 **)	30	±3 dB(note 4)	±4dB(note 4)
			1	4	28	±3 dB	±4 dB
	·		2	5	26	±3 dB(note 4)	±4 dB(note 4)
	·		3	6	24	±3 dB	±4 dB
	·	·	4	7	22	±3 dB	±4 dB
	·	·	5	8	20	±3 dB	±4 dB
	·	·	6	9	18	±3 dB	±4 dB
	·	·	7	10	16	±3 dB	±4 dB
	·	·	8	11	14	±4 dB	±4 dB
	·	·	9	12	12	±4 dB	±5 dB
	·	·	10	13	10	±4 dB	±5 dB
	·	·	11	14	8	±4 dB	±5 dB
	·	·	12	15	6	±4 dB	±5 dB
	·	·	13	16	4	±5 dB	±5 dB
	·	·	14	17	2	±5 dB	±6 dB
	·	·	15	18	0	±5 dB	±6 dB

*) 30-0 for PCS 1900 **) 1-3 for PCS 1900

NOTE 1: For R99 and Rel-4, the maximum output power in a multislot configuration must be lower within the limits defined in table 13.17.3-2a. From Rel-5 onwards, the maximum output power in a multislot configuration may be lower within the limits defined in table 13.17.3-2b.

NOTE 2: For a MS using reduced interslot dynamic range in multislot configurations, the MS may restrict the interslot output power control range to a 10 dB window, on a TDMA frame basis. On those timeslots where the ordered power level is more than 10 dB lower than the applied power level of the highest power timeslot, the MS shall transmit at a lowest possible power level within 10 dB range from the highest applied power level, if not transmitting at the actual ordered power level.

NOTE 3: There is no requirement to test power control levels 16-28.

NOTE 4: When the power control level corresponds to the power class of the MS, then the tolerances shall be ±2,0 dB under normal test conditions and ±2,5 dB under extreme test conditions for a class E1 mobile. For a class E2 mobile the tolerances shall be -4/+3 under normal test conditions and -4,5/+4 dB under extreme test conditions.

Table 13.17.3-2a: R99 and Rel-4: DCS 1 800 and PCS 1 900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

Table 13.17.3-2b: From Rel-5 onwards: DCS 1 800 and PCS 1 900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	3,0
3	4,8
4	6,0
5	7,0
6	7,8
7	8,5
8	9,0

From R5 onwards, the actual supported maximum output power shall be in the range indicated by the parameter 8-PSK_MULTISLOT_POWER_PROFILE for n allocated uplink timeslots:

a ≤ MS maximum output power ≤ min(MAX_PWR, a + 3dB)

Where:

a = min (MAX_PWR, MAX_PWR + 8-PSK _MULTISLOT_POWER_PROFILE – 10log(n));

MAX_PWR equals to the MS maximum output power according to the relevant power class and

8-PSK_MULTISLOT_POWER_PROFILE 0 = 0 dB;

8-PSK_MULTISLOT_POWER_PROFILE 1 = 2 dB;

8-PSK_MULTISLOT_POWER_PROFILE 2 = 4 dB;

8-PSK_MULTISLOT_POWER_PROFILE 3 = 6 dB.

DCS 1 800 and PCS 1 900 - end

c) The difference between the transmitter output power at two adjacent power control levels, measured at the same frequency, shall not be less than 0,5 dB and not be more than 3,5 dB.

For R99 and Rel-4, if one or both of the adjacent output power levels are reduced according to the number of timeslots, the difference between the transmitter output power at two adjacent power control levels, measured at the same frequency, shall not be less than -1dB and not be more than 3.5 dB.

From Rel-5 onwards, if one or both of the adjacent output power levels are reduced according to 8PSK_MULTISLOT_POWER_PROFILE X and the number of timeslots, the difference between the transmitter output power at two adjacent power control levels, measured at the same frequency, shall not be less than -1dB and not be more than 3.5 dB

d) The power/time relationship of the measured samples for normal bursts shall be within the limits of the power time template of figure 13.17.3-1for 8-PSK at each frequency, under every combination of normal and extreme test conditions and at each power control level measured.

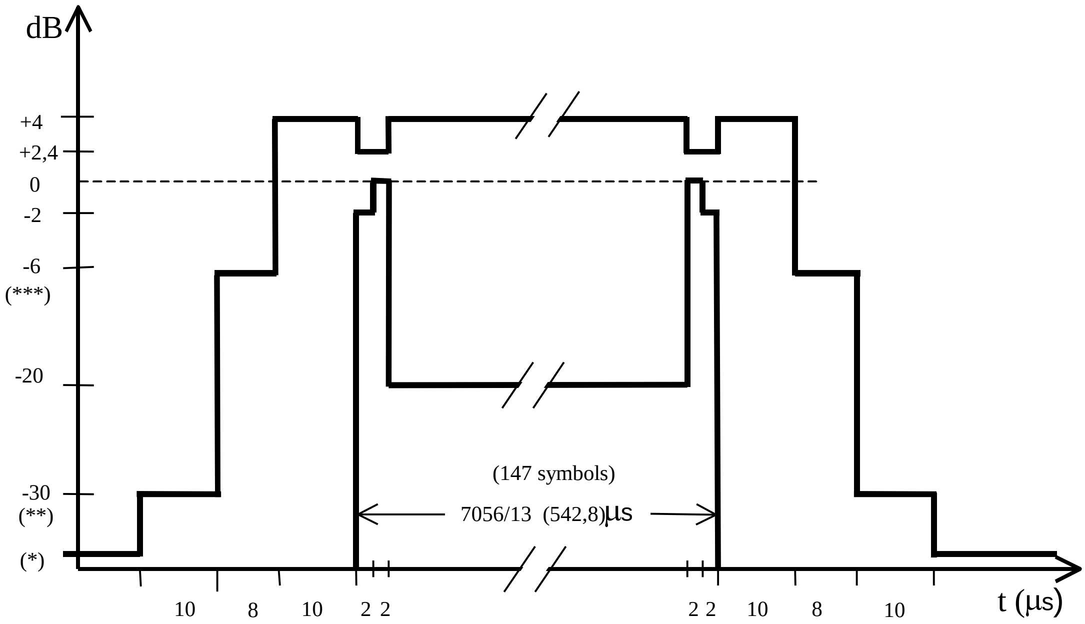

Figure 13.17.3-1: Time mask for normal duration bursts (NB) at 8-PSK modulation

e) All the power control levels, for the type and power class of the MS as stated by the manufacturer, shall be implemented in the MS.

f) When the transmitter is commanded to a power control level outside of the capability corresponding to the type and power class of the MS as stated by the manufacturer, then the transmitter output power shall be within the tolerances for the closest power control level corresponding to the type and power class as stated by the manufacturer.

Table 13.17.3-3: Lowest measurement limit for power / time template

(*)	For bands other than DCS 1800 and PCS 1900 MS	:	59 dBc or -54 dBm whichever is the highest, except for the timeslot preceding the active slot, for which the allowed level is -59 dBc or -36 dBm, whichever is the highest
	For DCS 1 800 MS and PCS 1 900 MS	:	-48 dBc or -48 dBm, whichever is the higher.
		:	no requirement below -30 dBc (see subclause 4.5.1).
(***)	For bands other than DCS 1800 and PCS 1900 MS	:	-4 dBc for power control level 16;
			-2 dBc for power level 17;
			-1 dBc for power level controls levels 18 and 19.
	For DCS 1 800 and PCS 1900 MS		-4dBc for power control level 11,
			-2dBc for power level 12,
			-1dBc for power control levels 13,14 and 15
(**)	For bands other than DCS 1800 and PCS 1900 MS	:	-30 dBc or -17 dBm, whichever is the higher.
	For DCS 1 800 and PCS 1900 MS		-30dBc or -20dBm, whichever is the higher.

13.17.3a Transmitter output power in EGPRS2A configuration

13.17.3a.1 Definition

The transmitter output power is the average value of the power delivered to an artificial antenna or radiated by the MS and its integral antenna, over the time that the useful information bits of one burst are transmitted.

Since the conformance requirement, test procedure and test requirement of GMSK modulated signal's output power are defined in subclause 13.16.2 for GPRS MS, being thereby defined also for all EGPRS MS in that section and the conformance requirement, test procedure and test requirement of 8-PSK modulated signal's output power are defined in subclause 13.17.3 for EGPRS MS, only 16-QAM modulated signal's output power conformance requirement, test procedure and test requirements are defined in this subclause.

13.17.3a.2 Conformance requirement

1. The MS maximum output power for 16-QAM modulated signal shall be as defined in 3GPP TS 45.005, subclause 4.1.1, second table, according to its power class, with a tolerances of ±2 dB, ±3 dB, +3/-4 dB defined under normal conditions in the 3GPP TS 45.005, subclause 4.1.1, second table. From R99 onwards, the MS maximum output power in an uplink multislot configuration shall be as defined in 3GPP TS 45.005 subclause 4.1.1, sixth table, according to its power class, with a tolerance of ±3 dB under normal conditions; 3GPP TS 45.005, subclause 4.1.1, second and seventh table. In case the MS supports the same maximum output power in an uplink multislot configuration as it supports for single slot uplink operation, the tolerance shall be ±2 dB.

2. The MS maximum output power for 16-QAM modulated signal shall be as defined in 3GPP TS 45.005, subclause 4.1.1, second table, according to its power class, with a tolerances of ±2,5 dB, ±4 dB, +4/-4,5 dB defined under extreme conditions in the 3GPP TS 45.005, subclause 4.1.1, second table. From R99 onwards, the MS maximum output power in an uplink multislot configuration shall be as defined in 3GPP TS 45.005 subclause 4.1.1, sixth table, according to its power class, with a tolerance of ±4 dB under extreme conditions; 3GPP TS 45.005, subclause 4.1.1, second and seventh table; 3GPP TS 45.005 annex D in subclauses D.2.1 and D.2.2. In case the MS supports the same maximum output power in an uplink multislot configuration as it supports for single slot uplink operation, the tolerance shall be ±2,5 dB.

3. The power control levels for 16-QAM shall have the nominal output power levels as defined in 3GPP TS 45.005, subclause 4.1.1, fourth table (for GSM 400, GSM 700, GSM 850 and GSM 900), fifth table (for DCS 1 800) or sixth table (for PCS 1 900), from the lowest power control level up to the maximum output power corresponding to the class of the MS (for tolerance on maximum output power see conformance requirement 1), with a tolerance of ±2 dB,±3 dB, 4 dB or 5 dB under normal conditions; 3GPP TS 45.005, subclause 4.1.1, fourth, fifth or sixth table.

4. The power control levels for 16-QAM shall have the nominal output power levels as defined in 3GPP TS 45.005, subclause 4.1.1, fourth table (for GSM 400, GSM 700, GSM 850 and GSM 900), fifth table (for DCS 1 800) or sixth table (for PCS 1 900), from the lowest power control level up to the maximum output power corresponding to the class of the MS (for tolerance on maximum output power see conformance requirements 2), with a tolerance of ±2,5 dB, ±4 dB, 5 dB or 6 dB under extreme conditions; 3GPP TS 45.005, subclause 4.1.1, fourth, fifth or sixth table; 3GPP TS 45.005 annex D subclauses D.2.1 and D.2.2.

4a. From R99 onwards, the supported maximum output power for each number of uplink timeslots shall form a monotonic sequence. The maximum reduction of maximum output power from an allocation of n uplink timeslots to an allocation of n+1 uplink timeslots shall be equal to the difference of maximum permissible nominal reduction of maximum output power for the corresponding number of timeslots, as defined in 3GPP TS 45.005, subclause 4.1.1, seventh table.

5. For 16-QAM, the output power actually transmitted by the MS at consecutive power control levels shall form a monotonic sequence and the interval between power control levels shall be 2 ± 1,5 dB; 3GPP TS 45.005, subclause 4.1.1, from R99 onwards, in a multislot configuration, the first power control step down from the maximum output power is allowed to be in the range 0…2 dB

6. The transmitted power level relative to time for a normal burst shall be within the power/time template given in 3GPP TS 45.005, annex B, figure B.5 for 16-QAM and 32- QAM modulated signal at normal symbol rate. In the case of Multislot Configurations where the bursts in two or more consecutive time slots are actually transmitted at the same frequency, the template of annex B shall be respected during the useful part of each burst and at the beginning and the end of the series of consecutive bursts. The output power during the guard period between every two consecutive active timeslots shall not exceed the level allowed for the useful part of the first timeslot, or the level allowed for the useful part of the second timeslot plus 3 dB, whichever is the highest.

   6.1 Under normal conditions; 3GPP TS 45.005, subclause 4.5.2.

   6.2 Under extreme conditions; 3GPP TS 45.005, subclause 4.5.2, 3GPP TS 45.005 annex D subclauses D.2.1 and D.2.2.

On a multislot uplink configuration the MS may restrict the interslot output power control range to a 10 dB window, on a TDMA frame basis. On those timeslots where the ordered power level is more than 10 dB lower than the applied power level of the highest power timeslot, the MS shall transmit at a lowest possible power level within 10 dB range from the highest applied power level, if not transmitting at the actual ordered power level.

3GPP TS 45.005 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

13.17.3a.3 Test purpose

1. To verify that the maximum output power of the 16-QAM modulated signal of the EGPRS MS, under normal conditions, is within conformance requirement 1.

2. To verify that the maximum output power of the 16-QAM modulated signal of the EGPRS MS, under extreme conditions, is within conformance requirement 2.

3. To verify that the maximum output power of the 16-QAM modulated signal of the EGPRS MS capable of 16-QAM multislot configuration in the uplink, under normal conditions, is within conformance requirement 1.

4. To verify that the maximum output power of the 16-QAM modulated signal of the EGPRS MS capable of 16-QAM multislot configuration in the uplink, under extreme conditions, is within conformance requirement 2.

4a. From R99 onwards: to verify that the supported maximum output power for each uplink multislot configuration is within the conformance requirement 4a.

5. To verify that all nominal output power levels, relevant to the power class of the EGPRS MS for 16-QAM modulation, are implemented in the MS and have output power levels, under normal conditions, within conformance requirement 3.

6. To verify that all nominal output power levels, relevant to the power class of the EGPRS MS for 16-QAM modulation, are implemented in the MS capable of 16-QAM multislot configuration in the uplink and have the output power levels, under normal conditions, within conformance requirement 3.

7. To verify that all nominal output power levels, relevant to the power class of the EGPRS MS for 16-QAM modulation, have output power levels, under extreme conditions, within conformance requirement 4.

8. To verify that all nominal output power levels, relevant to the power class of the EGPRS MS for 16-QAM modulation, have output power levels in 16-QAM multislot configuration in the uplink, under extreme conditions, within conformance requirement 4.

9. To verify that the step in the output power transmitted by the EGPRS MS at consecutive power control levels for 16-QAM modulated signals is within conformance requirement 5 under normal conditions.

10. To verify that the step in the output power transmitted by the EGPRS MS capable of multislot 16-QAM configuration in the uplink at consecutive power control levels for 16-QAM modulated signals is within conformance requirement 5.

11. To verify that the output power relative to time, when sending a normal burst of the 16-QAM modulated signal is within conformance requirement 6:

    11.1 Under normal conditions.

    11.2 Under extreme conditions.

12. To verify that the output power relative to time, when sending a normal burst of 16-QAM modulated signal is within conformance requirement 6 for EGPRS MS capable of 16-QAM multislot configuration in the uplink:

    12.1 Under normal conditions.

    12.2 Under extreme conditions.

NOTE: For EGPRS MS capable of 16-QAM multislot configuration in the uplink, the tests are executed only for multislot configuration.

13.17.3a.4 Methods of test

Two methods of test are described, separately for:

1) equipment fitted with a permanent antenna connector or fitted with a temporary test connector as a test fixture; and for

2) equipment fitted with an integral antenna, and which cannot be connected to an external antenna.

NOTE: The behaviour of the MS in the system is determined to a high degree by the antenna, and this is the only transmitter test in this ETS using the integral antenna. Further studies are ongoing on improved testing on the integral antenna, taking practical conditions of MS use into account.

13.17.3a.4.1 Method of test for equipment with a permanent or temporary antenna connector

13.17.3a.4.1.1 Initial conditions

The test shall be run under the default EGPRS conditions defined in clause 50 with an ARFCN in the mid ARFCN range.

The Test Mode defined in 3GPP TS 44.014 subclause 5.4 shall be utilised. If the MS is capable of both:

Mode (a) transmitting pseudo-random data sequence in RLC data blocks;

Mode (b) transmitting looped-back RLC data blocks.

Then Mode (a) will be used. The SS orders the MS to transmit on the uplink with 16-QAM modulation, on a mid range ARFCN, power control level set to Max power and MS to operate in its highest number of uplink slots.

The SS controls the power level by setting the concerned timeslot's power control parameter ALPHA (α) to 0 and GAMMA_TN (Γ_{CH}) to the desired power level in the Packet Uplink Assignment or Packet Time Slot Reconfigure message (Closed Loop Control, see 3GPP TS 45.008, clause B.2) GPRS_ MS TXPWR_MAX_CCH / MS TXPWR_MAX_CCH is set to the maximum value supported by the Power Class of the Mobile under test. For DCS 1 800 mobile stations the POWER_OFFSET parameter is set to 6 dB.

Specific PICS Statements:

- MS using reduced interslot dynamic range in multislot configurations (TSPC_Addinfo_Red_IntSlotRange_Mult_Conf).
- 8-PSK_MULTISLOT_POWER_PROFILE 0..3 (TSPC_Type_8-PSK_Multislot_Power_Profile_x)

PIXIT statements:

-

13.17.3a.4.1.2 Test procedure

a) Measurement of normal burst transmitter output power

   For 16-QAM, power may be determined by applying the technique described for GMSK in subclause 13.16.2.4.1.2; step a) and then averaging over multiple bursts to achieve sufficient accuracy (see annex 5). Alternatively, an estimation technique based on a single burst which can be demonstrated to yield the same result as the long term average may be used. The long term average or the estimate of long term average is used as the 0dB reference for the power/time template.

b) Measurement of normal burst power/time relationship. The array of power samples measured in a) are referenced in time to the centre of the useful transmitted symbols and in power to the 0 dB reference, both identified in a).

c) Steps a) to b) are repeated on each timeslot within the multislot configuration with the MS commanded to operate on each of the nominal output power levels defined in tables 13.17.3-1, 13.17.3-2 and 13.17.3-3.

   NOTE: Power control levels 0 and 1 are excluded for bands other than DCS 1800 and PCS 1900 since these power control levels can not be set by GAMMA_TN.

d) The SS commands the MS to the maximum power control level supported by the MS and steps a) to b) are repeated on each timeslot within the multislot configuration for ARFCN in the Low and High ranges.

e) The SS commands the MS to the maximum power control level in the first timeslot allocated within the multislot configuration and to the minimum power control level in the second timeslot allocated. Any further timeslots allocated are to be set to the maximum power control level. Steps a) to b) and corresponding measurements on each timeslot within the multislot configuration are repeated. This step is only applicable to MS which support more than one uplink time slot.

f) Steps a) to e) are repeated under extreme test conditions (annex 1, TC2.2) except that the repeats at step c) are only performed for power control level 10 and the minimum nominal output power level supported by the MS.

13.17.3a.4.2 Method of test for equipment with an integral antenna

NOTE: If the MS is equipped with a permanent connector, such that the antenna can be disconnected and the SS be connected directly, then the method of subclause 13.17.3a.4.1 will be applied.

The tests in this subclause are performed on an unmodified test sample.

13.17.3.4.2.1 Initial conditions

The MS is placed in the anechoic shielded chamber (annex 1, GC5) or on the outdoor test site, on an isolated support, in the position for normal use, at a distance of at least 3 metres from a test antenna, connected to the SS.

NOTE: The test method described has been written for measurement in an anechoic shielded chamber. If an outdoor test site is used then, in addition, it is necessary to raise/lower the test antenna through the specified height range to maximize the received power levels from both the test sample and the substitution antenna.

The initial conditions for the MS are defined in subclause 13.17.3a.4.1.1

13.17.3a.4.2.2 Test procedure

a) With the initial conditions set according to subclause 13.17.3a.4.2.1 the test procedure in subclause 13.17.3a.4.1.2 is followed up to and including step e), except that in step a), when measurements are done at maximum power for ARFCN in the Low, Mid and High range, the measurement is made eight times with the MS rotated by n*45 degrees for all values of n in the range 0 to 7.

The measurements taken are received transmitter output power measurements rather than transmitter output power measurements, the output power measurement values can be derived as follows.

b) Assessment of test site loss for scaling of received output power measurements.

The MS is replaced by a half-wave dipole, resonating at the centre frequency of the transmit band, connected to an RF generator.

The frequency of the RF signal generator is set to the frequency of the ARFCN used for the 24 measurements in step a), the output power is adjusted to reproduce the received transmitter output power averages recorded in step a).

For each indication the power, delivered by the generator (in Watts) to the half-wave dipole, is recorded. These values are recorded in the form Pnc, where n = MS rotation and c = channel number.

For each channel number used compute:

$$\text{Pac(Watts into dipole)} = \frac{1}{8} * \sum_{n=0}^{n=7} \text{Pnc}$$

from which: Pac (Tx dBm) = $10\log_{10}$(Pac) + 30 + 2,15

The difference, for each of the three channels, between the actual transmitter output power averaged over the 8 measurement orientations and the received transmitter output power at orientation n = 0 is used to scale the received measurement results to actual transmitter output powers for all measured power control levels and ARFCN, which can then be checked against the requirements.

c) Temporary antenna connector calibration factors (transmit)

A modified test sample equipped with a temporary antenna connector is placed in a climatic test chamber and is linked to the SS by means of the temporary antenna connector.

Under normal test conditions, the power measurement and calculation parts of steps a) to e) of subclause 13.17.3a.4.1.2 are repeated except that the repeats at step d) are only performed for power control level 10 and the minimum nominal output power level supported by the MS.

NOTE 1: The values noted here are related to the output transmitter carrier power levels under normal test conditions, which are known after step b). Therefore frequency dependent calibration factors that account for the effects of the temporary antenna connector can be determined.

d) Measurements at extreme test conditions.

NOTE 2: Basically the procedure for extreme conditions is:

- the power/time template is tested in the "normal" way;
- the radiated power is measured by measuring the difference with respect to the radiated power under normal test conditions.

Under extreme test conditions steps a) to e) of subclause 13.17.3a.4.1.2 are repeated except that the repeats at step d) are only performed for power control level 10 and the minimum nominal output power level supported by the MS.

The transmitter output power under extreme test conditions is calculated for each burst type, power control level and for every frequency used by adding the frequency dependent calibration factor, determined in c), to the values obtained at extreme conditions in this step.

13.17.3a.5 Test requirements

a) The transmitter output power for the 16-QAM modulated signals, under every combination of normal and extreme test conditions, for normal bursts, at each frequency and for each power control level applicable to the MS power class, shall be at the relevant level shown in table 13.17.3a-1 or table 13.17.3a-2 within the tolerances also shown in table 13.17.3a-1 or table 13.17.3a-2.

b) Void

Bands other than DCS 1800 and PCS 1900 beginning

Table 13.17.3a-1: Bands other than DCS 1800 and PCS 1900 transmitter output power for different power classes 16-QAM Modulated Signals

Power class			Power control level (note 3)	GAMMA_TN (Γ_{CH})	Transmitter output power (note 1,2)	Tolerances	
E1	E2	E3					
			2-5	0-3	33	±2 dB	±2.5dB
			6	4	31	±3 dB	±4 dB
			7	5	29	±3 dB	±4 dB
			8	6	27	±3 dB	±4 dB
			9	7	25	±3 dB	±4 dB
			10	8	23	±3 dB	±4 dB
			11	9	21	±3 dB	±4 dB
			12	10	19	±3 dB	±4 dB
			13	11	17	±3 dB	±4 dB
			14	12	15	±3 dB	±4 dB
			15	13	13	±3 dB	±4 dB
			16	14	11	±5 dB	±6 dB
			17	15	9	±5 dB	±6 dB
			18	16	7	±5 dB	±6 dB
			19	17	5	±5 dB	±6 dB

Note 1: For R99 and Rel-4, the maximum output power in a multislot configuration must be lower within the limits defined in table 13.17.3a-1a. From Rel-5 onwards, the maximum output power in a multislot configuration may be lower within the limits defined in table 13.17.3a-1b.

Note 2: For a MS using reduced interslot dynamic range in multislot configurations, the MS may restrict the interslot output power control range to a 10 dB window, on a TDMA frame basis. On those timeslots where the ordered power level is more than 10 dB lower than the applied power level of the highest power timeslot, the MS shall transmit at a lowest possible power level within 10 dB range from the highest applied power level, if not transmitting at the actual ordered power level.

Note 3: There is no requirement to test power control levels 20-31.

Table 13.17.3a-1a: R99 and Rel-4: Bands other than DCS 1800 and PCS 1900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

Table 13.17.3a-1b: From Rel-5 onwards: Bands other than DCS 1800 and PCS 1900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	3,0
3	4,8
4	6,0
5	7,0
6	7,8
7	8,5
8	9,0

From R5 onwards, the actual supported maximum output power shall be in the range indicated by the parameter 16-QAM_MULTISLOT_POWER_PROFILE for n allocated uplink timeslots:

a ≤ MS maximum output power ≤ min(MAX_PWR, a + 2dB)

Where:

a = min (MAX_PWR, MAX_PWR + 8-PSK_MULTISLOT_POWER_PROFILE – 10log(n));

MAX_PWR equals to the MS maximum output power according to the relevant power class and

8-PSK_MULTISLOT_POWER_PROFILE 0 = 0 dB;

8-PSK _MULTISLOT_POWER_PROFILE 1 = 2 dB;

8-PSK _MULTISLOT_POWER_PROFILE 2 = 4 dB;

8-PSK _MULTISLOT_POWER_PROFILE 3 = 6 dB.

Bands other than DCS 1800 and PCS 1900 - end

DCS 1 800 and PCS 1 900 - beginning

Table 13.17.3a-2: DCS 1 800 and PCS 1 900 transmitter output power for different power classes 16-QAM Modulated Signals

Power class			**Power control level (note 3)**	**GAMMA_TN (Γ_{CH})**	**Transmitter output power** (note 1,2)	**Tolerances**	
E1	**E2**	**E3**				**NORMAL**	**EXTREME**
			29,0 *)	0-3 **)	30	±3 dB(note 4)	±4dB(note 4)
			1	4	28	±3 dB	±4 dB
			2	5	26	±3 dB(note 4)	±4 dB(note 4)
			3	6	24	±3 dB	±4 dB
			4	7	22	±3 dB	±4 dB
			5	8	20	±3 dB	±4 dB
			6	9	18	±3 dB	±4 dB
			7	10	16	±3 dB	±4 dB
			8	11	14	±4 dB	±4 dB
			9	12	12	±4 dB	±5 dB
			10	13	10	±4 dB	±5 dB
			11	14	8	±4 dB	±5 dB
			12	15	6	±4 dB	±5 dB
			13	16	4	±5 dB	±5 dB
			14	17	2	±5 dB	±6 dB
			15	18	0	±5 dB	±6 dB

*) 30-0 for PCS 1900 **) 1-3 for PCS 1900

NOTE 1: For R99 and Rel-4, the maximum output power in a multislot configuration must be lower within the limits defined in table 13.17.3a-2a. From Rel-5 onwards, the maximum output power in a multislot configuration may be lower within the limits defined in table 13.17.3a-2b.

NOTE 2: For a MS using reduced interslot dynamic range in multislot configurations, the MS may restrict the interslot output power control range to a 10 dB window, on a TDMA frame basis. On those timeslots where the ordered power level is more than 10 dB lower than the applied power level of the highest power timeslot, the MS shall transmit at a lowest possible power level within 10 dB range from the highest applied power level, if not transmitting at the actual ordered power level.

NOTE 3: There is no requirement to test power control levels 16-28.

NOTE 4: When the power control level corresponds to the power class of the MS, then the tolerances shall be ±2,0 dB under normal test conditions and ±2,5 dB under extreme test conditions for a class E1 mobile. For a class E2 mobile the tolerances shall be -4/+3 under normal test conditions and -4,5/+4 dB under extreme test conditions.

Table 13.17.3a-2a: R99 and Rel-4: DCS 1 800 and PCS 1 900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

Table 13.17.3a-2b: From Rel-5 onwards: DCS 1 800 and PCS 1 900 allowed maximum output power reduction in a multislot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	3,0
3	4,8
4	6,0
5	7,0
6	7,8
7	8,5
8	9,0

From R5 onwards, the actual supported maximum output power shall be in the range indicated by the parameter 16-QAM_MULTISLOT_POWER_PROFILE for n allocated uplink timeslots:

a ≤ MS maximum output power ≤ min(MAX_PWR, a + 3dB)

Where:

a = min (MAX_PWR, MAX_PWR + 8-PSK_MULTISLOT_POWER_PROFILE – 10log(n));

MAX_PWR equals to the MS maximum output power according to the relevant power class and

8-PSK_MULTISLOT_POWER_PROFILE 0 = 0 dB;
8-PSK_MULTISLOT_POWER_PROFILE 1 = 2 dB;
8-PSK_MULTISLOT_POWER_PROFILE 2 = 4 dB;
8-PSK_MULTISLOT_POWER_PROFILE 3 = 6 dB.

DCS 1 800 and PCS 1 900 - end

c) The difference between the transmitter output power at two adjacent power control levels, measured at the same frequency, shall not be less than 0,5 dB and not be more than 3,5 dB.

   For R99 and Rel-4, if one or both of the adjacent output power levels are reduced according to the number of timeslots, the difference between the transmitter output power at two adjacent power control levels, measured at the same frequency, shall not be less than -1dB and not be more than 3.5 dB.

   From Rel-5 onwards, if one or both of the adjacent output power levels are reduced according to 16-QAM_MULTISLOT_POWER_PROFILE X and the number of timeslots, the difference between the transmitter output power at two adjacent power control levels, measured at the same frequency, shall not be less than -1dB and not be more than 3.5 dB

d) The power/time relationship of the measured samples for normal bursts shall be within the limits of the power time template of figure 13.17.3a-1for 16-QAM at each frequency, under every combination of normal and extreme test conditions and at each power control level measured.

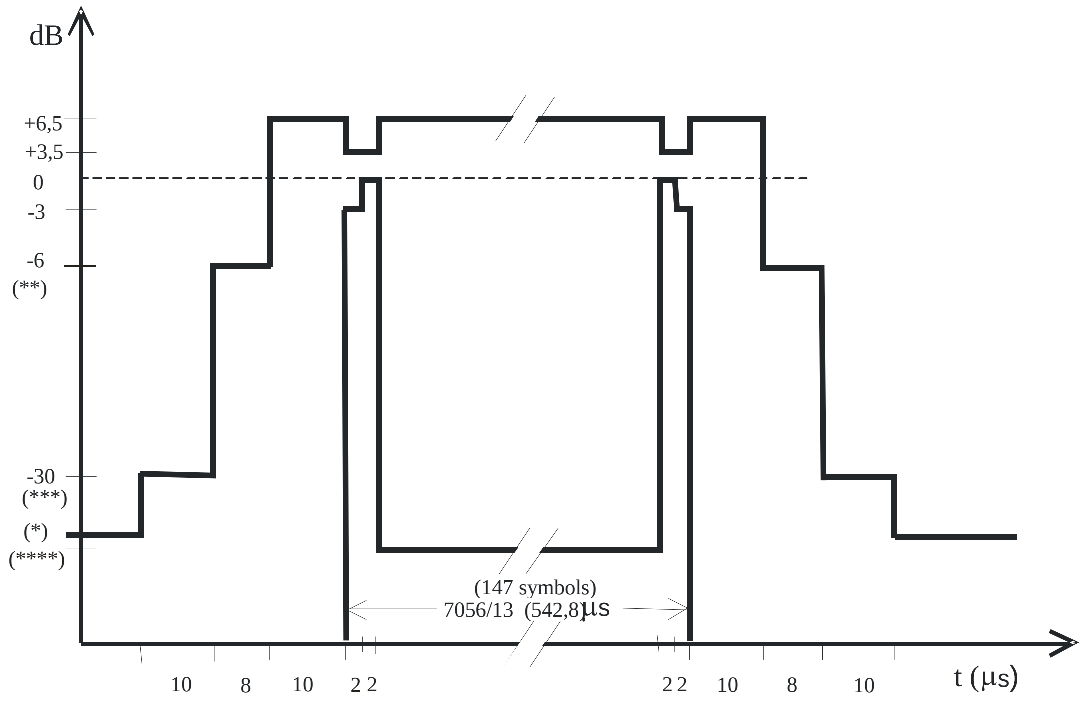

Figure 13.17.3a-1: Time mask for normal duration bursts (NB) at 16-QAM and 32-QAM modulation at normal symbol rate

e) All the power control levels, for the type and power class of the MS as stated by the manufacturer, shall be implemented in the MS.

f) When the transmitter is commanded to a power control level outside of the capability corresponding to the type and power class of the MS as stated by the manufacturer, then the transmitter output power shall be within the tolerances for the closest power control level corresponding to the type and power class as stated by the manufacturer.

Table 13.17.3a-3: Lowest measurement limit for power / time template

(*)	For GSM 400, GSM 850, GSM 700 and GSM 900 MS	:	59 dBc or -54 dBm whichever is the highest, except for the timeslot preceding the active slot, for which the allowed level is -59 dBc or -36 dBm, whichever is the highest
	For DCS 1 800 and PCS 1900 MS	:	-48 dBc or -48 dBm, whichever is the higher.
	For all BTS	:	no requirement below -30 dBc (see subclause 4.5.1).
(**)	For GSM 400, GSM 900, GSM 700 and GSM 850 MS	:	-4 dBc for power control level 16;
			-2 dBc for power control level 17;
			-1 dBc for power control levels 18 and 19-31.
	For DCS 1 800 MS	:	-4 dBc for power control level 11,
			-2 dBc for power control level 12,
			-1 dBc for power control levels 13, 14 and 15-28.
	For PCS 1900 MS	:	-4 dBc for power control level 11,
			-2 dBc for power control level 12,
			-1 dBc for power control levels 13, 14 and 15.
(***)	For GSM 400, GSM 900, GSM 700 and GSM 850 MS	:	-30 dBc or -17 dBm, whichever is the higher.
	For DCS 1 800 and PCS 1900 MS	:	-30 dBc or -20 dBm, whichever is the higher.
(****)	For all BTS and all MS		Lower limit within the useful part of burst is seen as undefined for 16-QAM and 32-QAM.

13.17.4 Output RF spectrum in EGPRS configuration

13.17.4.1 Definition

The output RF spectrum is the relationship between the frequency offset from the carrier and the power, measured in a specified bandwidth and time, produced by the MS due to the effects of modulation and power ramping.

Since the conformance requirement, test procedure and test requirement of GSMK modulated signal's output RF spectrum are defined in subclause 13.16.3 for GPRS MS, being thereby defined also for all EGPRS MS in that section, only 8PSK modulated signal's RF output spectrum conformance requirement, test procedure and test requirements are defined in this subclause.

13.17.4.2 Conformance requirement

1. The level of the output RF spectrum due to 8PSK modulation shall be no more than that given in 3GPP TS 05.05, subclause 4.2.1, with the following lowest measurement limits:

   - -36 dBm below 600 kHz offset from the carrier;

   - -51 dBm for GSM 400, GSM 700, GSM 850 and GSM 900 or -56 dBm for DCS 1 800 and PCS 1 900 from 600 kHz out to less than 1 800 kHz offset from the carrier;

   - -46 dBm for GSM 400, GSM 700, GSM 850 and GSM 900 or -51 dBm for DCS 1 800 and PCS 1 900 at and beyond 1 800 kHz offset from the carrier;

   but with the following exceptions at up to -36 dBm:

   - up to three bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz in the combined range 600 kHz to 6 000 kHz above and below the carrier;

   - up to 12 bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz at more than 6 000 kHz offset from the carrier.

   1.1 Under normal conditions; 3GPP TS 05.05, subclause 4.2.1.

   1.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.2.1; 3GPP TS 05.05, annex D subclauses D.2.1 and D.2.2.

2. The level of the output RF spectrum due to switching transients shall be no more than given in 3GPP TS 05.05, subclause 4.2.2, table "a) Mobile Station".

   2.1 Under normal conditions; 3GPP TS 05.05, subclause 4.2.2.

   2.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.2.2; 3GPP TS 05.05 annex D subclauses D.2.1 and D.2.2.

3. When allocated a channel, the power emitted by the GSM 400, GSM 900 and DCS 1800 MS, in the band 935 MHz to 960 MHz shall be no more than -79 dBm, in the band 925 MHz to 935 MHz shall be no more than -67 dBm and in the band 1 805 MHz to 1 880 MHz shall be no more than -71 dBm, except in five measurements in each of the bands 925 MHz to 960 MHz and 1 805 MHz to 1 880 MHz, where exceptions at up to -36 dBm are permitted. For GSM 400 mobiles, in addition, a limit of -67 dBm shall apply in the frequency bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz.

   For GSM 700, GSM 850 and PCS 1 900, the power emitted by MS, in the band of 728 MHz to 736 MHz shall be no more than -73 dBm, in the band of 736 MHz to 746 MHz shall be no more than -79 dBm, in the band of 747 MHz to 757 MHz shall be no more than -79 dBm, in the band of 757 MHz to 763 MHz shall be no more than -73 dBm, in the band 869 MHz to 894 MHz shall be no more than -79 dBm, in the band 1 930 MHz to 1 990 MHz shall be no more than -71 dBm except in five measurements in each of the bands 728 MHz to 746 MHz, 747 MHz to 763 MHz, 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where exceptions at up to -36 dBm are permitted; 3GPP TS 45.005, subclause 4.3.3.

13.17.4.3 Test purpose

1. To verify that the output RF spectrum due to 8PSK modulation of an EGPRS MS does not exceed conformance requirement 1.

1.1 Under normal conditions.

1.2 Under extreme conditions.

2. To verify that the output RF spectrum due to 8PSK modulation of an EGPRS MS does not exceed conformance requirement 1 in 8PSK uplink multislot configuration.

   2.1 Under normal conditions.

   2.2 Under extreme conditions.

3. To verify that the output RF spectrum due to switching transients of 8PSK modulated signals of an EGPRS MS does not exceed conformance requirement 2 when a reasonable margin is allowed for the effect of spectrum due to modulation.

   3.1 Under normal conditions.

   3.2 Under extreme conditions.

4. To verify that the output RF spectrum due to switching transients of 8PSK modulated signals of an EGPRS MS does not exceed conformance requirement 2 in 8PSK uplink multislot configuration when a reasonable margin is allowed for the effect of spectrum due to modulation.

   4.1 Under normal conditions.

   4.2 Under extreme conditions.

5. To verify that the MS spurious emissions in the MS receive band for 8PSK modulated signals of an EGPRS MS do not exceed conformance requirement 3.

6. To verify that the MS spurious emissions in the MS receive band for 8PSK modulated signals of an EGPRS MS do not exceed conformance requirement 3 in 8PSK uplink multislot configuration.

NOTE: For EGPRS MS capable of 8PSK multislot configuration in the uplink, the tests are executed only for multislot configuration.

13.17.4.4 Method of test

Initial conditions

The test shall be run under the default EGPRS conditions defined in clause 50, with power control parameter ALPHA (α) set to 0.

The Test Mode defined in 3GPP TS 04.14 subclause 5.4 shall be utilised. If the MS I s capable of both:

Mode (a) transmitting pseudo-random data sequence in RLC data blocks;

Mode (b) transmitting looped-back RLC data blocks;

then Mode (a) will be used.

The SS commands the MS to transmit with its maximum number of uplink slots, with 8PSK modulation in hopping mode. The hopping pattern includes only three channels, namely one with an ARFCN in the Low ARFCN range, a second one with an ARFCN in the Mid ARFCN range and the third one with an ARFCN in the High ARFCN range.

The SS shall use a transmission level of 23 dBμVemf( ).

NOTE 1: Although the measurement is made whilst the MS is in hopping mode, each measurement is on one single channel.

NOTE 2: This test is specified in hopping mode as a simple means of making the MS change channel, it would be sufficient to test in non hopping mode and to cell re-select the MS between the three channels tested at the appropriate time.

NOTE 3: Mid ARFCN range for GSM 900 will use the range 63-65 ARFCN

13.17.4.4.2 Test procedure

NOTE: When averaging is in use during frequency hopping mode, the averaging only includes bursts transmitted when the hopping carrier corresponds to the nominal carrier of the measurement.

a) In steps b) to h) the FT is equal to the hop pattern ARFCN in the Mid ARFCN range.

b) The other settings of the spectrum analyser are set as follows:

- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 30 kHz;
- Video averaging: may be used, depending on the implementation of the test.

The video signal of the spectrum analyser is "gated" such that the spectrum generated by at least 40 of the symbols 87 to 132 of the burst in one of the active time slots is the only spectrum measured. This gating may be analogue or numerical, dependent upon the design of the spectrum analyser. Only measurements during transmitted bursts on the nominal carrier of the measurement are included. The spectrum analyser averages over the gated period and over 200 or 50 such bursts, using numerical and/or video averaging.

The MS is commanded to its maximum power control level in every transmitted time slot.

c) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured over 50 bursts at all multiples of 30 kHz offset from FT to < 1 800 kHz.

d) The resolution and video bandwidth on the spectrum analyser are adjusted to 100 kHz and the measurements are made at the following frequencies:

on every ARFCN from 1 800 kHz offset from the carrier to the edge of the relevant transmit band for each measurement over 50 bursts.

at 200 kHz intervals over the 2 MHz either side of the relevant transmit band for each measurement over 50 bursts.

For GSM 400 and DCS 1 800:

at 200 kHz intervals over the band 450 MHz to 496 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 925 MHz to 960 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 1 805 MHz to 1 880 MHz for each measurement over 50 bursts.

For GSM 900

at 200 kHz intervals over the band 925 MHz to 960MHz for each measurement over 50 bursts;

at 200 kHz intervals over the band 1805 MHz to 1880 MHz for each measurement over 50 bursts.

For GSM 700, GSM 850 and DCS 1 900:

at 200 kHz intervals over the band 728MHz to 746 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 747 MHz to 763 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 869 MHz to 894 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 1 930 MHz to 1 990 MHz for each measurement over 50 bursts.

e) The MS is commanded to its minimum power control level. The spectrum analyser is set again as in b).

f) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured over 200 bursts at the following frequencies:

FT;

FT + 100 kHz	FT - 100 kHz;
FT + 200 kHz	FT - 200 kHz;
FT + 250 kHz	FT - 250 kHz;
FT + 200 kHz * N	FT - 200 kHz * N;

where N = 2, 3, 4, 5, 6, 7, and 8;

and FT = RF channel nominal centre frequency.

g) Steps a) to f) is repeated except that in step a) the spectrum analyzer is gated so that the burst of the next active time slot is measured.

h) The spectrum analyser settings are adjusted to:

- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 100 kHz;
- Peak hold.

The spectrum analyser gating of the signal is switched off.

The MS is commanded to its maximum power control level in every transmitted time slot.

i) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured at the following frequencies:

FT + 400 kHz	FT - 400 kHz;
FT + 600 kHz	FT - 600 kHz;
FT + 1,2 MHz	FT - 1,2 MHz;
FT + 1,8 MHz	FT - 1,8 MHz;

where FT = RF channel nominal centre frequency.

The duration of each measurement (at each frequency) will be such as to cover at least 10 burst transmissions at FT.

j) Step i) is repeated for power control levels 7 and 11.

k) Steps b), f), h) and i) are repeated with FT equal to the hop pattern ARFCN in the Low ARFCN range except that in step h) the MS is commanded to power control level 11 rather than maximum power.

l) Steps b), f), h) and i) are repeated with FT equal to the hop pattern ARFCN in the High ARFCN range except that in step h) the MS is commanded to power control level 11 rather than maximum power.

m) Steps a) b) f) h), and i) are repeated under extreme test conditions (annex 1, TC2.2). except that at step h) the MS is commanded to power control level 11.

13.17.4.5 Test requirements

For absolute measurements, performed on a temporary antenna connector, in the frequency band 450 MHz to 486 MHz or 777 MHz to 792 MHz or 824 MHz to 849 MHz or 880 MHz to 915 MHz or 1 710 MHz to 1 785 MHz or 1 850 MHz to 1 910 MHz, the temporary antenna connector coupling factor, determined according to subclause 13.3.4.2.2 and annex 1 GC7, for the nearest relevant frequency, will be used.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 450 MHz to 486 MHz or 925 MHz to 960 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 400 or GSM 900 MS respectively. For a DCS 1 800 MS and PCS 1 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 1 805 MHz to 1 880 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for DCS 1 800 MS. For GSM 400 MS and GSM 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 728 MHz to 763 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 700 MS. For a GSM 400, GSM 850, GSM 900, DCS 1800 or PCS 1 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 869 to 894 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 850 MS. For a GSM 400, GSM 700, GSM 900, DCS 1800 or PCS 1 900 MS 0 dB will be assumed.

The figures in the tables below, at the listed frequencies from the carrier (kHz), are the maximum level (dB) relative to a measurement in 30 kHz bandwidth on the carrier (reference 3GPP TS 05.05 subclause 4.2.1).

a) For the modulation sidebands out to less than 1 800 kHz offset from the carrier frequency (FT) measured in step c), f), i), k), l) and m) the measured power level in dB relative to the power level measured at FT, for all types of MS, shall not exceed the limits derived from the values shown in table 13.17.4-1 for GSM 400, GSM 700, GSM 850 and GSM 900 or table 13.17.4-2 for DCS 1 800 and PCS 1 900 MS, according to the actual transmit power and frequency offset from FT. However any failures in the combined range 600 kHz to less than 1 800 kHz above and below the carrier may be counted towards the exceptions allowed in test requirements c) below.

Table 13.17.4-1: GSM 400, GSM 700, GSM 850 and GSM 900 Spectrum due to modulation out to less than 1 800 kHz offset

	power levels in dB relative to the measurement at FT				
Power level	**Frequency offset (kHz)**				
(dBm)	**0-100**	**200**	**250**	**400**	**600 to < 1 800**
39	+0,5	-30	-33	-60	-66
37	+0,5	-30	-33	-60	-64
35	+0,5	-30	-33	-60	-62
<= 33	+0,5	-30	-33	-60 (note)	-60
The values above are subject to the minimum absolute levels (dBm) below.					
	-36	-36	-36	-36	-51
NOTE: For equipment supporting 8PSK, the requirement for 8-PSK modulation is –54dB.					

Table 13.17.4-2: DCS 1 800/PCS 1 900 Spectrum due to modulation out to less than 1 800 kHz offset

	power levels in dB relative to the measurement at FT				
Power level	**Frequency offset (kHz)**				
(dBm)	**0-100**	**200**	**250**	**400**	**600 to < 1 800**
<= 36	+0,5	-30	-33	-60	-60
34	+0.5	-30	-33	-60	-60
32	+0.5	-30	-33	-60	-60
30	+0.5	-30	-33	-60 (note)	-60
The values above are subject to the minimum absolute levels (dBm) below.					
	-36	-36	-36	-36	-56
NOTE: For equipment supporting 8-PSK, the requirement for 8-PSK modulation is –54dB.					

NOTE 1: For frequency offsets between 100 kHz and 600 kHz the requirement is derived by a linear interpolation between the points identified in the table with linear frequency and power in dB relative.

b) For the modulation sidebands from 1 800 kHz offset from the carrier frequency (FT) and out to 2 MHz beyond the edge of the relevant transmit band, measured in step d), the measured power level in dB relative to the power level measured at FT, shall not exceed the values shown in table 13.17.4-3 according to the actual transmit power, frequency offset from FT and system on which the MS is designed to operate. However any failures in the combined range 1 800 kHz to 6 MHz above and below the carrier may be counted towards the exceptions allowed in test requirements c) below, and any other failures may be counted towards the exceptions allowed in test requirements d) below.

Table 13.17.4-3: Spectrum due to modulation from 1 800 kHz offset to the edge of the transmit band (wideband noise)

power levels in dB relative to the measurement at FT						
GSM 400, GSM 700, GSM 850 and GSM 900				DCS 1 800 and PCS 1 900		
Power	Frequency offset			Power	Frequency offset	
level	kHz			level	kHz	
(dBm)	1 800 to	3 000 to	≥ 6 000	(dBm)	1 800 to	≥ 6 000
	< 3 000	< 6 000			< 6 000	
39	-69	-71	-77	36	-71	-79
37	-67	-69	-75	34	-69	-77
35	-65	-67	-73	32	-67	-75
<= 33	***-63***	***-65***	***-71***	30	-65	*-73*
				28	-63	*-71*
				26	-61	*-69*
				<= 24	-59	*-67*
The values above are subject to the minimum absolute levels (dBm) below.						
	-46	-46	-46		-51	-51

c) Any failures (from a) and b) above) in the combined range 600 kHz to 6 MHz above and below the carrier should be re-checked for allowed spurious emissions. For each of the three ARFCN used, spurious emissions are allowed in up to three 200 kHz bands centred on an integer multiple of 200 kHz so long as no spurious emission exceeds -36 dBm. Any spurious emissions measured in a 30 kHz bandwidth which spans two 200 kHz bands can be counted towards either 200 kHz band, whichever minimizes the number of 200 kHz bands containing spurious exceptions.

d) Any failures (from b) above) beyond 6 MHz offset from the carrier should be re-checked for allowed spurious emissions. For each of the three ARFCN used, up to twelve spurious emissions are allowed so long as no spurious emission exceeds -36 dBm.

e) The MS spurious emissions in the bands 460,4 MHz to 467,6 MHz, 488,8 MHz to 496 MHz, 925 MHz to 935 MHz, 935 MHz to 960 MHz, 1 805 MHz to 1 880 MHz and 1 850 MHz to 1 910 MHz measured in step d), for all types of MS, shall not exceed the values shown in table 13.16.4-4 except in up to 3 measurements in the band 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz, in up to five measurements in the band 925 MHz to 960 MHz and five measurements in the band 1 805 MHz to 1 880 MHz where a level up to -36 dBm is permitted. For GSM 700, GSM 850 and PCS 1 900 the spurious emissions in the bands 728 MHz to 746 MHz, 747 MHz to 763 MHz, 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz shall not exceed the values shown in table 13-17.4-4 except in up to five measurements in each of the bands 728 MHz to 746 MHz , 747 MHz to 763 MHz, 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where a level up to -36 dBm is permitted.

Table 13.17.4-4: Spurious emissions in the MS receive bands

Band (MHz)	Spurious emissions level for GSM 400, GSM 900 and DCS 1800 (dBm)	Spurious emissions level for GSM 700, GSM 850 and PCS 1 900 (dBm)
460 to 496	-67 Applicable only for GSM 400 mobiles	
925 to 935 935 to 960 1 805 to 1 880	-67 -79 -71	
728 to 736		-73
736 to 746		-79
747 to 757		-79
757 to763		-73
869 to 894		-79
1 930 to 1 990		-71
1 850 to 1 910		Comply with FCC rules for wideband PCS services (see 3GPP TS 05.05, subclause 4.3, applicable only for PCS)

f) For the power ramp sidebands of steps h), i) and k) the power levels must not exceed the values shown in table 13.17.4-5 for GSM 700, GSM 850 and GSM 900 or table 13.17.4-6 for DCS 1 800.

Table 13.17.4-5: GSM700, GSM 850 and GSM 900 Spectrum due to switching transients

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1 200 kHz	1 800 kHz
39 dBm	-13 dBm	-21 dBm	-21 dBm	-24 dBm
37 dBm	-15 dBm	-21 dBm	-21 dBm	-24 dBm
35 dBm	-17 dBm	-21 dBm	-21 dBm	-24 dBm
33 dBm	-19 dBm	-21 dBm	-21 dBm	-24 dBm
31 dBm	-21 dBm	-23 dBm	-23 dBm	-26 dBm
29 dBm	-23 dBm	-25 dBm	-25 dBm	-28 dBm
27 dBm	-23 dBm	-26 dBm	-27 dBm	-30 dBm
25 dBm	-23 dBm	-26 dBm	-29 dBm	-32 dBm
23 dBm	-23 dBm	-26 dBm	-31 dBm	-34 dBm
<= +21 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

Table 13.17.4-6: DCS 1 800/PCS 1 900 Spectrum due to switching transients

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1 200 kHz	1 800 kHz
36 dBm	-16 dBm	-21 dBm	-21 dBm	-24 dBm
34 dBm	-18 dBm	-21 dBm	-21 dBm	-24 dBm
32 dBm	-20 dBm	-22 dBm	-22 dBm	-25 dBm
30 dBm	-22 dBm	-24 dBm	-24 dBm	-27 dBm
28 dBm	-23 dBm	-25 dBm	-26 dBm	-29 dBm
26 dBm	-23 dBm	-26 dBm	-28 dBm	-31 dBm
24 dBm	-23 dBm	-26 dBm	-30 dBm	-33 dBm
22 dBm	-23 dBm	-26 dBm	-31 dBm	-35 dBm
<= +20 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

NOTE 2: These figures are different from the requirements in 3GPP TS 05.05 because at higher power levels it is the modulation spectrum which is being measured using a peak hold measurement. This allowance is given in the table.

NOTE 3: The figures for table 13.17.3-5 and table 13.17.3-6 assume that, using the peak hold measurement, the lowest level measurable is 8 dB above the level of the modulation specification using the 30 kHz bandwidth gated average technique for 400 kHz offset from the carrier. At 600 and 1 200 kHz offset the level is 6 dB above and at 1 800 kHz offset the level is 3 dB above. The figures for 1 800 kHz have assumed the 30 kHz bandwidth spectrum due to modulation specification at <1 800 kHz.

13.17.4a Output RF spectrum in EGPRS2A configuration

13.17.4a.1 Definition

The output RF spectrum is the relationship between the frequency offset from the carrier and the power, measured in a specified bandwidth and time, produced by the MS due to the effects of modulation and power ramping.

Since the conformance requirement, test procedure and test requirement of GSMK modulated signal's output RF spectrum are defined in subclause 13.16.3 for GPRS MS, being thereby defined also for all EGPRS MS in that section and the conformance requirement, test procedure and test requirement of 8-PSK modulated signal's output RF spectrum in EGPRS configuration subclause 13.17.4, only 16-QAM modulated signal's RF output spectrum conformance requirement, test procedure and test requirements are defined in this subclause.13.17.4a.2 Conformance requirement

1. The level of the output RF spectrum due to 16-QAM modulation shall be no more than that given in 3GPP TS 45.005, subclause 4.2.1, with the following lowest measurement limits:

   - -36 dBm below 600 kHz offset from the carrier;

   - -51 dBm for GSM 400, GSM 700, GSM 850 and GSM 900 or -56 dBm for DCS 1 800 and PCS 1 900 from 600 kHz out to less than 1 800 kHz offset from the carrier;

   - -46 dBm for GSM 400, GSM 700, GSM 850 and GSM 900 or -51 dBm for DCS 1 800 and PCS 1 900 at and beyond 1 800 kHz offset from the carrier;

   but with the following exceptions at up to -36 dBm:

   - up to three bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz in the combined range 600 kHz to 6 000 kHz above and below the carrier;

   - up to 12 bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz at more than 6 000 kHz offset from the carrier.

   1.1 Under normal conditions; 3GPP TS 45.005, subclause 4.2.1.

   1.2 Under extreme conditions; 3GPP TS 45.005, subclause 4.2.1; 3GPP TS 45.005, annex D subclauses D.2.1 and D.2.2.

2. The level of the output RF spectrum due to switching transients shall be no more than given in 3GPP TS 45.005, subclause 4.2.2, table "a) Mobile Station".

   2.1 Under normal conditions; 3GPP TS 45.005, subclause 4.2.2.

   2.2 Under extreme conditions; 3GPP TS 45.005, subclause 4.2.2; 3GPP TS 45.005 annex D subclauses D.2.1 and D.2.2.

3. When allocated a channel, the power emitted by the GSM 400, GSM 900 and DCS 1800 MS, in the band 935 MHz to 960 MHz shall be no more than -79 dBm, in the band 925 MHz to 935 MHz shall be no more than -67 dBm and in the band 1 805 MHz to 1 880 MHz shall be no more than -71 dBm, except in five measurements in each of the bands 925 MHz to 960 MHz and 1 805 MHz to 1 880 MHz, where exceptions at up to -36 dBm are permitted. For GSM 400 mobiles, in addition, a limit of -67 dBm shall apply in the frequency bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz.

   For GSM 700, GSM 850 and PCS 1 900, the power emitted by MS, in the band of 728 MHz to 736 MHz shall be no more than -73 dBm, in the band of 736 MHz to 746 MHz shall be no more than -79 dBm, in the band of 747 MHz to 757 MHz shall be no more than -79 dBm, in the band of 757 MHz to 763 MHz shall be no more than -73 dBm, in the band 869 MHz to 894 MHz shall be no more than -79 dBm, in the band 1 930 MHz to 1 990 MHz shall be no more than -71 dBm except in five measurements in each of the bands 728 MHz to 746

MHz, 747 MHz to 763 MHz, 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where exceptions at up to -36 dBm are permitted; 3GPP TS 45.005, subclause 4.3.3.

13.17.4a.3 Test purpose

1. To verify that the output RF spectrum due to 16-QAM modulation of an EGPRS MS does not exceed conformance requirement 1.

   1.1 Under normal conditions.

   1.2 Under extreme conditions.

2. To verify that the output RF spectrum due to 16-QAM modulation of an EGPRS MS does not exceed conformance requirement 1 in 16-QAM uplink multislot configuration.

   2.1 Under normal conditions.

   2.2 Under extreme conditions.

3. To verify that the output RF spectrum due to switching transients of 16-QAM modulated signals of an EGPRS MS does not exceed conformance requirement 2 when a reasonable margin is allowed for the effect of spectrum due to modulation.

   3.1 Under normal conditions.

   3.2 Under extreme conditions.

4. To verify that the output RF spectrum due to switching transients of 16-QAM modulated signals of an EGPRS MS does not exceed conformance requirement 2 in 16-QAM uplink multislot configuration when a reasonable margin is allowed for the effect of spectrum due to modulation.

   4.1 Under normal conditions.

   4.2 Under extreme conditions.

5. To verify that the MS spurious emissions in the MS receive band for 16-QAM modulated signals of an EGPRS MS do not exceed conformance requirement 3.

6. To verify that the MS spurious emissions in the MS receive band for 16-QAM modulated signals of an EGPRS MS do not exceed conformance requirement 3 in 16-QAM uplink multislot configuration.

NOTE: For EGPRS MS capable of 16-QAM multislot configuration in the uplink, the tests are executed only for multislot configuration.

13.17.4a.4 Method of test

Initial conditions

The test shall be run under the default EGPRS conditions defined in clause 50, with power control parameter ALPHA (α) set to 0.

The Test Mode defined in 3GPP TS 44.014 subclause 5.4 shall be utilised. If the MS is capable of both:

Mode (a) transmitting pseudo-random data sequence in RLC data blocks;

Mode (b) transmitting looped-back RLC data blocks;

then Mode (a) will be used.

The SS commands the MS to transmit with its maximum number of uplink slots, with 16-QAM modulation in hopping mode. The hopping pattern includes only three channels, namely one with an ARFCN in the Low ARFCN range, a second one with an ARFCN in the Mid ARFCN range and the third one with an ARFCN in the High ARFCN range.

The SS shall use a transmission level of 23 dBµVemf( ).

NOTE 1: Although the measurement is made whilst the MS is in hopping mode, each measurement is on one single channel.

NOTE 2: This test is specified in hopping mode as a simple means of making the MS change channel, it would be sufficient to test in non hopping mode and to cell re-select the MS between the three channels tested at the appropriate time.

NOTE 3: Mid ARFCN range for GSM 900 will use the range 63-65 ARFCN

13.17.4a.4.2 Test procedure

NOTE: When averaging is in use during frequency hopping mode, the averaging only includes bursts transmitted when the hopping carrier corresponds to the nominal carrier of the measurement.

a) In steps b) to h) the FT is equal to the hop pattern ARFCN in the Mid ARFCN range.

b) The other settings of the spectrum analyser are set as follows:

- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 30 kHz;
- Video averaging: may be used, depending on the implementation of the test.

The video signal of the spectrum analyser is "gated" such that the spectrum generated by at least 40 of the symbols 87 to 132 of the burst in one of the active time slots is the only spectrum measured. This gating may be analogue or numerical, dependent upon the design of the spectrum analyser. Only measurements during transmitted bursts on the nominal carrier of the measurement are included. The spectrum analyser averages over the gated period and over 200 or 50 such bursts, using numerical and/or video averaging.

The MS is commanded to its maximum power control level in every transmitted time slot.

c) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured over 50 bursts at all multiples of 30 kHz offset from FT to < 1 800 kHz.

d) The resolution and video bandwidth on the spectrum analyser are adjusted to 100 kHz and the measurements are made at the following frequencies:

on every ARFCN from 1 800 kHz offset from the carrier to the edge of the relevant transmit band for each measurement over 50 bursts.

at 200 kHz intervals over the 2 MHz either side of the relevant transmit band for each measurement over 50 bursts.

For GSM 400 and DCS 1 800:

at 200 kHz intervals over the band 450 MHz to 496 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 925 MHz to 960 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 1 805 MHz to 1 880 MHz for each measurement over 50 bursts.

For GSM 900

at 200 kHz intervals over the band 925 MHz to 960MHz for each measurement over 50 bursts;

at 200 kHz intervals over the band 1805 MHz to 1880 MHz for each measurement over 50 bursts.

For GSM 700, GSM 850 and DCS 1 900:

at 200 kHz intervals over the band 728MHz to 746 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 747 MHz to 763 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 869 MHz to 894 MHz for each measurement over 50 bursts.

at 200 kHz intervals over the band 1 930 MHz to 1 990 MHz for each measurement over 50 bursts.

e) The MS is commanded to its minimum power control level. The spectrum analyser is set again as in b).

f) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured over 200 bursts at the following frequencies:

FT;

FT + 100 kHz	FT - 100 kHz;
FT + 200 kHz	FT - 200 kHz;
FT + 250 kHz	FT - 250 kHz;
FT + 200 kHz * N	FT - 200 kHz * N;

where N = 2, 3, 4, 5, 6, 7, and 8;

and FT = RF channel nominal centre frequency.

g) Steps a) to f) is repeated except that in step a) the spectrum analyzer is gated so that the burst of the next active time slot is measured.

h) The spectrum analyser settings are adjusted to:

- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 100 kHz;
- Peak hold.

The spectrum analyser gating of the signal is switched off.

The MS is commanded to its maximum power control level in every transmitted time slot.

i) By tuning the spectrum analyser centre frequency to the measurement frequencies the power level is measured at the following frequencies:

FT + 400 kHz	FT - 400 kHz;
FT + 600 kHz	FT - 600 kHz;
FT + 1,2 MHz	FT - 1,2 MHz;
FT + 1,8 MHz	FT - 1,8 MHz;

where FT = RF channel nominal centre frequency.

The duration of each measurement (at each frequency) will be such as to cover at least 10 burst transmissions at FT.

j) Step i) is repeated for power control levels 7 and 11.

k) Steps b), f), h) and i) are repeated with FT equal to the hop pattern ARFCN in the Low ARFCN range except that in step h) the MS is commanded to power control level 11 rather than maximum power.

l) Steps b), f), h) and i) are repeated with FT equal to the hop pattern ARFCN in the High ARFCN range except that in step h) the MS is commanded to power control level 11 rather than maximum power.

m) Steps a) b) f) h), and i) are repeated under extreme test conditions (annex 1, TC2.2). except that at step h) the MS is commanded to power control level 11.

13.17.4a.5 Test requirements

For absolute measurements, performed on a temporary antenna connector, in the frequency band 450 MHz to 486 MHz or 777 MHz to 792 MHz or 824 MHz to 849 MHz or 880 MHz to 915 MHz or 1 710 MHz to 1 785 MHz or 1 850 MHz to 1 910 MHz, the temporary antenna connector coupling factor, determined according to subclause 13.3.4.2.2 and annex 1 GC7, for the nearest relevant frequency, will be used.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 450 MHz to 486 MHz or 925 MHz to 960 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 400 or GSM 900 MS respectively. For a DCS 1 800 MS and PCS 1 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 1 805 MHz to 1 880 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for DCS 1 800 MS. For GSM 400 MS and GSM 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 728 MHz to 763 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 700 MS. For a GSM 400, GSM 850, GSM 900, DCS 1800 or PCS 1 900 MS 0 dB will be assumed.

For absolute measurements, performed on a temporary antenna connector, in the frequency band 869 to 894 MHz, the temporary antenna connector coupling factor, will be as determined according to annex 1 GC7 for GSM 850 MS. For a GSM 400, GSM 700, GSM 900, DCS 1800 or PCS 1 900 MS 0 dB will be assumed.

The figures in the tables below, at the listed frequencies from the carrier (kHz), are the maximum level (dB) relative to a measurement in 30 kHz bandwidth on the carrier (reference 3GPP TS 45.005 subclause 4.2.1).

a) For the modulation sidebands out to less than 1 800 kHz offset from the carrier frequency (FT) measured in step c), f), i), k), l) and m) the measured power level in dB relative to the power level measured at FT, for all types of MS, shall not exceed the limits derived from the values shown in table 13.17.4a-1 for GSM 400, GSM 700, GSM 850 and GSM 900 or table 13.17.4a-2 for DCS 1800 or 13.17.4a-3 for PCS 1900 MS, according to the actual transmit power and frequency offset from FT. However any failures in the combined range 600 kHz to less than 1 800 kHz above and below the carrier may be counted towards the exceptions allowed in test requirements c) below where.

Case 1: Normal symbol rate using linearised GMSK pulse-shaping filter and higher symbol rate using spectrally narrow pulse shaping filter

Case 2: Higher symbol rate using spectrally wide pulse shaping filter

Table 13.17.4a-1: GSM 400, GSM 700, GSM 850 and GSM 900 Spectrum due to modulation out to less than 1 800 kHz offset

<table>
<tr><td rowspan="2"></td><td rowspan="2">Power level</td><td colspan="5">power levels in dB relative to the measurement at FT</td></tr>
<tr><td colspan="5">Frequency offset (kHz)</td></tr>
<tr><td rowspan="2">Case 1</td><td>(dBm)</td><td>100</td><td>200</td><td>250</td><td>400</td><td>≥ 600
< 1 800</td></tr>
<tr><td>≥ 39
37
35
≤ 33</td><td>+0,5
+0,5
+0,5
+0,5</td><td>-30
-30
-30
-30</td><td>-33
-33
-33
-33</td><td>-60
-60
-60
-60*</td><td>-66
-64
-62
-60</td></tr>
<tr><td rowspan="2">Case 2</td><td>Power level</td><td>[100]</td><td>[200]</td><td>[250]</td><td>[400]</td><td>[600]</td></tr>
<tr><td>≥ 39
37
35
≤ 33</td><td>[+0,5]
[+0,5]
[+0,5]
[+0,5]</td><td>[-12.3]
[-12.3]
[-12.3]
[-12.3]</td><td>[-25][**]
[-25][**]
[-25][**]
[-25][**]</td><td>[-40][***]
[-40][***]
[-40][***]
[-40][***]</td><td>[-55]
[-55]
[-55]
[-55]</td></tr>
<tr><td colspan="7">The values above are subject to the minimum absolute levels (dBm) below.</td></tr>
<tr><td></td><td>-36</td><td>-36</td><td>-36</td><td>-36</td><td>-36</td><td>-51</td></tr>
<tr><td colspan="7">NOTE: * For equipment supporting QPSK, 8-PSK, 16-QAM or 32-QAM, the requirement for these modulations is -54 dB.
NOTE: ** The requirement shall be [tbd] when the wideband pulse shaping filter with the tight spectrum mask is indicated (see Pulse Format Information Element in 3GPP TS 44.060).
NOTE: *** the requirement shall be [tbd] when the wide pulse shaping filter with the tight spectrum mask is indicated (see Pulse Format Information Element in 3GPP TS 44.060).</td></tr>
</table>

Table 13.17.4a-2: DCS 1800 Spectrum due to modulation out to less than 1 800 kHz offset

	Power level	**power levels in dB relative to the** measurement at FT				
		Frequency offset (kHz)				
	(dBm)	100	200	250	400	≥ 600 < 1 800
Case 1	≥ 36	+0,5	-30	-33	-60	-60
	34	+0,5	-30	-33	-60	-60
	32	+0,5	-30	-33	-60	-60
	30	+0,5	-30	-33	-60*	-60
	28	+0,5	-30	-33	-60*	-60
	26	+0,5	-30	-33	-60*	-60
	≤ 24	+0,5	-30	-33	-60*	-60
	Power Level	[100]	[200]	[250]	[400]	[600]
Case 2	≥ 36	[+0,5]	[-12.3]	[-25][**]	[-40][***]	[-55]
	34	[+0,5]	[-12.3]	[-25][**]	[-40][***]	[-55]
	32	[+0,5]	[-12.3]	[-25][**]	[-40][***]	[-55]
	30	[+0,5]	[-12.3]	[-25][**]	[-40][***]	[-55]
	28	[+0,5]	[-12.3]	[-25][**]	[-40][***]	[-55]
	26	[+0,5]	[-12.3]	[-25][**]	[-40][***]	[-55]
	≤ 24	[+0,5]	[-12.3]	[-25][**]	[-40][***]	[-55]
The values above are subject to the minimum absolute levels (dBm) below.						
		-36	-36	-36	-36	-56
NOTE: * For equipment supporting QPSK, 8-PSK, 16-QAM or 32-QAM, the requirement for these modulations is -54 dB. NOTE: ** The requirement shall be [tbd] when the wideband pulse shaping filter with the tight spectrum mask is indicated (see Pulse Format Information Element in 3GPP TS 44.060). NOTE: *** the requirement shall be [tbd] when the wide pulse shaping filter with the tight spectrum mask is indicated (see Pulse Format Information Element in 3GPP TS 44.060).						

Table 13.17.4a-3: PCS 1900 Spectrum due to modulation out to less than 1800 kHz offset

	Power level	**power levels in dB relative to the measurement at FT**					
		Frequency offset (kHz)					
	(dBm)	100	200	250	400	≥ 600 < 1 200	≥ 1 200 < 1 800
Case 1	≥ 33	+0,5	-30	-33	-60	-60	-60
	32	+0,5	-30	-33	-60	-60	-60
	30	+0,5	-30	-33	-60*	-60	-60
	28	+0,5	-30	-33	-60*	-60	-60
	26	+0,5	-30	-33	-60*	-60	-60
	≤ 24	+0,5	-30	-33	-60*	-60	-60
	Power Level	[100]	[200]	[250]	[400]	[600]	≥ [800] < 1 800
Case 2	≥ 33	[+0,5]	[-12.3]	[-25][**]	[-40][***]	[-55]	[-60]
	32	[+0,5]	[-12.3]	[-25][**]	[-40][***]	[-55]	[-60]
	30	[+0,5]	[-12.3]	[-25][**]	[-40][***]	[-55]	[-60]
	28	[+0,5]	[-12.3]	[-25][**]	[-40][***]	[-55]	[-60]
	26	[+0,5]	[-12.3]	[-25][**]	[-40][***]	[-55]	[-60]
	≤ 24	[+0,5]	[-12.3]	[-25][**]	[-40][***]	[-55]	[-60]
The values above are subject to the minimum absolute levels (dBm) below.							
		-36	-36	-36	-36	-56	-56
NOTE: * For equipment supporting QPSK, 8-PSK, 16-QAM or 32-QAM, the requirement for these modulations is -54 dB. NOTE: ** The requirement shall be [tbd] when the wideband pulse shaping filter with the tight spectrum mask is indicated (see Pulse Format Information Element in 3GPP TS 44.060). NOTE: *** the requirement shall be [tbd] when the wide pulse shaping filter with the tight spectrum mask is indicated (see Pulse Format Information Element in 3GPP TS 44.060).							

NOTE 1: For frequency offsets between 100 kHz and 600 kHz the requirement is derived by a linear interpolation between the points identified in the table with linear frequency and power in dB relative.

b) For the modulation sidebands from 1 800 kHz offset from the carrier frequency (FT) and out to 2 MHz beyond the edge of the relevant transmit band, measured in step d), the measured power level in dB relative to the power level measured at FT, shall not exceed the values shown in table 13.17.4a-4 for GSM 400, GSM 700, GSM 850 and GSM 900 or 13.17.4a-5 for DCS 1800 or 13.17.4a-6 for PCS 1900 according to the actual transmit power, frequency offset from FT and system on which the MS is designed to operate. However any failures in the combined range 1 800 kHz to 6 MHz above and below the carrier may be counted towards the exceptions allowed in test requirements c) below, and any other failures may be counted towards the exceptions allowed in test requirements d) below.

Table 13.17.4a-4: GSM 400, GSM 700, GSM 850 and GSM 900 Spectrum due to modulation from 1 800 kHz offset to the edge of the transmit band (wideband noise)

	Power level	**power levels in dB relative to the** measurement at FT			
		Frequency offset (kHz)			
Case 1	(dBm)	≥ 1 800 < 3 000	≥ 3 000 < 6 000	≥ 6 000	
	≥ 39 37 35 ≤ 33	-66 -64 -62 -60	-69 -67 -65 -63	-71 -69 -67 -65	
Case 2	Power level	≥ [800] < 1 800	≥ 1 800 < 3 000	≥ 3 000 < 6 000	≥ 6 000
	≥ 39 37 35 ≤ 33	[-60] [-60] [-60] [-60]	[-63] [-63] [-63] [-63]	[-65] [-65] [-65] [-65]	[-71] [-71] [-71] [-71]
The values above are subject to the minimum absolute levels (dBm) below.					
		-46	-46	-46	-46
NOTE: * For equipment supporting QPSK, 8-PSK, 16-QAM or 32-QAM, the requirement for these modulations is -54 dB. NOTE: ** The requirement shall be [tbd] when the wideband pulse shaping filter with the tight spectrum mask is indicated (see Pulse Format Information Element in 3GPP TS 44.060). NOTE: *** the requirement shall be [tbd] when the wide pulse shaping filter with the tight spectrum mask is indicated (see Pulse Format Information Element in 3GPP TS 44.060).					

Table 13.17.4a-5: DCS 1800 Spectrum due to modulation from 1800 kHz offset to the edge of the transmit band (wideband noise)

	Power level	**power levels in dB relative to the** measurement at FT			
		Frequency offset (kHz)			
	(dBm)	≥ 1 800 < 6 000	≥ 6 000		
Case 1	≥ 36 34 32 30 28 26 ≤ 24	-71 -69 -67 -65 -63 -61 -59	-79 -77 -75 -73 -71 -69 -67		
Case 2	Power Level	≥ [800] < 1 800	≥ 1 800 < 3 000	≥ 3 000 < 6 000	≥ 6 000
	≥ 36 34 32 30 28 26 ≤ 24	[-60] [-60] [-60] [-60] [-60] [-60] [-60]	[-63] [-63] [-63] [-63] [-63] [-63] [-63]	[-65] [-65] [-65] [-65] [-65] [-65] [-65]	[-71] [-71] [-71] [-71] [-71] [-71] [-71]
The values above are subject to the minimum absolute levels (dBm) below.					
		-51	-51	-51	-51
NOTE: * For equipment supporting QPSK, 8-PSK, 16-QAM or 32-QAM, the requirement for these modulations is -54 dB. NOTE: ** The requirement shall be [tbd] when the wideband pulse shaping filter with the tight spectrum mask is indicated (see Pulse Format Information Element in 3GPP TS 44.060). NOTE: *** the requirement shall be [tbd] when the wide pulse shaping filter with the tight spectrum mask is indicated (see Pulse Format Information Element in 3GPP TS 44.060).					

Table 13.17.4a-6: PCS 1900 Spectrum due to modulation from 1800 kHz offset to the edge of the transmit band (wideband noise)

	Power level	power levels in dB relative to the measurement at FT		
		Frequency offset (kHz)		
	(dBm)	≥ 1 800 < 6 000	≥ 6 000	
Case 1	≥ 33 32 30 28 26 ≤ 24	-68 -67 -65 -63 -61 -59	-76 -75 -73 -71 -69 -67	
Case 2	Power Level	≥ 1 800 < 3 000	≥ 3 000 < 6 000	≥ 6 000
	≥ 33 32 30 28 26 ≤ 24	[-63] [-63] [-63] [-63] [-63] [-63]	[-65] [-65] [-65] [-65] [-65] [-65]	[-71] [-71] [-71] [-71] [-71] [-71]
The values above are subject to the minimum absolute levels (dBm) below.				
		-51	-51	-51
NOTE: * For equipment supporting QPSK, 8-PSK, 16-QAM or 32-QAM, the requirement for these modulations is -54 dB. NOTE: ** The requirement shall be [tbd] when the wideband pulse shaping filter with the tight spectrum mask is indicated (see Pulse Format Information Element in 3GPP TS 44.060). NOTE: *** the requirement shall be [tbd] when the wide pulse shaping filter with the tight spectrum mask is indicated (see Pulse Format Information Element in 3GPP TS 44.060).				

c) Any failures (from a) and b) above) in the combined range 600 kHz to 6 MHz above and below the carrier should be re-checked for allowed spurious emissions. For each of the three ARFCN used, spurious emissions are allowed in up to three 200 kHz bands centred on an integer multiple of 200 kHz so long as no spurious emission exceeds -36 dBm. Any spurious emissions measured in a 30 kHz bandwidth which spans two 200 kHz bands can be counted towards either 200 kHz band, whichever minimizes the number of 200 kHz bands containing spurious exceptions.

d) Any failures (from b) above) beyond 6 MHz offset from the carrier should be re-checked for allowed spurious emissions. For each of the three ARFCN used, up to twelve spurious emissions are allowed so long as no spurious emission exceeds -36 dBm.

e) The MS spurious emissions in the bands 390.2 - 400 MHz and 420.2 - 430 MHz , 460,4 MHz to 467,6 MHz, 488,8 MHz to 496 MHz, 851- 866 MHz , 921 - 925 MHz, 925 MHz to 935 MHz, 935 MHz to 960 MHz, 1 805 MHz to 1 880 MHz, 1 850 MHz to 1 910 MHz, 1900 - 1920 MHz, 1920 - 1980 MHz, 2010 - 2025 MHz, 2110 - 2170 MHz and 2300-2400 MHz measured in step d), for all types of MS, shall not exceed the values shown in table 13.16.4-4.

As exceptions up to five measurements with a level up to -36 dBm are permitted in each of the bands 851MHz to 866 MHz, 925 MHz to 960 MHz, 1 805 MHz to 1 880 MHz, 1900 - 1920 MHz, 1920 - 1980 MHz, 2010 - 2025 MHz, and 2110 - 2170 MHz for each ARFCN used in the measurements. For GSM 400 MS, in addition, exceptions up to three measurements with a level up to -36 dBm are permitted in each of the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz for each ARFCN used in the measurements.

A maximum of five exceptions with a level up to -36 dBm are permitted in each of the band 728 MHz to 746 MHz, 747 MHz to 763 MHz, 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz for each ARFCN used in the measurements.

Table 13.17.4a-7: Spurious emissions in the MS receive bands

Band (MHz)	Spurious emissions level for GSM 400, GSM 900 and DCS 1800 (dBm)	Spurious emissions level for GSM 700, GSM 850 and PCS 1 900 (dBm)
390 to 430	-62 Applicable only for GSM 400 mobiles T-GSM 380 and T-GSM 410	
460 to 496	-67 Applicable only for GSM 400 mobiles	
851- 866	-79 Applicable only for T-GSM 810 MS	
921 - 925	-60 Applicable only for R-GSM MS	
925 to 935 935 to 960 1 805 to 1 880 1900 to1980 2010 to 2025 2110-2170 2300-2400	-67 -79 -71 -66 -66 -66 -66	
728 to 736		-73
736 to 746		-79
747 to 757		-79
757 to763		-73
869 to 894		-79
1 930 to 1 990		-71
1 850 to 1 910		Comply with FCC rules for wideband PCS services (see 3GPP TS 05.05, subclause 4.3, applicable only for PCS)

f) For the power ramp sidebands of steps h), i) and k) the power levels must not exceed the values shown in table 13.17.4a-8 for GSM 700, GSM 850 and GSM 900 or table 13.17.4a-9 for DCS 1 800 and PCS 1900.

Table 13.17.4a-8: GSM700, GSM 850 and GSM 900 Spectrum due to switching transients

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1 200 kHz	1 800 kHz
39 dBm	-13 dBm	-21 dBm	-21 dBm	-24 dBm
37 dBm	-15 dBm	-21 dBm	-21 dBm	-24 dBm
35 dBm	-17 dBm	-21 dBm	-21 dBm	-24 dBm
33 dBm	-19 dBm	-21 dBm	-21 dBm	-24 dBm
31 dBm	-21 dBm	-23 dBm	-23 dBm	-26 dBm
29 dBm	-23 dBm	-25 dBm	-25 dBm	-28 dBm
27 dBm	-23 dBm	-26 dBm	-27 dBm	-30 dBm
25 dBm	-23 dBm	-26 dBm	-29 dBm	-32 dBm
23 dBm	-23 dBm	-26 dBm	-31 dBm	-34 dBm
<= +21 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

Table 13.17.4a-9: DCS 1 800/PCS 1 900 Spectrum due to switching transients

Power level	Maximum level for various offsets from carrier frequency			
	400 kHz	600 kHz	1 200 kHz	1 800 kHz
36 dBm	-16 dBm	-21 dBm	-21 dBm	-24 dBm
34 dBm	-18 dBm	-21 dBm	-21 dBm	-24 dBm
32 dBm	-20 dBm	-22 dBm	-22 dBm	-25 dBm
30 dBm	-22 dBm	-24 dBm	-24 dBm	-27 dBm
28 dBm	-23 dBm	-25 dBm	-26 dBm	-29 dBm
26 dBm	-23 dBm	-26 dBm	-28 dBm	-31 dBm
24 dBm	-23 dBm	-26 dBm	-30 dBm	-33 dBm
22 dBm	-23 dBm	-26 dBm	-31 dBm	-35 dBm
<= +20 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm

NOTE 2: These figures are different from the requirements in 3GPP TS 05.05 because at higher power levels it is the modulation spectrum which is being measured using a peak hold measurement. This allowance is given in the table.

NOTE 3: The figures for table 13.17.3-5 and table 13.17.3-6 assume that, using the peak hold measurement, the lowest level measurable is 8 dB above the level of the modulation specification using the 30 kHz bandwidth gated average technique for 400 kHz offset from the carrier. At 600 and 1 200 kHz offset the level is 6 dB above and at 1 800 kHz offset the level is 3 dB above. The figures for 1 800 kHz have assumed the 30 kHz bandwidth spectrum due to modulation specification at <1 800 kHz.

13.17.5 Void