

12 Transceiver

12.1 Conducted spurious emissions

12.1.1 MS allocated a channel

12.1.1.1 Definition and applicability

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.

The requirements and this test apply to all types of GSM 900 and DCS 1 800 MS with a permanent antenna connector.

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; GSM 05.05, 4.3/4.3.3.

1.2 Under extreme voltage conditions; GSM 05.05, 4.3/4.3.3/Annex D.2.

Table 12.1

Frequency range	Power level in dBm	
	GSM900	DCS1800
9 kHz to 1 GHz	-36	-36
1 GHz to 12,75 GHz	-30	
1 GHz to 1710 MHz		-30
1710 MHz to 1785 MHz		-36
1785 MHz to 12,75 GHz		-30

12.1.1.3 Test purpose

1. To verify that conducted spurious emissions, in the frequency band 100 kHz to 12,75 GHz excluding the GSM900 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 - 100 kHz is not tested, because of test implementation problems.

12.1.1.4 Method of test

12.1.1.4.1 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 commands 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.

12.1.1.4.2 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 Ohm 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 to 500 MHz	-	100 kHz	300 kHz
500 MHz to 12,75 GHz, excl. relevant TX band: P-GSM: 890 to 915 MHz; E-GSM: 880 to 915 MHz; DCS: 1710 to 1785 MHz, and the RX bands: 925 to 960 MHz; 1805 to 1880 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: P-GSM: 890 to 915 MHz E-GSM: 880 to 915 MHz DCS: 1710 to 1785 MHz	1,8 to 6,0 MHz > 6,0 MHz (offset from carrier)	30 kHz 100 kHz	100 kHz 300 kHz

NOTE 1: The frequency ranges 925 MHz to 960 MHz and 1 805 MHz to 1 880 MHz are excluded as these ranges are tested in section [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	
	GSM900	DCS1800
100 kHz to 1 GHz	-36	-36
1 GHz to 12,75 GHz	-30	
1 GHz to 1710 MHz		-30
1710 MHz to 1785 MHz		-36
1785 MHz to 12,75 GHz		-30

12.1.2 MS in idle mode

12.1.2.1 Definition and applicability

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

The requirements and this test apply to all types of GSM 900 and DCS 1 800 MS with a permanent antenna connector.

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; GSM 05.05, 4.3/4.3.3.
 - 1.2 Under extreme voltage conditions; GSM 05.05, 4.3/4.3.3/Annex D.2.

Table 12.4

Frequency range		Power level in dBm
9 kHz to	880 MHz	-57
880 MHz to	915 MHz	-59
915 MHz to	1000 MHz	-57
1 GHz to	1710 MHz	-47
1710 MHz to	1785 MHz	-53
1785 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 - 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 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_BLKES_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".

12.1.2.4.2 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 Ohm 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
100 kHz to 880 MHz	-57
880 MHz to 915 MHz	-59
915 MHz to 1000 MHz	-57
1 GHz to 1710 MHz	-47
1710 MHz to 1785 MHz	-53
1785 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:

- Raise/lower the test antenna through the specified height range during both the emission detection and substitution parts of the test.
- 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.
- Detect emissions at a more sensitive threshold to that specified in section 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 and applicability

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 requirements apply to all types of GSM 900 and DCS 1 800 MS. The test applies to all types of GSM 900 and DCS 1 800 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; GSM 05.05, 4.3/4.3.3.
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; GSM 05.05, 4.3/4.3.3/annex D.2.

Table 12.7

Frequency range		Power level in dBm	
		GSM900	DCS1800
30 MHz to	1 GHz	-36	-36
1 GHz to	4 GHz	-30	-36
1 GHz to	1710 MHz		-30
1710 MHz to	1785 MHz		-36
1785 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 commands 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: 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 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 12.8

Frequency range	Frequency offset	Filter bandwidth	Approx video bandwidth
30 to 50 MHz	-	10 kHz	30 kHz
50 to 500 MHz	-	100 kHz	300 kHz
500 MHz to 4 GHz,	0 to 10 MHz	100 kHz	300 kHz
excl. relevant TX band:	>= 10 MHz	300 kHz	1 MHz
P-GSM: 890 to 915 MHz;	>= 20 MHz	1 MHz	3 MHz
E-GSM: 880 to 915 MHz;	>= 30 MHz	3 MHz	3 MHz
DCS: 1710 to 1785 MHz.	(offset from edge of relevant TX band)		
relevant TX band:			
P-GSM: 890 to 915 MHz	1,8 to 6,0 MHz	30 kHz	100 kHz
E-GSM: 880 to 915 MHz	> 6,0 MHz	100 kHz	300 kHz
DCS: 1710 to 1785 MHz	(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.

12.2.1.5 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 and applicability

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 requirements apply to all types of GSM 900 and DCS 1 800 MS. The test applies to all types of GSM 900 and DCS 1 800 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; GSM 05.05, 4.3/4.3.3.
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; GSM 05.05, 4.3/4.3.3/Annex D.2.

Table 12.9

Frequency range		Power level in dBm
30 MHz to	880 MHz	-57
880 MHz to	915 MHz	-59
915 MHz to	1000 MHz	-57
1 GHz to	1710 MHz	-47
1710 MHz to	1785 MHz	-53
1785 MHz to	4 GHz	-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: 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_BLKES_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".

12.2.2.4.2 Procedure

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

NOTE: 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: 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	10 kHz	30 kHz
50 MHz to 4 GHz	100 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.