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CTS-FP Radio subsystem
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1 Scope

The present document specifies the requirements for the CTS-Fixed Part (CTS-FP) transceiver of the digital mobile cellular and personal communication systems operating in the 900 MHz (P-GSM and E-GSM) and 1 800 MHz band (GSM 900 and DCS 1 800), and specifies the Radio subsystem frequency control implemented in the CTS-Fixed Part.

Unless otherwise stated, the requirements defined in the present document apply to the full range of environmental conditions specified for the CTS-FP equipment (see annex C).

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
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- [1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".
- [2] GSM 03.22: "Digital cellular telecommunications system (Phase 2+); Functions related to Mobile Station (MS) in idle mode and group receive mode".
- [3] GSM 03.52 : "Digital cellular telecommunications system (Phase 2+); GSM Cordless Telephony System (CTS); Lower layers of the CTS radio interface; Stage 2".
- [4] GSM 04.56 : "Digital cellular telecommunications system (Phase 2+); GSM Cordless Telephony System (CTS); CTS radio interface layer 3 specification".
- [5] GSM 05.01: "Digital cellular telecommunications system (Phase 2+); Physical layer on the radio path General description".
- [6] GSM 05.02: "Digital cellular telecommunications system (Phase 2+); Multiplexing and multiple access on the radio path".
- [7] GSM 05.04: "Digital cellular telecommunications system (Phase 2+); Modulation".
- [8] GSM 05.05: "Digital cellular telecommunications system (Phase 2+); Radio transmission and reception".
- [9] GSM 05.08: "Digital cellular telecommunications system (Phase 2+); Radio subsystem link control".
- [10] GSM 05.10: "Digital cellular telecommunications system (Phase 2+); Radio subsystem synchronization".
- [11] GSM 11.56: "Digital cellular telecommunications system (Phase 2+); CTS-Fixed Part conformance specification".
- [12] GSM 03.56: "Digital cellular telecommunications system (Phase 2+); GSM Cordless Telephony System (CTS); CTS Architecture Description; Stage 2".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

CTS Mobile Station: GSM-MS supporting CTS.

CTS Fixed Part: CTS-FP is a device which acts as a link between the CTS-MS and the fixed network.

GSM-CTS: Cordless Telephony System based on GSM.

3.2 Abbreviations

Abbreviations used in the present document are listed in GSM 01.04. In addition, the following abbreviations are used:

AFA	Adaptive Frequency Allocation
CTS	Cordless Telephony System
CTS-FP	CTS-Fixed Part
CTS-MS	CTS-Mobile Station
GFL	Generic Frequency List
TFH	Total Frequency Hopping

4 Radio transmission and reception

4.1 Frequency band and channels arrangements

- i) Standard or primary GSM 900 Band, P-GSM:
 - for Standard GSM 900 band, the CTS-FP is required to operate in the following frequency band:
 - 890 MHz to 915 MHz: CTS-FP receive;
 - 935 MHz to 960 MHz: CTS-FP transmit.
- ii) Extended GSM 900 Band, E-GSM (includes Standard GSM 900 band):
 - for Extended GSM 900 band, the CTS-FP is required to operate in the following frequency band:
 - 880 MHz to 915 MHz: CTS-FP receive;
 - 925 MHz to 960 MHz: CTS-FP transmit.
- iii) DCS 1 800 Band:
 - for DCS 1 800 band, the CTS-FP is required to operate in the following band:
 - 1 710 MHz to 1 785 MHz: CTS-FP receive;
 - 1 805 MHz to 1 880 MHz: CTS-FP transmit.

The carrier spacing is 200 kHz.

The carrier frequency is designated by the absolute radio frequency channel number (ARFCN) as specified in GSM 05.05 clause 2.

4.2 Reference configuration

The reference configuration for the CTS-FP radio subsystem is described in GSM 05.01.

4.3 Transmitter characteristics

Throughout this clause, unless otherwise stated, requirements are given in terms of power levels at the antenna connector of the equipment. If an active device is added to the CTS-FP antenna connector, the requirements of this clause shall also be met at the output of this active device. For equipment with integral antenna only, a reference antenna with 0 dBi gain shall be assumed.

The term output power refers to the measure of the power when averaged over the useful part of the burst (see annex B).

The term peak hold refers to a measurement where the maximum is taken over a sufficient time that the level would not significantly increase if the holding time were longer.

4.3.1 Output power

The CTS-FP maximum output power and lowest nominal output power shall be, as defined in the following table.

	GSM 900	DCS 1 800	Tolerance (dB) for conditions	
			normal	extreme
Maximum Nominal output power	11 dBm	12 dBm	+0/-2	+0,5/-2,5
Lowest Nominal output power	-9 dBm	-8 dBm	±4	±5

The different power control levels needed to support downlink adaptive RF power control (see GSM 05.08) shall have the nominal output power as defined in the table below, starting from the power control level for the lowest nominal output power up to the power control level for the maximum nominal output power as defined in the table above.

GSM 900			
Power control level	Nominal Output power (dBm)	Tolerance (dB) for conditions	
		normal	extreme
1	11	+0/-2	+0,5/-2,5
2	9	±2	±3
3	7	±3	±4
4	5	±3	±4
5	3	±3	±4
6	1	±3	±4
7	-1	±3	±4
8	-3	±4	±5
9	-5	±4	±5
10	-7	±4	±5
11-14	-9	±4	±5

DCS 1 800			
Power control level	Nominal Output power (dBm)	Tolerance (dB) for conditions	
		normal	extreme
1-4	12	+0/-2	+0,5/-2,5
5	10	±2	±3
6	8	±3	±4
7	6	±3	±4
8	4	±3	±4
9	2	±3	±4
10	0	±3	±4
11	-2	±4	±5
12	-4	±4	±5
13	-6	±4	±5
14	-8	±4	±5

NOTE: The above definition of the power control levels for GSM 900 and DCS 1800 allows to have an equivalent indoor coverage when the same power control level is applied in GSM 900 and DCS 1800.

Furthermore, the difference in output power actually transmitted by the CTS-FP between two power control levels where the difference in nominal output power indicates an increase of 2 dB (taking into account the restrictions due to nominal maximum and lowest output powers), shall be $+2 \pm 1,5$ dB. Similarly, if the difference in output power actually transmitted by the CTS-FP between two power control levels where the difference in nominal output power indicates an decrease of 2 dB (taking into account the restrictions due to nominal maximum and lowest output powers), shall be $-2 \pm 1,5$ dB.

4.3.2 Output RF spectrum

The specifications contained in this clause apply to CTS-FP, in frequency hopping as well as in non frequency hopping mode.

Due to the bursty nature of the signal, the output RF spectrum results from two effects:

- the modulation process;
- the power ramping up and down (switching transients).

The two effects are specified separately; the measurement method used to analyse separately those two effects is specified in GSM 11.56. It is based on the "ringing effect" during the transients, and is a measurement in the time domain, at each point in frequency.

The limits specified thereunder are based on a 5-pole synchronously tuned measurement filter.

4.3.2.1 Spectrum due to the modulation and wide band noise

The output RF modulation spectrum is specified in the following tables. A mask representation of the present document is shown in annex A. The present document applies for all RF channels supported by the equipment.

The specification applies to the entire of the relevant transmit band and up to 2 MHz either side.

The specification shall be met under the following measurement conditions:

- zero frequency scan, filter bandwidth and video bandwidth of 30 kHz up to 1800 kHz from the carrier and 100 kHz at 1800 kHz and above from the carrier, with averaging done over 50 % to 90 % of the useful part of the transmitted bursts, excluding the midamble, and then averaged over at least 200 such burst measurements. Above 1800 kHz from the carrier only measurements centred on 200 kHz multiples are taken with averaging over 50 bursts;

- when tests are done in frequency hopping mode, the averaging shall include only bursts transmitted when the hopping carrier corresponds to the nominal carrier of the measurement. The specifications then apply to the measurement results for any of the hopping frequencies.

The power level is the "actual absolute output power" defined in clause 4.3.1.

The figures in tables a) and b) below, at the horizontally listed frequency offset from the carrier (kHz), are then the maximum allowed level (dB) relative to a measurement in 30 kHz on the carrier.

a) GSM 900 CTS-FP:

	100	200	250	400	≥ 600 < 1 800	$\geq 1\ 800$ < 6 000	$\geq 6\ 000$
dBc	+0,5	-30	-33	-60	-60	-68	-71

b) DCS 1800 CTS-FP:

	100	200	250	400	≥ 600 < 1 800	$\geq 1\ 800$ < 6 000	$\geq 6\ 000$
dBc	+0,5	-30	-33	-60	-60	-63	-67

The following exceptions shall apply, using the same measurement conditions as specified above:

- in the combined range 600 kHz to 6 MHz above and below the carrier, in up to three bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz, exceptions at up to -36 dBm are allowed;
- above 6 MHz offset from the carrier in up to 12 bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz, exceptions at up to -36 dBm are allowed. For the BTS only one transmitter is active for this test.

Using the same measurement conditions as specified above, if a requirement in tables a) and b) is tighter than the limit given in the following, the latter shall be applied instead.

Frequency offset from the carrier	GSM 900	DCS 1 800
< 1 800 kHz	-69 dBm	-64 dBm
$\geq 1\ 800$ kHz	-64 dBm	-59 dBm

4.3.2.2 Spectrum due to switching transient

Those effects are also measured in the time domain and the specifications assume the following measurement conditions: zero frequency scan, filter bandwidth 30 kHz, peak hold, and video bandwidth 100 kHz.

The example of a waveform due to a burst as seen in a 30 kHz filter offset from the carrier is given in the figure 1 of GSM 05.05.

The maximum level measured, after any filters and combiners, at the indicated offset from the carrier, shall be: