



**SLOVENSKI STANDARD**  
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Digital cellular telecommunications system (Phase 2 and Phase 2+) (GSM); Base Station System (BSS) equipment specification; Radio aspects (GSM 11.21 version 5.3.1)

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# EN 301 087 V5.3.1 (1998-11)

*European Standard (Telecommunications series)*

## **Digital cellular telecommunications system (Phase 2 and Phase 2+); Base Station System (BSS) equipment specification; Radio aspects (GSM 11.21 version 5.3.1)**

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## Foreword

This EN has been produced by the Special Mobile Group (SMG) of the European Telecommunications Standards Institute (ETSI).

This EN specifies the Radio Frequency (RF) test methods and conformance requirements for GSM 900 and DCS 1800 Base Station Systems (BSS)s. within the Digital cellular telecommunications system (Phase 2+).

The contents of this EN may be subject to continuing work within SMG and may change following formal SMG approval. Should SMG modify the contents of this EN, it will be resubmitted for formal approval procedure by ETSI with an identifying change of release date and an increase in version number as follows:

Version 5.x.y

where:

- x the second digit is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.
- y the third digit is incremented when editorial only changes have been incorporated in the specification

NOTE: This EN contains both essential conformance requirements and complete conformance requirements. Essential conformance requirements are those requirements which may be deemed sufficient for radio type approval purposes, complete conformance requirements cover all conformance aspects.

### National transposition dates

Date of adoption of this EN:	9 October 1998
Date of latest announcement of this EN (doa):	31 January 1999
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 July 1999
Date of withdrawal of any conflicting National Standard (dow):	30 July 1999

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# 1 Scope

This EN specifies the Radio Frequency (RF) test methods and conformance requirements for GSM 900 and DCS 1800 Base Station Systems (BSS)s. These have been derived from, and are consistent with, the core GSM specifications specified in the requirements reference subclause of each test.

This EN is applicable BSS meeting the requirements of either GSM Phase 2 or GSM Phase 2+. Unless otherwise stated, all tests are applicable to BSS meeting Phase 2 and/or Phase 2+ GSM requirements, because the requirements of the Phase 2 and Phase 2+ core GSM specifications which are referenced in the test are consistent. Most differences between Phase 2 and Phase 2+ requirements represent Phase 2+ features which are optional for the BSS to support.

For each test, two conformance requirements are specified:

- essential conformance requirements;
- complete conformance requirements.

Essential conformance requirements are those which are required:

- a) to ensure compatibility between the radio channels in the same cell;
- b) to ensure compatibility between cells, both co-ordinated and unco-ordinated;
- c) to ensure compatibility with existing systems in the same or adjacent frequency bands;
- d) to verify the important aspects of the transmission quality of the system.

Essential conformance requirements are sufficient to verify the performance of the equipment for radio type approval purposes, in countries where this is applicable.

Complete conformance requirements may be tested to verify all aspects of the performance of a BSS. These requirements are intended to be used by manufacturers and operators to allow conformance and acceptance testing to be performed in a consistent manner; the tests to be performed should be agreed between the parties.

In some tests there are separate requirements for micro-BTS and BTS. If there is no separate requirement for a micro-BTS, the requirements for the BTS apply to a micro-BTS.

In the present document, the reference point for RF connections (except for the measurement of mean transmitted RF carrier power) is the antenna connector, as defined by the manufacturer. This EN does not apply to repeaters or RF devices which may be connected to an antenna connector of a BSS, except as specified in subclause 4.10.

---

# 2 Normative references

References may be made to:

- a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or
- b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or
- c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or
- d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- [1] GSM 01.04 (ETR 350): "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

- [2] GSM 04.22 (ETS 300 946): "Digital cellular telecommunications system (Phase 2+); Radio Link Protocol (RLP) for data and telematic services on the Mobile Station - Base Station System (MS - BSS) interface and the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".
- [3] GSM 05.01: "Digital cellular telecommunications system (Phase 2); Physical layer on the radio path; General description".
- [4] GSM 05.02 (ETS 300 574): "Digital cellular telecommunications system (Phase 2); Multiplexing and multiple access on the radio path".
- [5] GSM 05.03 (ETS 300 575): "Digital cellular telecommunications system (Phase 2); Channel coding".
- [6] GSM 05.04 (ETS 300 576): "Digital cellular telecommunications system (Phase 2); Modulation".
- [7] GSM 05.05 (ETS 300 577): "Digital cellular telecommunications system (Phase 2); Radio transmission and reception".
- [8] GSM 05.08 (ETS 300 578): "Digital cellular telecommunications system (Phase 2); Radio subsystem link control".
- [9] GSM 05.10 (ETS 300 579): "Digital cellular telecommunications system (Phase 2); Radio subsystem synchronization".
- [10] GSM 08.20: "Digital cellular telecommunications system (Phase 2); Rate adaption on the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".
- [11] ETS 300 019-1: "Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment Part 1-0: Classification of environmental conditions Introduction".
- [12] IEC 68-2: "Basic environmental testing procedures; Part 2: Tests".
- [13] IEC 721: "Classification of environmental conditions".
- [14] ETR 027: "Radio and Equipment Systems; methods of measurement for mobile radio equipment".
- [15] ETR 028: "Radio and Equipment Systems; Uncertainties in the measurement of mobile radio equipment characteristics".
- [16] ETS 300 113: "Radio Equipment and Systems; Land mobile service; Technical characteristics and test conditions for radio equipment intended for transmission of data (and speech) and having an antenna connector".
- [17] GSM 04.22 (ETS 300 563): "Digital cellular telecommunications system (Phase 2); Radio Link Protocol (RLP) for data and telematic services on the Mobile Station - Base Station System (MS - BSS) interface and the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".
- [18] GSM 05.01: "Digital cellular telecommunications system (Phase 2+); Physical layer on the radio path; General description".
- [19] GSM 05.02 (ETS 300 908): "Digital cellular telecommunications system (Phase 2+); Multiplexing and multiple access on the radio path".
- [20] GSM 05.03 (ETS 300 909): "Digital cellular telecommunications system (Phase 2+); Channel coding".
- [21] GSM 05.04 (ETS 300 959): "Digital cellular telecommunications system (Phase 2+); Modulation".
- [22] GSM 05.05 (ETS 300 910): "Digital cellular telecommunications system (Phase 2+); Radio transmission and reception".

- [23] GSM 05.08 (ETS 300 911): "Digital cellular telecommunications system (Phase 2+); Radio subsystem link control".
- [24] GSM 05.10 (ETS 300 912): "Digital cellular telecommunications system (Phase 2+); Radio subsystem synchronization".

## 3 Definitions, abbreviations, frequency bands and channels

### 3.1 Definitions

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

**Carrier Frequency:** The centre of the ARFCN under test.

**GSM:** Unless otherwise specified, references to GSM include both GSM 900 and DCS1800.

**BSS:** In the present document, the term BSS (or base station subsystem) applies to both a BTS and integrated BSS. If a separate BSC is required to perform tests on a BTS, the BSC may be regarded as test equipment and the environmental conditions of the BSC need not be controlled.

**micro-BTS:** As defined in GSM 05.05 (ETS 300 577 [7] and ETS300 910 [22]). In this EN, this also includes a BSS which incorporates a micro-BTS.

**normal BTS:** Any BTS or BSS as defined by GSM 05.05 (ETS 300 910) [7] which is not a micro-BTS.

**BSSTE:** Base Station System Test Equipment; see annex B.

**manufacturer:** In this EN, a reference to a manufacturer shall also apply to an agent of the manufacturer.

**P-GSM:** The primary GSM 900 band.

**E-GSM:** The extended GSM 900 band (includes P-GSM band).

**R-GSM:** The Railways GSM 900 band (includes P-GSM band and E-GSM band).

**Relevant TX band (or relevant transmit band):** The transmit band defined in subclause 3.3.1 for the frequency band of BTS declared by the manufacturer

**Relevant RX band (or relevant receive band):** The receive band defined in subclause 3.3.1 for the frequency band of BTS declared by the manufacturer

**Operating band:** The transmit and receive operating bands together comprise the frequency band supported by the BSS; (see subclause 4.2)

### 3.2 Abbreviations

Unless otherwise stated, abbreviations used in this EN shall have the meaning given in GSM 01.04 (ETR 350) [1].

- |   |  |
|---|--|
| B | "Bottom"; the lowest frequency on which a test is performed.   |
| M | "Middle"; a frequency in the middle portion of the operating band of the BSS on which a test is performed. |
| T | "Top"; the highest frequency on which a test is performed.   |

## 3.3 Frequency bands and channels

### 3.3.1 Frequency bands

The frequency bands for the Base Station System are given in table 1.

**Table 1: Frequency bands for GSM900 and DCS1800 Base Station Systems**

	<b>TX:</b>	<b>RX:</b>
<b>P-GSM900</b>	935-960 MHz	890-915 MHz
<b>DCS1800</b>	1805-1880 MHz	1710-1785 MHz
<b>E-GSM900</b>	925-960 MHz	880-915 MHz
<b>R-GSM900</b>	921-960 MHz	876-915 MHz

NOTE: It is up to the operator to choose any subset of these bands (or the complete band) on a location basis within a frequency band assigned to the operator by the authority responsible for frequency management issues.

### 3.3.2 Channels and channel numbering

The channel numbers (ARFCN) for the carrier frequencies (RF channels) within the frequency bands defined above (as defined in GSM 05.05 (ETS 300 910) [7]), are given in table 2.  $F_l(n)$  is the frequency of the centre of the RF channel  $n$  in the lower band (=RX) and  $F_u(n)$  the corresponding frequency in the upper band (=TX).

**Table 2: Channel Numbering: Frequencies are in MHz.**

<b>P-GSM900</b>	$F_l(n)=890+0.2*n$	$1 \leq n \leq 124$	$F_u(n)=F_l(n)+45$
<b>E-GSM900</b>	$F_l(n)=890+0.2*n$ $F_l(n)=890+0.2*(n-1024)$	$0 \leq n \leq 124$ $975 \leq n \leq 1023$	$F_u(n)=F_l(n)+45$
<b>R-GSM900</b>	$F_l(n)=890+0.2*n$ $F_l(n)=890+0.2*(n-1024)$	$0 \leq n \leq 124$ $955 \leq n \leq 1023$	$F_u(n)=F_l(n)+45$
<b>DCS1800</b>	$F_l(n)=1710.2+0.2*(n-512)$	$-0.8 \leq n \leq 885$	$F_u(n)=F_l(n)+95$

## 4 General test conditions and declarations

The requirements of this clause apply to all tests in this EN, when applicable.

The general conditions during the tests should be according to the relevant parts of ETR 027 [14] (methods of measurement for mobile radio equipment) with the exceptions and additions defined in the individual tests.

Many of the tests in this EN measure a parameter relative to a value which is not fully specified in the GSM specifications. For these tests, the conformance requirement is determined relative to a nominal value specified by the manufacturer.

Certain functions of a BTS are optional in the GSM specifications.

When specified in a test, the manufacturer shall declare the nominal value of a parameter, or whether an option is supported.

### 4.1 Output power and determination of power class

The manufacturer shall declare the rated maximum power per TRX. For a micro-BTS, this shall be specified at the antenna connector. For a normal BTS, it shall be stated whether this is specified at the input to the combiner or at the antenna connector of the BSS.

For a micro-BTS, the class of the micro-BTS shall be determined from the declared maximum power, according to table 3.

**Table 3: Definition of micro-BTS Power Classes**

TRX power class	GSM 900 micro-BTS Maximum output power	DCS1800 micro-BTS Maximum output power
M1	(>19)-24 dBm ((>0.08)-0.25W)	(>27)-32 dBm ((>0.5)-1.6W)
M2	(>14)-19 dBm ((>0.03)-0.08W)	(>22)-27 dBm ((>0.16)-0.5W)
M3	(>9)-14 dBm ((>0.01)-0.03W)	(>17)-22 dBm ((>0.05)-0.16W)

NOTE: For a normal BTS, the TRX power class can be determined from the manufacturers declared output power per TRX measured at the input to the combiner, according to the tables of TRX power classes in ETS 300 910 [7]. The test requirements for a normal BTS do not vary in this [ETS] with TRX power classes. The definition of TRX power class only relates to the declared power per TRX and does not impose any requirement on the measured output power of the BTS.

## 4.2 Specified frequency range

The manufacturer shall declare:

- which of the frequency bands defined in subclause 3.3.1 is supported by the BSS; a BSS may support the DCS 1800 band and one of the GSM 900 bands, but shall not be defined as supporting more than one of the GSM 900 bands.
- the frequency range within the above frequency band(s) supported by the BSS; This frequency range comprises the transmit and receive operating bands

Many tests in this EN are performed with appropriate frequencies in the bottom, middle and top of the operating frequency band of the BTS. These are denoted as RF channels B (bottom), M (middle) and T (top).

When a test is performed by a test laboratory, the ARFCNs to be used for RF channels B, M and T shall be specified by the laboratory. The laboratory may consult with operators, the manufacturer or other bodies.

When a test is performed by a manufacturer, the ARFCNs to be used for RF channels B, M and T may be specified by an operator.

## 4.3 Frequency hopping

The Manufacturer shall declare whether the BSS supports Slow Frequency Hopping (SFH) and if yes, which basic implementation or implementations is supported. If SFH is supported the BSS shall be able to switch to any frequency in its operating band on a time slot per time slot basis.

Two basic implementations of SFH are possible:

- Baseband frequency hopping: frequency hopping is done by multiplexing the data of the logical channels to different TRXs according to the hopping scheme. The TRXs are fixed tuned to a dedicated ARFCN.
- Synthesizer frequency hopping: frequency hopping is done by tuning the TRX on a timeslot per timeslot basis. The logical channels are dedicated to a hopping TRX.

The detailed description of the frequency hopping scheme is described in GSM 05.02 (ETS 300 908) [4].

## 4.4 RF power control

RF power control functions ("dynamic power control") may optionally be implemented in GSM Base Station Systems according to GSM 05.08 (ETS 300 911) [8] as an operator choice. If implemented, the BSS shall be able to hop between any defined power level on a time slot per time slot basis.