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Harmonized European Standard (Telecommunications series)

Global System for Mobile communications (GSM); Harmonized EN for Base Station Equipment covering the essential requirements of article 3.2 of the R&TTE Directive

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Foreword

This Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Mobile Standards Group (MSG), and is now submitted for the Public Enquiry phase of the ETSI standards Two-step Approval Procedure.

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [i.1] (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Directive 1999/5/EC [i.2] of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity ("the R&TTE Directive").

Technical specifications relevant to Directive 1999/5/EC [i.2] are given in annex A.

The present document is single-part deliverable.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
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Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

Introduction

The present document is part of a set of standards developed by ETSI and is designed to fit in a modular structure to cover all radio and telecommunications terminal equipment within the scope of the R&TTE Directive. The modular structure is shown in EG 201 399 [i.3].

Figure 1: Void

1 Scope

The present document applies to the following {radio}{telecommunications terminal} equipment types:

1) GSM base stations:

Table 1: GSM Base Station System frequency bands

GSM band	Direction of transmission	*GSM Base Station System relevant frequency bands*
P-GSM 900	Transmit	935 MHz to 960 MHz
	Receive	890 MHz to 915 MHz
E-GSM 900	Transmit	925 MHz to 960 MHz
	Receive	880 MHz to 915 MHz
R-GSM 900	Transmit	921 MHz to 960 MHz
	Receive	876 MHz to 915 MHz
DCS 1 800	Transmit	1 805 MHz to 1 880 MHz
	Receive	1 710 MHz to 1 785 MHz
GSM 450	Transmit	460,4 MHz to 467,6 MHz
	Receive	450,4 MHz to 457,6 MHz
GSM 480	Transmit	488,8 MHz to 496 MHz
	Receive	478,8 MHz to 486 MHz

The present document is intended to cover the provisions of Directive 1999/5/EC [i.2] (R&TTE Directive) [i.2], Article 3.2, which states that "….. radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communications and orbital resources so as to avoid harmful interference".

In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of article 3 of the R&TTE Directive [i.2] may apply to equipment within the scope of the present document.

NOTE: A list of such ENs is included on the web site http://www.newapproach.org.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
  - for informative references.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] ETSI TR 121 905 (V8.8.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Vocabulary for 3GPP Specifications (3GPP TR 21.905 version 8.8.0 Release 8)".

[2] ETSI TS 151 021 (V8.5.0): "Digital cellular telecommunications system (Phase 2+); Base Station System (BSS) equipment specification; Radio aspects (3GPP TS 51.021 version 8.5.0 Release 8)".

[3] ETSI TS 145 002 (V8.0.0): "Digital cellular telecommunications system (Phase 2+); Multiplexing and multiple access on the radio path (3GPP TS 45.002 version 8.0.0 Release 8)".

[4] ETSI TS 145 004 (V8.0.0): "Digital cellular telecommunications system (Phase 2+); Modulation (3GPP TS 45.004 version 8.0.0 Release 8)".

[5] ETSI TS 145 005 (V8.7.0): "Digital cellular telecommunications system (Phase 2+); Radio Transmission and reception (3GPP TS 45.005 version 8.7.0 Release 8)".

[6] ETSI TS 145 008 (V8.5.0): "Digital cellular telecommunications system (Phase 2+); Radio subsystem link control (3GPP TS 45.008 version 8.5.0 Release 8)".

[7] ETSI TS 145 010 (V8.5.0): "Digital cellular telecommunications system (Phase 2+); Radio subsystem synchronization (3GPP TS 45.010 version 8.5.0 Release 8)".

[8] ETSI TS 144 060 (V8.7.0): "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol (3GPP TS 44.060 version 8.7.0 Release 8)".

[9] ETSI TR 100 028 (all parts) (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

[10] ETSI EN 300 019-1 (V2.1.2): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-0: Classification of environmental conditions; Introduction".

[11] ETSI EN 300 019-1-3 (V2.3.2): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-3: Classification of environmental conditions; Stationary use at weatherprotected locations".

[12] ETSI EN 300 019-1-4 (V2.1.2): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-4: Classification of environmental conditions; Stationary use at non-weatherprotected locations".

[13] IEC 60068-2 (2007): "Environmental testing procedures; Part 2: Tests".

[14] IEC 60721 (2002): "Classification of environmental conditions".

[15] ETSI TS 124 022 (V8.0.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Radio Link Protocol (RLP) for circuit switched bearer and teleservices (3GPP TS 24.022 version 8.0.0 Release 8)".

[16] ETSI TS 148 020 (V8.0.0): "Digital cellular telecommunications system (Phase 2+); Rate Adaptation on the Base Station System - Mobile Service Switching Centre (BSS-MSC) Interface (3GPP TS 48.020 version 8.0.0 Release 8)".

[17] ITU-T Recommendation O.153 (1992): "Basic Parameters for the measurement of error performance at bit rates below the primary rate".

[18] ITU-R Recommendation SM.329-10: "Unwanted emissions in the spurious domain".

[19] ETSI TS 145 001 (V8.1.0): "Digital cellular telecommunications system (Phase 2+); Physical layer on the radio path; General description (3GPP TS 45.001 Release 8)".

[20] ITU T Recommendation O.151: "Error performance measuring equipment operating a the primary rate and above".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

[i.1] Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.

[i.2] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).

[i.3] ETSI EG 201 399: "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of candidate Harmonized Standards for application under the R&TTE Directive".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 121 905 [1] and the following apply:

8-PSK: modulation type as defined in TS 145 004 [4], clause 3

16-QAM: modulation type as defined TS 145 004 [4], clause 4 for EGPRS2-A and clause 5 for EGRPS2-B

32-QAM: modulation type as defined TS 145 004 [4], clause 4 for EGPRS2-A and clause 5 for EGRPS2-B

ancillary RF amplifier: piece of equipment, which when connected by RF coaxial cables to the BTS, has the primary function to provide amplification between the transmit and/or receive antenna connector of a BTS and an antenna without requiring any control signal to fulfil its amplifying function

base station RF bandwidth: instantaneous bandwidth in which a multicarrier BTS transmits or transmits and receives multiple carriers simultaneously

BSS: in the present document, the term BSS (or base station subsystem) applies to both a BTS and integrated BSS

NOTE: 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.

Base Station System Test Equipment (BSSTE): See annex B in TS 151 021 [2].

carrier frequency: centre of the ARFCN under test

circuit switched logical channels: all the standard GSM logical channels, including traffic channels (TCH), common control channels (RACH) and dedicated control channels (SDCCH, SACCH)

E-GSM: extended GSM 900 band (includes P-GSM band)

ECSD: any subset of the E-TCH traffic channels and related control channels

EGPRS: any subset of the packet traffic channels PDTCH/MCS-1 to MCS-9 and related control channels

EGPRS2: any of EGPRS2-A and EGPRS2-B

EGPRS2-A: packet traffic channels utilizing any subset of the packet traffic channels MCS-1 to 6 and PDTCH/UAS-7 to UAS-11 in uplink, together with MCS-1 to 4 and PDTCH/DAS-5 to DAS-12 in downlink, and related control channels

NOTE In addition, MCS-7 and MCS-8 may be used in downlink when either the USF or the PAN or both are addressed to one or more EGPRS mobile stations.

EGPRS2-B: packet traffic channels utilizing any subset of the packet traffic channels MCS-1 to 4 and PDTCH/UBS-5 to UBS-12 in uplink, together with MCS-1 to 4 and PDTCH/DBS-5 to DBS-12 in downlink, and related control channels

NOTE: In addition, MCS-6 to MCS-9, DAS-5, DAS-6, DAS-8, DAS-9, DAS-10 pad, DAS-11, and DAS-12pad may be used in downlink under the conditions specified in TS 144 060 [8].

environmental profile: range of environmental conditions under which equipment within the scope of the present document is required to comply with the provisions of the present document

GMSK: modulation type as defined by TS 145 004 clause 2 [3]

GPRS: any subset of the packet traffic channels PDTCH/CS-1 to CS-4 and related control channels

GSM: unless otherwise specified, references to GSM include GSM 400, GSM 900 and DCS1800

GSM 400: unless otherwise specified, references to GSM 400 include GSM 450 and GSM 480 band

GSM 900: unless otherwise specified, references to GSM 900 include P-GSM, E-GSM and R-GSM band

manufacturer: in the present document, a reference to a manufacturer shall also apply to an agent of the manufacturer

maximum base station RF bandwidth: maximum bandwidth in which a multicarrier BTS transmits or transmits and receives multiple carriers simultaneously

maximum transmit filter bandwidth: maximum bandwidth of the duplexer or the transmit filter used in a multicarrier BTS transmitting carriers simultaneously

micro-BTS: low-power BTS with performance requirements defined in TS 145 005 [5]

NOTE: In the present document, this also includes a BSS which incorporates a micro-BTS.

multicarrier BTS: class of BTS, characterized by the ability to, in addition to single carrier operation, process two or more carriers in common active components simultaneously, either in multicarrier transmitter only or, in both multicarrier transmitter and multicarrier receiver

normal BTS: any BTS or BSS as defined by TS 145 005 [5] which is not a micro-BTS or pico-BTS

operating band: transmit and receive operating bands together comprise the frequency band supported by the BSS

NOTE: As defined in clause 4.2.

P-GSM: primary GSM 900 band

packet switched logical channels: all the General Packet Radio Services (GPRS) packet data logical channels, including packet traffic channels (PDTCH and PACCH) and packet common control channels (PRACH)

pico-BTS: low-power BTs with performance requirements defined in TS 145 005 [5]

NOTE: In the present document, this also includes a BSS which incorporates a pico-BTS.

QPSK: modulation type as defined TS 145 004 clause 5 [4], used in EGPRS2-B

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

relevant RX band (or relevant receive band): receive band for the frequency band of BTS declared by the manufacturer

NOTE: As defined in clause 3.3.1.

relevant TX band (or relevant transmit band): transmit band for the frequency band of BTS declared by the manufacturer

NOTE: As defined in clause 3.3.1.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 121 905 [1] and the following apply:

AGC	Automatic Gain Control
AMR	Adaptive Multi-rate
AMR-WB	Adaptive - Wideband
ARFCN	Absolute Radio Frequency Channel Number
B	Bottom"; the lowest frequency on which a test is performed, i.e. within the operating RX and TX band respectively
BER	Bit Error Ratio
BLER	BLock Error Ratio
BSS	Base Station System
BSSTE	Badse Station System Test Equipment
BTS	Base Tranceiver Station
BTTI	Basic Transmission Time Interval
DCS	Digital Cellular System
ECSD	Enhanced Circuit Switched Data
EGPRS	Enhanced GPRS
EGPRS2	Enhanced GPRS phase 2
EVM	Error Vector Magnitude
FANR	Fast Ack/Nack Reporting
FER	Frame Erasure Ratio
GMSK	Gaussian Minimum Shift Keying
GPRS	General Packet Radio Service
M	"Middle"; a frequency in the middle portion of the operating band of the BSS on which a test is performed
MCBTS	MulticCarrier BTS
MSE	Mean Square Error
PAN	Piggy-backed Ack/Nack message
RBER	Residual Bit Error Ratio
RF	Radio Frequency
RTTI	Reduced Transmission Time Interval
SFH	Slow Frequency Hopping
T	"Top"; the highest frequency on which a test is performed, i.e. within the operating RX and TX band respectively
TRX	Transceiver
TSC	Training Sequence Code

4 Technical requirements specifications

4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the supplier. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile.

For guidance on how a supplier can declare the environmental profile see annex C.

4.2 Conformance requirements

Support of 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. A summary of such functions are included in annex B.

4.2.1 Modulation accuracy

4.2.1.1 Definition

GMSK modulation

When transmitting a burst, the modulation accuracy is defined by the phase accuracy of the signal, relative to the theoretical modulated waveforms as specified in [4]. The phase error trajectory on the useful part of the burst (including tail bits), shall be measured by computing the difference between the phase of the transmitted waveform and the phase of the expected one.

8-PSK, QPSK, 16-QAM and 32-QAM modulation

When transmitting a burst, the modulation accuracy is defined by the error vector between the vector representing the actual transmitted signal and the vector representing the error-free modulated signal as specified in [4]. The magnitude of the error vector is called Error Vector Magnitude (EVM). The magnitude of the error vector shall be computed by measuring the error vector between the vector representing the transmitted waveform and the vector representing the ideal one on the useful part of the burst (excluding tail symbols).

The purpose of the test to measure against modulation accuracy requirements is:

1) To verify the correct implementation of the pulse shaping filtering.

2) To verify that at GMSK modulation the phase error during the active part of the time slot does not exceed the specified limits under normal and extreme test conditions and when subjected to vibration.

3) To verify that the frequency error during the active part of the time slot does not exceed the specified limits under normal and extreme test conditions and when subjected to vibration.

4) To verify that at supported modulations 8-PSK, QPSK, 16-QAM and 32-QAM the Error Vector Magnitude (EVM) and the origin offset during the active part of the time slot do not exceed the specified limits under normal and extreme test conditions and when subjected to vibration.

4.2.1.2 Limit

GMSK modulation

The phase error shall not exceed:

5 degrees rms

20 degrees peak

For normal and micro BTSs the mean frequency error across the burst shall not exceed:

0,05 ppm

For pico BTSs the mean frequency error across the burst shall not exceed:

0,1 ppm