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Harmonized European Standard (Telecommunications series)

**Broadband Data Transmission Systems operating in the
2 500 MHz to 2 690 MHz frequency band;
Part 1: TDD Base Stations;
Harmonized EN 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 Broadband Radio Access Networks (BRAN), 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 (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 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") [1].

Technical specifications relevant to Directive 1999/5/EC [1] are given in annex A.

The present document is part 1 of a multi-part deliverable covering the Base Stations (BS) and User Equipment (UE) for Broadband Data Transmission Systems in 2 500 MHz to 2 690 MHz frequency band, as identified below:

- Part 1: "TDD Base Stations; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive";**
- Part 2: "TDD User Equipment Stations; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive";
- Part 3: "FDD Base Stations; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive";
- Part 4: "FDD User Equipment Stations; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".

| Proposed national transposition dates | |
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| Date of latest announcement of this EN (doa): | 3 months after ETSI publication |
| Date of latest publication of new National Standard or endorsement of this EN (dop/e): | 6 months after doa |
| 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 [6].

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1 Scope

The present document is applicable to TDD Base Station radio equipment for mobile/nomadic Broadband Data Transmitting Systems operating in the 2 500 MHz to 2 690 MHz frequency band.

TDD radio equipment types are capable of operating in all or any part of the frequency band 2 500 MHz to 2 690 MHz frequency band according to national frequency plans designed on the same basic assumption that the assigned blocks are in multiples of 5 MHz (same centre frequency).

The document is equally applicable to systems utilizing integral or non integral antennas.

The present document is intended to cover the provisions of Directive 1999/5/EC [1] (R&TTE Directive) 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 may apply to equipment within the scope of the present document. The present document does not address those IMT-2000 systems which are considered in EN 301 908 [7].

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>.

For online referenced documents, information sufficient to identify and locate the source shall be provided. Preferably, the primary source of the referenced document should be cited, in order to ensure traceability. Furthermore, the reference should, as far as possible, remain valid for the expected life of the document. The reference shall include the method of access to the referenced document and the full network address, with the same punctuation and use of upper case and lower case letters.

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] 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).
- [2] ETSI EN 300 019 (all parts): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment".

- [3] Void.
- [4] ETSI TR 100 028 (parts 1 and 2 V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [5] CEPT/ERC/REC 74-01E (2005): "Unwanted Emissions in the Spurious Domain".
- [6] ETSI EG 201 399 (V2.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of candidate Harmonized Standards for application under the R&TTE Directive".
- [7] ETSI EN 301 908 (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS), Repeaters and User Equipment (UE) for IMT-2000 Third-Generation cellular networks ".

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.

- [8] ETSI TR 102 215 (V1.3.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Recommended approach, and possible limits for measurement uncertainty for the measurement of radiated electromagnetic fields above 1 GHz".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in the R&TTE Directive [1] and the following apply:

ACLR Class 1: a BS classification that identifies a level of ACLR performance generally appropriate for intra-system operation in contiguous channel assignments

ACLR Class 2: a BS classification that identifies a level of ACLR performance appropriate for more demanding inter-operator / coexistence scenarios at adjacent frequency block boundaries (e.g. TDD/FDD boundary)

burst: period during which radio waves are intentionally transmitted, preceded and succeeded by periods during which no intentional transmission is made

environmental profile: the declared range of environmental conditions under which equipment within the scope of the present document is required to be compliant

Eval_BW1: the pass band of a rectangular filter with a bandwidth of 4,75 MHz for 5 MHz equipment and 9,5 MHz for 10 MHz equipment

Eval_BW 2: the measurement for EVAL_BW2 on the operating channel is performed using a rectangular filter with a 4,75 MHz or 9,5 MHz bandwidth and the measurement on the victim channel is performed using an RRC filter with a 3,84 MHz or 7,68 MHz bandwidth (respectively) both with roll-off factor of 0,22 centred on the 1st or 2nd adjacent victim channel

Eval_BW 3: The measurement for EVAL_BW3 on the operating channel is performed using a rectangular filter with a 9,5 MHz bandwidth and the measurement on the victim channel is performed using a RRC filter with a 3,84 MHz bandwidth (with roll-off factor of 0,22) centred on the corresponding adjacent victim channel

integral antenna: antenna which is declared to be part of the radio equipment by the supplier

NOTE: Even when equipment with an integral antenna is concerned, it might still be possible to separate the antenna from the equipment using a special tool. In such cases the assessment of the radio equipment and of the antenna against requirements of this multipart EN may be done separately.

maximum output power: mean power level per carrier of the base station or mobile station measured at the antenna connector in a specified reference condition

mean power: when applied to a modulated signal, this is the power (transmitted or received) in a bandwidth

nominal maximum output power: maximum nominal mean power level per carrier of the base station or user equipment available at the antenna connector declared by the manufacturer; for equipment implementing dynamic change of modulation format, it is intended as the maximum nominal mean power associated to the modulation format delivering the highest power

operating nominal RF channel width: the nominal amount of spectrum used by a single device operating on an identified centre frequency

TDD down-link frame: time interval in which the BS is transmitting and the UE is receiving

3.2 Symbols

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

| | |
|--------------|---|
| A_{BS} | Base Station Interface A |
| A_{MS} | Mobile Station Interface A |
| A_{UUT} | Unit Under Test Interface A |
| dB | decibel |
| dBc | decibel relative to carrier |
| dBm | decibel relative to 1 milliwatt |
| f | Frequency (of the assigned channel frequency of the wanted signal) |
| F_c | centre frequency of the assigned channel |
| M_{BS} | Base Station Interface M |
| M_{MS} | Mobile Station Interface M |
| P_{nom} | nominal maximum output Power |
| P_{max} | maximum output Power of the base station |
| P_{SENS5} | Receiver sensitivity level at BER 10^{-6} for a 5 MHz channelised system |
| P_{SENS10} | Receiver sensitivity level at BER 10^{-6} for a 10 MHz channelised system |
| QPSK | Quadrature Phase-Shift Keying |
| SNR | Signal to Noise Ratio |

3.3 Abbreviations

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

| | |
|-------|---|
| ACLR | Adjacent Channel Leakage power Ratio |
| AWGN | Additive White Gaussian Noise |
| BER | Bit Error Ratio |
| BS | Base Station |
| FDD | Frequency Division Duplexing |
| GHz | GigaHertz |
| MHz | MegaHertz |
| PER | Packet Error Ratio |
| RF | Radio Frequency |
| R&TTE | Radio equipment and Telecommunications Terminal Equipment |
| TDD | Time Division Duplexing |
| Tx | Transmit, Transmitter |
| UE | User Equipment |
| UUT | Unit Under Test |

4 Essential requirements specification

With reference to Article 3.2 of 1999/5/EC Directive [1] the phenomena in this clause have been identified as relevant to the essential requirements.

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 required operational environmental profile.

4.2 Conformance requirements

4.2.1 Introduction

To meet the essential requirement under article 3.2 of the R&TTE Directive [1] seven essential parameters have been identified. Table 1 provides a cross reference between these seven essential parameters and the corresponding nine technical requirements for equipment within the scope of the present document. To fulfil an essential parameter the compliance with all the corresponding technical requirements in table 1 must be verified.

Table 1: Cross references

| Essential parameter | Corresponding technical requirements |
|---|--|
| Spectrum emissions mask | 4.2.2 Transmitter Spectrum emissions mask |
| | 4.2.3 Transmitter adjacent channel leakage power ratio |
| Conducted spurious emissions from the transmitter antenna connector | 4.2.4 Transmitter spurious emissions |
| Output power | 4.2.5 Maximum output power tolerance |
| Intermodulation attenuation of the transmitter | 4.2.6 Transmit Intermodulation |
| Conducted spurious emissions from the receiver antenna connector | 4.2.7 Receiver spurious emissions |
| Impact of interference on receiver performance | 4.2.8 Receiver adjacent and alternate rejection |
| | 4.2.9 Receiver blocking characteristics |
| | 4.2.10 Receiver intermodulation characteristics |

4.2.2 Spectrum emission mask

4.2.2.1 Definition

Spectrum emission mask defines an out of band emission requirement for the transmitter. These out of band emissions are unwanted emissions outside the channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions.

4.2.2.2 Limits

A base station transmitting on a single RF carrier configured in accordance with the manufacturer's specification shall meet the requirement. Emissions shall not exceed the maximum level specified in tables 2 to 5.

The spectrum emissions measured according to clause 5.4.1 shall not exceed the maximum level specified in tables 2 to 9 for the appropriate BS maximum output power and channel widths of 5 MHz and 10 MHz.

4.2.2.2.1 Spectrum emission mask for 5 MHz bandwidth

The spectrum emission mask of the BS applies over the frequency range 0,015 MHz to 10 MHz from the channel edge on both sides of the BS centre carrier frequency.

- f_{offset} is the separation between the channel edge and the centre frequency of the measuring filter.

The out-of-channel emission is specified as power level measured over the specified measurement bandwidth but relative to the total mean power P_{nom} of the BS carrier measured in Eval_BW1 centred in the 5 MHz channel.

The power of any BS emission shall not exceed the levels specified in tables 2 to 5.

Table 2: Test Requirements for spectrum emission mask values for 5 MHz channels, $P_{\text{nom}} \geq 43$ dBm

| Frequency offset from channel edge of the measurement filter centre frequency, f_{offset} | Maximum level | Measurement bandwidth |
|--|---|--|
| $0,015 \text{ MHz} \leq f_{\text{offset}} < 0,215 \text{ MHz}$ | -12,5 dBm | 30 kHz |
| $0,215 \text{ MHz} \leq f_{\text{offset}} < 1,015 \text{ MHz}$ | $-12,5 \text{ dBm} - 15 \left(\frac{f_{\text{offset}}}{\text{MHz}} - 0,215 \right) \text{ dB}$ | 30 kHz |
| $1,015 \text{ MHz} \leq f_{\text{offset}} < 1,5 \text{ MHz}$ | -24,5 dBm | 30 kHz |
| $1,5 \text{ MHz} \leq f_{\text{offset}} < 5,5 \text{ MHz}$ | -11,5 dBm | 1 MHz, by aggregation of 30 kHz measurements |
| $5,5 \text{ MHz} \leq f_{\text{offset}} < 10 \text{ MHz}$ | -11,5 dBm | 1 MHz, by aggregation of 30 kHz measurements |

Table 3: Test requirements for spectrum emission mask values for 5 MHz channels, $39 \text{ dBm} \leq P_{\text{nom}} < 43 \text{ dBm}$

| Frequency offset from channel edge of the measurement filter centre frequency, f_{offset} | Maximum level | Measurement bandwidth |
|--|---|--|
| $0,015 \text{ MHz} \leq f_{\text{offset}} < 0,215 \text{ MHz}$ | -12,5 dBm | 30 kHz |
| $0,215 \text{ MHz} \leq f_{\text{offset}} < 1,015 \text{ MHz}$ | $-12,5 \text{ dBm} - 15 \left(\frac{f_{\text{offset}}}{\text{MHz}} - 0,215 \right) \text{ dB}$ | 30 kHz |
| $1,015 \text{ MHz} \leq f_{\text{offset}} < 1,5 \text{ MHz}$ | -24,5 dBm | 30 kHz |
| $1,5 \text{ MHz} \leq f_{\text{offset}} < 5,5 \text{ MHz}$ | -11,5 dBm | 1 MHz, by aggregation of 30 kHz measurements |
| $5,5 \text{ MHz} \leq f_{\text{offset}} < 10 \text{ MHz}$ | $P - 54,5 \text{ dBm}$ | 1 MHz, by aggregation of 30 kHz measurements |

Table 4: Test requirements for spectrum emission mask values for 5 MHz channels, $31 \text{ dBm} \leq P_{\text{nom}} < 39 \text{ dBm}$

| Frequency offset from channel edge of the measurement filter centre frequency, f_{offset} | Maximum level | Measurement bandwidth |
|--|--|--|
| $0,015 \text{ MHz} \leq f_{\text{offset}} < 0,215 \text{ MHz}$ | $P - 51,5 \text{ dBm}$ | 30 kHz |
| $0,215 \text{ MHz} \leq f_{\text{off}} < 1,015 \text{ MHz}$ | $P - 51,5 \text{ dBm} - 15 \left(\frac{f_{\text{offset}}}{\text{MHz}} - 0,215 \right) \text{ dB}$ | 30 kHz |
| $1,015 \text{ MHz} \leq f_{\text{offset}} < 1,5 \text{ MHz}$ | $P - 63,5 \text{ dBm}$ | 30 kHz |
| $1,5 \text{ MHz} \leq f_{\text{offset}} < 5,5 \text{ MHz}$ | $P - 50,5 \text{ dBm}$ | 1 MHz, by aggregation of 30 kHz measurements |
| $5,5 \text{ MHz} \leq f_{\text{offset}} < 10 \text{ MHz}$ | $P - 54,5 \text{ dBm}$ | 1 MHz, by aggregation of 30 kHz measurements |