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Candidate Harmonized European Standard (Telecommunications series)

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
Land Mobile Service;
Radio equipment for analogue and/or digital
communication (speech and/or data) and operating on
narrow band channels and having an antenna connector;
Part 2: Harmonized EN covering essential requirements
of article 3.2 of the R&TTE Directive**



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Foreword

This Candidate Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), 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 [3] (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]).

The present document is part 2 of a multi-part deliverable covering Land Mobile Service; Radio equipment for analogue and/or digital communication (speech and/or data) and operating on narrow band channels and having an antenna connector, as identified below:

Part 1: "Technical characteristics and methods of measurement";

Part 2: "**Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive**".

Proposed national transposition dates	
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 [1]. The modular structure is shown in EG 201 399 (see bibliography).

1 Scope

The present document applies to radio transmitters and receivers used in stations in the Private Mobile Radio (PMR) service. It applies to use in the land mobile service capable of operating in all or any part of the frequency bands given below:

Table 1: Radiocommunications service frequency bands

Radiocommunications service frequency bands	
Transmit	30 MHz to 3 000 MHz
Receive	30 MHz to 3 000 MHz

The present document applies to equipment operating with narrow channel separations (CSP) (less than 10 kHz) and intended for speech and/or data. It is the intention of the present document to cover any Channel Bandwidths (CBW) permitted by CEPT for such systems e.g. 6,25 kHz.

In the present document different requirements are given for the different radio frequency bands, environmental conditions and types of equipment where appropriate.

In the present document, data transmission systems are defined as systems which transmit and/or receive data and/or digitized voice. The equipment comprises a transmitter and associated encoder and modulator and/or a receiver and associated demodulator and decoder.

The present document covers equipment which may use constant envelope or non-constant envelope modulation.

The types of equipment covered by the present document are as follows:

- base station: equipment fitted with antenna socket;
- mobile station: equipment fitted with antenna socket.

Handportable stations:

- a) either fitted with an antenna socket; or
- b) without an external antenna socket (integral antenna equipment) but fitted with a permanent internal or a temporary internal 50 Ω RF connector which allows access to the transmitter output and the receiver input.

Handportable station equipment without an external or internal Radio Frequency (RF) connector and without the possibility of having a temporary internal 50 Ω RF connector is not covered by the present document.

The present document is intended to cover the provisions of article 3.2 of Directive 1999/5/EC [1] (R&TTE Directive), 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.

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 and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

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

- [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 301 166-1 (V1.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service; Radio equipment for analogue and/or digital communication (speech and/or data) and operating on narrow band channels and having an antenna connector; Part 1: Technical characteristics and methods of measurement".
- [3] 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.

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 EN 301 166-1 [2] apply.

3.2 Symbols

For the purposes of the present document, the symbols given in EN 301 166-1 [2] apply.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in EN 301 166-1 [2] apply.

4 Technical requirements

For equipment without an external antenna socket (integral antenna equipment) but fitted with a permanent internal or a temporary internal 50 Ω RF connector which allows access to the transmitter output and the receiver input, the following additional measurements are made using the equipment antenna connected to the station (and not using any connector):

- transmitter effective radiated power;
- transmitter radiated spurious emissions;
- receiver maximum usable sensitivity (field strength);
- receiver spurious radiations.

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 manufacturer. 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.

4.2 Transmitter requirements

4.2.1 Frequency error

4.2.1.1 Definition

The frequency error is defined in EN 301 166-1 [2], clause 7.7.1.

4.2.1.2 Limit

The frequency error shall not exceed the limits in EN 301 166-1 [2], table 4.

4.2.1.3 Conformance

Conformance tests as defined in clause 5.3.1 shall be carried out.

4.2.2 Maximum power (PX) (conducted)

4.2.2.1 Definition

The maximum power (conducted) is defined in EN 301 166-1 [2], clause 7.1.1.

4.2.2.2 Limit

The maximum power (conducted) shall not exceed the limits in EN 301 166-1 [2], clause 7.1.3.

4.2.2.3 Conformance

Conformance tests as defined in clause 5.3.2 shall be carried out.

4.2.3 Maximum effective radiated power

4.2.3.1 Definition

The maximum effective radiated power is defined in EN 301 166-1 [2], clause 7.2.1.

4.2.3.2 Limit

The maximum effective radiated power shall not exceed the limits in EN 301 166-1 [2], clause 7.2.3.

4.2.3.3 Conformance

Conformance tests as defined in clause 5.3.3 shall be carried out.

4.2.4 Adjacent channel power

4.2.4.1 Definition

The adjacent channel power is defined in EN 301 166-1 [2], clause 7.3.1.

4.2.4.2 Limit

The adjacent channel power shall not exceed the limits in EN 301 166-1 [2], clause 7.3.3.

4.2.4.3 Conformance

Conformance tests as defined in clause 5.3.4 shall be carried out.

4.2.5 Spurious emissions

4.2.5.1 Definition

The spurious emissions are defined in EN 301 166-1 [2], clause 7.4.1.

4.2.5.2 Limit

The spurious emissions shall not exceed the limits in EN 301 166-1 [2], clause 7.4.3, tables 1, 2 and 3.

4.2.5.3 Conformance

Conformance tests as defined in clause 5.3.5 shall be carried out.

4.2.6 Intermodulation attenuation

4.2.6.1 Definition

The intermodulation attenuation is defined in EN 301 166-1 [2], clause 7.5.1.

4.2.6.2 Limit

The intermodulation attenuation shall not exceed the limits in EN 301 166-1 [2], clause 7.5.3.

4.2.6.3 Conformance

Conformance tests as defined in clause 5.3.6 shall be carried out.

4.2.7 Transient power

4.2.7.1 Definition

The transient power is defined in EN 301 166-1 [2], clause 7.6.1.

4.2.7.2 Limit

The transient power shall not exceed the limits in EN 301 166-1 [2], clause 7.6.3.

4.2.7.3 Conformance

Conformance tests as defined in clause 5.3.7 shall be carried out.

4.3 Receiver requirements

4.3.1 Maximum usable sensitivity

4.3.1.1 Definition

The sensitivity is defined in EN 301 166-1 [2], clause 8.1.1 (analogue conducted), clause 8.2.1 (analogue field strength), clause 8.3.1 (digital conducted) and clause 8.4.1 (digital field strength).

In addition, for duplex equipment (equipment providing simultaneous transmission and reception), the receiver desensitization is defined in EN 301 166-1 [2], clause 9.1.1.

4.3.1.2 Limit

The sensitivity shall not exceed the limits in EN 301 166-1 [2], clause 8.1.3 (analogue conducted), clause 8.2.3, table 5 (analogue field strength), clause 8.3.3 (digital conducted) and clause 8.4.3, table 6 (digital field strength).

In addition, for duplex equipment (equipment providing simultaneous transmission and reception), the receiver desensitization shall meet the requirements of EN 301 166-1 [2], clause 9.1.3.

4.3.1.3 Conformance

Conformance tests as defined in clause 5.4.1 may be carried out.

4.3.2 Co-channel rejection

4.3.2.1 Definition

The co-channel rejection is defined in EN 301 166-1 [2], clause 8.10.1.

4.3.2.2 Limit

The co-channel rejection shall not exceed the limits in EN 301 166-1 [2], clause 8.10.3.

4.3.2.3 Conformance

Conformance tests as defined in clause 5.4.2 may be carried out.

4.3.3 Adjacent channel selectivity

4.3.3.1 Definition

The adjacent channel selectivity is defined in EN 301 166-1 [2], clause 8.5.1.

4.3.3.2 Limit

The adjacent channel selectivity shall not exceed the limits in EN 301 166-1 [2], clause 8.5.3.

4.3.3.3 Conformance

Conformance tests as defined in clause 5.4.3 may be carried out.

4.3.4 Spurious response rejection

4.3.4.1 Definition

The spurious response rejection is defined in EN 301 166-1 [2], clause 8.6.1.

In addition, for duplex equipment (equipment providing simultaneous transmission and reception), the receiver spurious response rejection (with simultaneous transmission and reception) is defined in EN 301 166-1 [2], clause 9.2.1.

4.3.4.2 Limit

The spurious response rejection shall not exceed the limits in EN 301 166-1 [2], clause 8.6.3.

In addition, for duplex equipment (equipment providing simultaneous transmission and reception), the receiver spurious response rejection (with simultaneous transmission and reception) shall not exceed the limits in EN 301 166-1 [2], clause 9.2.3.

4.3.4.3 Conformance

Conformance tests as defined in clause 5.4.4 may be carried out.

4.3.5 Intermodulation response rejection

4.3.5.1 Definition

The intermodulation response rejection is defined in EN 301 166-1 [2], clause 8.7.1.

4.3.5.2 Limit

The intermodulation response rejection shall not exceed the limits in EN 301 166-1 [2], clause 8.7.3.

4.3.5.3 Conformance

Conformance tests as defined in clause 5.4.5 may be carried out.

4.3.6 Blocking or desensitization

4.3.6.1 Definition

The blocking or desensitization is defined in EN 301 166-1 [2], clause 8.8.1.

4.3.6.2 Limit

The blocking or desensitization shall not exceed the limits in EN 301 166-1 [2], clause 8.8.3.

4.3.6.3 Conformance

Conformance tests as defined in clause 5.4.6 may be carried out.

4.3.7 Spurious radiations

4.3.7.1 Definition

The spurious radiations are defined in EN 301 166-1 [2], clause 8.9.1.

4.3.7.2 Limit

The spurious radiations shall not exceed the limits in EN 301 166-1 [2], clause 8.9.3, tables 7 and 8.

4.3.7.3 Conformance

Conformance tests as defined in clause 5.3.8 shall be carried out.

5 Testing for compliance with technical requirements

5.1 Environmental conditions for testing

Tests defined in the present document shall be carried out at representative points within the boundary limits of the declared operational environmental profile.

Where technical performance varies subject to environmental conditions, tests shall be carried out under a sufficient variety of environmental conditions (within the boundary limits of the declared operational environmental profile) to give confidence of compliance for the affected technical requirements.

5.1.1 Normal and extreme test-conditions

Measurements shall be made under normal test conditions, and also, where stated, under extreme test conditions.

The test conditions and procedures shall be as specified in EN 301 166-1 [2], clauses 5.3, 5.4 and 5.5.

5.1.2 Test power source

The test power source shall meet the requirements of EN 301 166-1 [2], clause 5.2.

5.1.3 Choice of samples for the measurements

Measurement shall be performed, according to the present document, on samples of equipment defined in EN 301 166-1 [2], clause 4.1.

5.2 Interpretation of the measurement results

The interpretation of the results recorded in a test report for the measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of the present document;
- the value of the measurement uncertainty for the measurement of each parameter shall be included in the test report;
- the value of the measurement uncertainty shall be, for each measurement, equal to or lower than the figures in table 2.

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with the principles of TR 100 028 (see bibliography) and shall correspond to an expansion factor (coverage factor) $k = 1,96$ or $k = 2$ (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Table 2 is based on such expansion factors.

Table 2: Absolute measurement uncertainties: maximum values

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-7}$
RF Power (up to 160 W)	$\pm 0,75$ dB
Radiated RF power	± 6 dB
Adjacent channel power	± 5 dB
Conducted spurious emission of transmitter Valid up to 12,75 GHz	± 4 dB
Conducted spurious emission of receiver, Valid up to 12,75 GHz	± 7 dB
Two-signal measurement, Valid up to 4 GHz	± 4 dB
Three-signal measurement	± 3 dB
Radiated emission of the transmitter, valid up to 4 GHz	± 6 dB
Radiated measurement of receiver, valid up to 4 GHz	± 6 dB
Transmitter attack time	± 20 %
Transmitter release time	± 20 %
Transmitter transient frequency (frequency difference)	± 250 Hz
Transmitter intermodulation	± 3 dB
Receiver desensitization (duplex operation)	$\pm 0,5$ dB
Temperature	$\pm 1^{\circ}$ C
Humidity	± 10 %
Valid up to 1 GHz for the RF parameters unless otherwise stated.	

For the test methods according to the present document, the uncertainty figures are valid to a confidence level of 95 % calculated according to the methods described in TR 100 028 (see bibliography).

5.3 Essential test suites

Essential test suites are referred to in annex III of R&TTE Directive [1].

The following essential test suites shall be used to assess the performance of equipment.

5.3.1 Frequency error

The measurements specified in EN 301 166-1 [2], clause 7.7.2 shall be carried out.

5.3.2 Maximum power (PX) (conducted)

The measurements specified in EN 301 166-1 [2], clause 7.1.2 shall be carried out.

5.3.3 Maximum effective radiated power

The measurements specified in EN 301 166-1 [2], clause 7.2.2 shall be carried out.

5.3.4 Adjacent channel power

The measurements specified in EN 301 166-1 [2], clause 7.3.2 shall be carried out.

5.3.5 Spurious emissions

The measurements specified in EN 301 166-1 [2], clause 7.4.2 shall be carried out.

5.3.6 Intermodulation attenuation

The measurements specified in EN 301 166-1 [2], clause 7.5.2. shall be carried out.

5.3.7 Transient power

The measurements specified in EN 301 166-1 [2], clause 7.6.2 shall be carried out.

5.3.8 Receiver spurious radiations

The measurements specified in EN 301 166-1 [2], clause 8.9.2 shall be carried out.

5.4 Other test suites

The requirements in clauses 4.3.1 to 4.3.7 inclusive have been set on the assumption that the measurements in clauses 5.4.1 to 5.4.7 are used in order to assess the performance of the equipment.

5.4.1 Maximum usable sensitivity

The measurements specified in EN 301 166-1 [2], clause 8.1.2 (analogue conducted), clause 8.2.2 (analogue field strength), clause 8.3.2 (digital conducted) and clause 8.4.2 (digital field strength) as appropriate, shall be carried out.

In addition, in the case of duplex equipment (equipment providing simultaneous transmission and reception), the measurements specified in EN 301 166-1 [2], clause 9.1.2 shall be carried out.

5.4.2 Co-channel rejection

The measurements specified in EN 301 166-1 [2], clause 8.10.2 shall be carried out.

5.4.3 Adjacent channel selectivity

The measurements specified in EN 301 166-1 [2], clause 8.5.2 shall be carried out.

5.4.4 Spurious response rejection

The measurements specified in EN 301 166-1 [2], clause 8.6.2 shall be carried out.

In addition, in the case of duplex equipment (equipment providing simultaneous transmission and reception), the measurements specified in EN 301 166-1 [2], clause 9.2.2 shall be carried out.

5.4.5 Intermodulation response rejection

The measurements specified in EN 301 166-1 [2], clause 8.7.2 shall be carried out.

5.4.6 Blocking or desensitization

The measurements specified in EN 301 166-1 [2], clause 8.8.2 shall be carried out.

Annex A (normative): HS Requirement & conformance Test specifications Table (HS-RTT)

Notwithstanding the provisions of the copyright clause related to the text of the present document, ETSI grants that users of the present document may freely reproduce the HS-RTT table in this annex so that it can be used for its intended purposes and may further publish the completed HS-RTT.

The HS Requirements & conformance Test specifications Table (HS-RTT) in table A.1 below serves a number of purposes, as follows:

- it provides a statement of all the essential requirements in words and by cross reference to a specific clause in the present document or to a specific clause in a specific referenced document;
- it provides a statement of all the test procedure corresponding to those essential requirements by cross reference to specific clause(s) in the present document or to a specific clause(s) in specific referenced document(s);
- it qualifies each requirement to be either:
 - Unconditional: meaning that the requirement applies in all circumstances, or
 - Conditional: meaning that the requirement is dependent on the supplier having chosen to support optional functionality defined within the schedule;
- in the case of Conditional requirements, it associates the requirement with the particular optional service or functionality;
- it qualifies each test procedure to be either:
 - Essential: meaning that it is included with the Essential Radio Test Suite and therefore the requirement shall be demonstrated to be met in accordance with the referenced procedures;
 - Other: meaning that the test procedure is illustrative but other means of demonstrating compliance with the requirement are permitted;
- when the schedule is completed in respect of a particular equipment including the testing outcomes, including a completed version of table A.1 it provides a means to assert the "presumption of conformity" with the HS.

Table A.1: HS Requirements & conformance Test specifications Table (HS-RTT)

Harmonized Standard EN 301 166-2						
The following technical requirements and test specifications are relevant to the presumption of conformity under Article 3.2 of the R&TTE Directive						
Technical Requirement reference			Technical Requirement Conditionality		Test Specification	
No	Description	Reference: Clause No	U/C	Condition	E/O	Reference: Clause No
1	Transmitter frequency error	4.2.1	U		E	5.3.1
2	Transmitter maximum power (PX) conducted	4.2.2	C	Applies to all equipment having an antenna port	E	5.3.2
3	Transmitter effective radiated power	4.2.3	C	Applies to all equipment having an integral antenna	E	5.3.3
4	Transmitter adjacent channel power	4.2.4	U		E	5.3.4
5	Transmitter spurious emissions	4.2.5	U		E	5.3.5
6	Transmitter intermodulation attenuation	4.2.6	C	Applies only to base station equipment	E	5.3.6
7	Transmitter transient power	4.2.7	U		E	5.3.7
8	Receiver spurious radiations	4.3.7	U		E	5.3.8
9	Receiver maximum useable sensitivity	4.3.1	C	Applies only to equipment using listen-before-transmit	O	5.4.1
10	Receiver co-channel rejection	4.3.2	C	Applies only to equipment using listen-before-transmit	O	5.4.2
11	Receiver adjacent channel selectivity	4.3.3	C	Applies only to equipment using listen-before-transmit	O	5.4.3
12	Receiver spurious response rejection	4.3.4	C	Applies only to equipment using listen-before-transmit	O	5.4.4
13	Receiver inter-modulation response	4.3.5	C	Applies only to equipment using listen-before-transmit	O	5.4.5
14	Receiver blocking or desensitization	4.3.6	C	Applies only to equipment using listen-before-transmit	O	5.4.6

Key to columns:**Essential Requirement:**

No A unique identifier for one row of the table which may be used to identify an essential requirement or its test specification.

Description A textual reference to the Essential Requirement

Reference: Clause Number

Identification of clause(s) defining the essential requirement in the present document unless another document is referenced explicitly

Conditionality:

U/C Indicates whether the requirement is to be *unconditionally* applicable (U) or is *conditional* upon the suppliers claimed functionality of the equipment (C)

Condition Explains the conditions when the requirement shall or shall not be applicable for a requirement which is classified "conditional"

Test Specification:

E/O Indicates whether the test specification forms part of the *Essential Radio Test Suite* (E) or whether it is one of the *Other Test Suite* (O)

NOTE: All tests whether "E" or "O" are relevant to technical requirements. Rows designated "E" collectively make up the Essential Radio Test Suite; those designated "O" make up the Other Test Suite; for those designated "X" there is no test specified corresponding to the technical requirements. All tests classified "E" shall be performed as specified with satisfactory outcomes is a necessary condition for a presumption of conformity. Technical requirements associated with tests classified "O" or "X" must be complied with as a necessary condition for presumption of conformity, although conformance with the requirement may be claimed by an equivalent test or by manufacturer's assertion supported by appropriate entries in the technical construction file.

Reference: Clause Number

Identification of clause(s) defining the test specification in the present, document unless another document is referenced explicitly. Where no test is specified (that is, where the previous field is "X") this field remains blank

Annex B (informative): The EN title in the official languages

Language	EN title
Czech	
Danish	
Dutch	
English	Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service; Radio equipment for analogue and/or digital communication (speech and/or data) and operating on narrow band channels and having an antenna connector; Part 2: Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive
Estonian	
Finnish	
French	
German	
Greek	
Hungarian	
Icelandic	
Italian	
Latvian	
Lithuanian	
Maltese	
Norwegian	
Polish	
Portuguese	
Slovak	
Slovenian	
Spanish	
Swedish	

Annex C (informative): Bibliography

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

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".

History

Document history		
V1.1.1	December 2001	Publication
V1.2.1	July 2006	Public Enquiry PE 20061124: 2006-07-26 to 2006-11-24