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Candidate Harmonized European Standard (Telecommunications series)

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
ElectroMagnetic Compatibility (EMC)
standard for radio equipment and services;
Part 3: Specific requirements for Short-Range Devices (SRD)
operating on frequencies between 9 kHz and 25 GHz**



Reference

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Foreword

This Candidate Harmonized European Standard (Telecommunications series) has been produced by the 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 the Council Directive 98/34/EC (as amended) laying down a procedure for the provision of information in the field of technical standards and regulation.

The present document, together with part 1 of this EMC standard, is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility ("the EMC Directive") (89/336/EEC [3] as amended), and the Council Directive on the approximation of the laws of the Member States relating to radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (the "R&TTE Directive" 1999/5/EC [2]).

The present document is part 3 of a multi-part EN covering the ElectroMagnetic Compatibility (EMC) standard for radio equipment and services, as identified below:

- Part 1: "Common technical requirements";
- Part 2: "Specific requirements for radio paging equipment";
- Part 3: "Specific requirements for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 25 GHz";**
- Part 4: "Specific requirements for fixed radio links and ancillary equipment and services";
- Part 5: "Specific requirements for Private land Mobile Radio (PMR) and ancillary equipment (speech and non-speech)".

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1 Scope

The present document together with the EN 300 489-1 [1], covers the assessment of Short Range Devices (SRD) and ancillary equipment not covered by other parts of the present document or by other specific SRD standards, in respect of ElectroMagnetic Compatibility (EMC).

Technical specifications related to the antenna port and emissions from the enclosure port of Short Range Devices are not included in the present document. Such technical specifications are exclusively found in the relevant product standards for the effective use of the radio spectrum.

The present document specifies the applicable test conditions, performance assessment, and performance criteria for Short Range Devices, as specified in ETS 300 220-1 [4], I-ETS 300 330 [5] and I-ETS 300 440 [6] depending on the used frequency band, and the associated ancillary equipment.

In case of differences (for instance concerning special conditions, definitions, abbreviations) between the present document and the EN 301 489-1 [1], the provisions of the present document take precedence.

The environmental classification and the emission and immunity requirements used in the present document are as stated in the EN 301 489-1 [1], except for any special conditions included in 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, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, 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] EN 301 489-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements".
- [2] 1999/5/EC: "Council Directive on the approximation of the laws of the Member States relating to radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity".
- [3] 89/336/EEC: "Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility".
- [4] ETS 300 220-1: "Radio Equipment and Systems (RES); Short range devices Technical characteristics and test methods for radio equipment to be used in the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW; Part 1: Requirements related to spectrum utilisation".
- [5] I-ETS 300 330: "Radio Equipment and Systems (RES); Short Range Devices (SRDs); Technical characteristics and test methods for radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz".
- [6] I-ETS 300 440: "Radio Equipment and Systems (RES); Short range devices; Technical characteristics and test methods for radio equipment to be used in the 1 GHz to 25 GHz frequency range".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in the EN 301 489-1 [1], clause 3 and the following apply.

receiver: stand alone receiver or a receiver being part of a transceiver.

short range device: piece of apparatus which includes a transmitter, and/or a receiver and or parts thereof, used in alarm-, telecommand and telemetry applications etc., operating with analogue speech/music or data (analogue and/or digital) or with combined analogue speech/music and data, using any modulation type. These devices can be used in a fixed, mobile or portable application.

transmitter: stand alone transmitter or a transmitter being part of a transceiver.

3.2 Abbreviations

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

AC	Alternating Current
CR	Continuous phenomena applied to Receivers
CT	Continuous phenomena applied to Transmitters
DC	Direct Current
EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
RF	Radio Frequency
SINAD	Signal plus noise plus distortion to noise plus distortion
SRD	Short Range Device
TR	Transient phenomena applied to Receivers
TT	Transient phenomena applied to Transmitters

4 Test conditions

For the purposes of the present document, the test conditions of the EN 301 489-1 [1], clause 4, shall apply as appropriate. Further product related test conditions for Short Range Devices (SRD) are specified in the present document.

4.1 General

For emission and immunity tests the normal test modulation, test arrangements, etc., as specified in the present document, subclauses 4.1 to 4.5, shall apply.

Whenever the Equipment Under Test (EUT) is provided with a detachable antenna, the EUT shall be tested with the antenna fitted in a manner typical of normal intended use, unless specified otherwise.

For the purpose of the present document Short Range Devices are divided into three types of equipment, based on the technical nature of the primary function.

Table 1

Equipment Type	Technical nature of the primary function
I	Transfer of messages (digital or analogue signals)
II	Transfer of audio (speech or music)
III	Others

4.2 Arrangements for test signals

The provisions of the EN 300 489-1 [1], subclause 4.2 shall apply.

4.2.1 Arrangements for test signals at the input of the transmitter

The provisions of the EN 301 489-1 [1], subclause 4.2.1 shall apply with the following modifications.

The transmitter shall be modulated with normal test modulation as specified for that type of equipment (subclause 4.5). Where transmitters do not have a modulation input port, the internal equipment modulation shall be used.

4.2.2 Arrangements for test signals at the output of the transmitter

The provisions of the EN 301 489-1 [1], subclause 4.2.2 shall apply with the following modifications.

The transmitter shall be operated at its maximum rated RF output power as specified for that type of equipment (subclause 4.5).

The manufacturer may provide a suitable companion receiver that can be used to set up a communications link and/or to receive messages.

4.2.3 Arrangements for test signals at the input of the receiver

The provisions of part 1 subclause 4.2.3 of this standard shall apply with the following modifications:

- the wanted RF input signal, coupled to the receiver, shall be modulated with normal test modulation as specified for that type of equipment (subclause 4.5);
- the level of the wanted RF input signal shall be chosen to a value significantly above the threshold sensitivity but below the overload characteristics of the receiver;
- the manufacturer may provide a suitable companion transmitter that can be used to set up a communications link and/or to transmit messages.

4.2.4 Arrangements for test signals at the output of the receiver

The provisions of part 1 subclause 4.2.4 of this standard shall apply.

4.2.5 Arrangements for testing transmitter and receiver together (as a system)

The provisions of part 1 subclause 4.2.5 of this standard shall apply.

4.3 Exclusion bands

The frequencies on which Short Range Devices (SRD) are intended to operate, shall be excluded from the conducted and radiated RF immunity tests.

The frequencies on which the SRD transmitters are intended to operate shall be excluded from conducted and radiated emission measurements when performed in transmit mode of operation.

There shall be no frequency exclusion band applied to emission measurements of SRD receivers, and/or associated ancillary equipment.

The emission measurement and immunity test exclusions are referred to as "exclusion bands" and are defined in the subclauses 4.3.1 and 4.3.2 of the present document.

4.3.1 Exclusion bands for receivers

The exclusion band for receivers (including receivers part of transceivers) intended to be used in a channellized frequency band, is determined as follows:

- for receivers capable of operating on only one single frequency and not having an alignment range, the lower frequency of the exclusion band is the lower frequency of the used frequency channel minus the extension value given in table 2, and the upper frequency of the exclusion band is the upper frequency of the used frequency channel plus the extension value given in table 2. The calculated extension value shall be based on the operating frequency;
- for receivers capable of operating on only one single frequency and having an alignment range, the lower frequency of the exclusion band is the lower frequency of the alignment range minus the extension value given in table 2, and the upper frequency of the exclusion band is the upper frequency of the alignment range plus the extension value given in table 2. The calculated extension values shall be based on the centre frequency of the alignment range. However, if the alignment range is more than 10 % of the upper frequency of the alignment range the calculated value shall be based on 10 % of the upper value of the alignment range;
- for receivers capable of operating on more than one frequency in an operating frequency band the width of which is less than 20 % of the centre frequency of the operating band, the lower frequency of the exclusion band is the lower frequency of the operating band minus the extension value given in table 2, and the upper frequency of the exclusion band is the upper frequency of the operating band plus the extension value given in table 2. The calculated extension value shall be based on the centre frequency of the operating band;
- for receivers capable of operating on a number of frequencies over a frequency band wider than the band specified above, immunity tests shall be made over a selected number of test frequencies. The selected test frequencies shall be located at three evenly spaced points per logarithmic decade of the frequency band. For each test frequency the lower frequency of the exclusion band is the lower frequency of the used test frequency channel minus the extension value given in table 2, and the upper frequency of the exclusion band is the upper frequency of the used test frequency channel plus the extension value given in table 2. The calculated extension value shall be based on the used test frequency.

For wide band receivers, i.e. receivers operating in a non-channellized frequency band, the lower frequency of the exclusion band is the lower frequency of the intended operating frequency band minus the extension value given in table 2 and the upper frequency of the exclusion band is the upper frequency of the intended operating band plus the extension value given in table 2, or the total exclusion band is twice the intended operating frequency band of the receiver centred around the centre frequency of the intended operating band, whichever is greater.

Table 2: Exclusion bands for Short Range Devices

Operating frequency	Extension value
< 5 MHz	20 %
≥ 5 MHz and < 80 MHz	10 % or 1 MHz, whichever is greater
≥ 80 MHz	5 % or 10 MHz, whichever is greater

4.3.2 Exclusion band for transmitters

For transmitters operating, or intended to operate, in a channellized frequency band, the exclusion band is three times the maximum occupied bandwidth allowed for that service, centred around the operating frequency.

For wide band transmitters, i.e. transmitters in a non-channellized frequency band, the exclusion band is twice the intended operating frequency band centred around the centre frequency of the intended operating frequency band.

In case the receiver and transmitter are tested together as a system (subclause 4.2.5 of part 1 of this standard) the exclusion band defined for receivers or the exclusion band defined for transmitters shall be used, whichever is greater.

4.4 Narrow band responses of receivers

The provision of part 1 subclause 4.4 of this standard shall apply.

4.5 Normal test modulation

For equipment type I the RF carrier shall be modulated with a test signal, representing a practical selection of usable selective messages/commands. The agreed test signal may be formatted and may contain error detection and correction. Where transmitters do not have a modulation input port, the internal equipment modulation is used.

For equipment type II (audio equipment):

- the wanted input signal of the receiver under test shall be set to the nominal frequency of the receiver, modulated with a sinusoidal audio frequency of 1 000 Hz having a modulation corresponding to 60 % of the peak system modulation;
- the transmitter under test shall be modulated with a sinusoidal audio frequency of 1 000 Hz having a modulation corresponding to 60 % of the system peak modulation.

For equipment type III the manufacturer shall specify the normal test modulation, if any.

5 Performance assessment

5.1 General

The provision of part 1 subclause 5.1 of this standard shall apply.

The manufacturer shall at the time of submission of the equipment for test, supply the necessary general information as requested in part one of this standard, subclause 5.1. Additionally he shall supply the following product-related information:

- the applicable equipment type according to table 1 (subclause 4.1);
- the class of equipment selected by the manufacturer according to table 3 (see subclause 6.1).

The performance assessment is dependent on the equipment type (subclause 4.1).

For all types of equipment the performance assessment is based on:

- the maintenance of function(s);
- the way the eventual loss of function(s) can be recovered;
- unintentional behaviour of the EUT.

Additionally:

- for equipment type I it shall be possible to assess the performance of the equipment by appropriately monitoring (observing) the receiver reaction;
- for equipment type II the degradation in performance during the radio frequency immunity tests is expressed in a minimum SINAD Decibel value;
- for equipment type III the manufacturer shall specify the way the degradation in performance should be measured and expressed.

5.2 Standard radio equipment

The provisions of part 1 subclause 5.2 of this standard shall apply.

5.3 Equipment of special nature

The provisions of part 1 subclause 5.3 of this standard shall apply with the following modification:

- for equipment type III the manufacturer shall always define the test method(s) for the assessment of the actual level of performance or degradation of performance during and/or after the EMC exposure.

5.4 Ancillary equipment

The provisions of part 1 subclause 5.4 of this standard shall apply.

5.5 Equipment classification

The provisions of part 1 subclause 5.5 of this standard shall apply.

6 Performance criteria

6.1 Classification of SRD equipment

The product family of Short Range Devices is divided into three classes of equipment, each having its own set of minimum performance criteria. This classification is based upon the impact on persons and/or goods in case the equipment does not operate above the specified minimum performance level under EMC stress.

Table 3

Class of SRD equipment	Result of too low performance
1	Physical risk to persons or goods
2	Inconvenience to persons, which cannot simply be overcome by other means
3	Inconvenience to persons, which can simply be overcome by other means (e.g. manual)

A non-exhaustive list of SRD equipment and its classification is given in annex A.

6.2 General performance criteria

The performance criteria for the different classes of SRD equipment (see table 3) in combination with the different equipment types (see table 1) during and after immunity test are specified in this subclause:

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature;
- performance criteria for immunity tests with power interruptions exceeding a certain time are specified in subclause 7.2.2.

The equipment shall meet the performance criteria as specified in the following subclauses, for the appropriate class of SRD equipment.

6.3 Performance table

Table 4

Class 1 SRD equipment		
Criteria	During test	After test
A	Operate as intended No loss of function For equipment type II the minimum performance shall be 12 dB SINAD No unintentional responses	Operate as intended For equipment type II the communication link shall be maintained No loss of function No degradation of performance No loss of stored data or user programmable functions
B	May be loss of function (one or more) No unintentional responses	Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions
Class 2 SRD equipment		
Criteria	During test	After test
A	Operate as intended No loss of function For equipment type II the minimum performance shall be 6 dB SINAD No unintentional responses	Operate as intended For equipment type II the communication link shall be maintained No loss of function No degradation of performance No loss of stored data or user programmable functions
B	May be loss of function (one or more) No unintentional responses	Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions
Class 3 SRD equipment		
Criteria	During test	After test
A and B	May be loss of function (one or more) No unintentional responses	Operate as intended, for equipment type II the communication link may be lost, but shall be recoverable by user No degradation of performance Lost functions shall be self-recoverable

6.4 Performance criteria for Continuous phenomena applied to Transmitters (CT)

For equipment of type I or II including ancillary equipment tested on a stand alone basis, the performance criteria A of the applicable class as given in subclause 6.3 shall apply.

For equipment of type II or type III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence.

Where the EUT is a transmitter, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

6.5 Performance criteria for Transient phenomena applied to Transmitters (TT)

For equipment of type I or II, including ancillary equipment tested on a stand alone basis, the performance criteria B of the applicable class as given in subclause 6.3 shall apply, except for power interruptions exceeding a certain time the performance criteria deviations are specified in subclause 7.2.2.

For equipment of type II or type III that requires a communication link that is maintained during the test, this shall be verified by appropriate means supplied by the manufacturer during each individual exposure in the test sequence.

Where the EUT is a transmitter, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

6.6 Performance criteria for Continuous phenomena applied to Receivers (CR)

For equipment of type I or II, including ancillary equipment tested on a stand alone basis, the performance criteria A of the applicable class as given in subclause 6.3 shall apply.

For equipment of type II or III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence.

Where the EUT is a transceiver, under no circumstances shall the transmitter operate unintentionally during the test.

6.7 Performance criteria for Transient phenomena applied to Receivers (TR)

For equipment of type I or II, including ancillary equipment tested on a stand alone basis, the performance criteria B of the applicable class as given in subclause 6.3 shall apply, except for power interruptions exceeding a certain time the performance criteria deviations are specified in subclause 7.2.2.

For equipment of type II or type III that requires a communication link that is maintained during the test, this shall be verified by appropriate means supplied by the manufacturer during each individual exposure in the test sequence.

Where the EUT is a transceiver, under no circumstances shall the transmitter operate unintentionally during the test.

7 Applicability overview

7.1 Emission

7.1.1 General

Part 1 of this standard, table 1, contains the applicability of EMC emission measurements to the relevant ports of radio and/or associated ancillary equipment.

7.1.2 Special conditions

The following special conditions set out in table 5, relate to the emission test methods used in part 1 of this standard, clause 8.

Table 5: Special conditions for EMC emission measurements

Reference to subclauses in part 1 of this standard [1]	Special product-related conditions, additional to or modifying the test conditions in part 1 of this standard, clause 8
8.3.2 and 8.4.2: Test method; DC power input/output ports, and AC mains input/output ports	Attention: The exclusion band for transmitters shall be considered for transmitters operating at frequencies below 30 MHz (see subclause 4.3.2).

7.2 Immunity

7.2.1 General

Part 1 of this standard, table 2, contains the applicability of EMC immunity measurements to the relevant ports of radio and/or associated ancillary equipment.

7.2.2 Special conditions

The following special conditions set out in table 6, relate to the immunity test methods and performance criteria used in part 1 of this standard, clause 9.

Table 6: Special conditions for EMC immunity tests

Reference to subclauses in part 1 of this standard [1]	Special product-related conditions, additional to or modifying the test conditions in part 1 of this standard, clause 9
9.2.2: Test method; Radio frequency electromagnetic field (80 MHz - 1 000 MHz)	Attention: The width of the steps for the test frequency increments is class-dependent: <ul style="list-style-type: none"> - for SRDs of class 1 or class 2, the stepped frequency increments shall be 1 % of the momentary used test frequency. - for SRDs of class 3, the stepped frequency increments shall be 10 % of the momentary used test frequency.
9.5.2: Test method; Radio frequency, common mode	Attention: The width of the steps for the test frequency increments is class-dependent: <ul style="list-style-type: none"> - for SRDs of class 1 or class 2, the stepped frequency increments shall be 1 % of the momentary used test frequency in the frequency range 5 MHz to 80 MHz. - for SRDs of class 3, the stepped frequency increments shall be 10 % of the momentary used test frequency in the frequency range 5 MHz to 80 MHz.
9.7.3: Performance criteria; Voltage dips and interruptions	Attention: The performance criteria are equipment class dependent: <p>For a voltage dip corresponding to a reduction of the supply voltage of 30 % for 10 ms the performance criteria CT or CR specified in subclauses 6.4 or 6.6 shall apply as appropriate.</p> <p>For a voltage dip corresponding to a reduction of the supply voltage of 60 % for 100 ms the following class-dependent performance criteria shall apply:</p> <ul style="list-style-type: none"> - for transmitters, belonging to class 1 equipment, the performance criteria CT (subclause 6.4); - for transmitters, belonging to class 2 or 3 equipment, the performance criteria TT (subclause 6.5); - for receivers, belonging to class 1 equipment, the performance criteria CR (subclause 6.6); - for receivers, belonging to class 2 or 3 equipment, the performance criteria TR (subclause 6.7). <p>For a voltage interruption corresponding to a reduction of the supply voltage of > 95 % for 5 000 ms the performance criteria TT or TR specified in subclauses 6.5 or 6.7 shall apply as appropriate.</p>

Annex A (normative): Performance classification of Short Range Devices

This normative annex classifies Short Range Devices into three performance classes as mentioned in subclause 6.1.

The classification is given in three tables for the applications "Telecommand/Telecontrol" equipment (table A.1), "Telemetry" equipment, and "Wireless sensing/measuring" equipment (table A.2), "Alarm" equipment (table A.3), and in a separate table "Other applications" (table A.4) for other SRD equipment.

The required performance class shall be selected according to the equipment application as mentioned in these tables, or in case a specific application is not mentioned, the application in the tables closest to the application of that specific equipment shall be selected.

Table A.1

Class	Application
	Telecommand/Telecontrol
3	Garage door openers
3	Car Lock/Unlock devices
1	Remote control, models - planes
2	Remote control, models - ships, cars etc.
3	Remote control toys general
3	Radio remote control television, Audio etc.
2	Remote control appliances & lighting etc. for residential use only
3	RF door bell
3	Baby monitor
1	Remote control power & lighting
1	Remote surveillance switching
1	Remote control cranes etc.
1	Remote control grass cutting tractors etc.
1	Emergency shutdown controls
2	Level indicators

Table A.2

Class	Application
	Telemetry
1	Person identification
2	Animal identification
2	Product identification
2	Cargo handling and/or store (warehouse) systems
2	Domestic telemetry
1	Telemetry in vehicles
	Wireless sensing/measuring
1	Machine tools/robotics
1	Fire detection
1	Crane weigher
1	Process control
1	Position locator
1	Mooring loads
1	Wireless data communication

Table A.3

Class	Application
	Alarms
1	Domestic security
2	Car alarms
2	Anti-theft
1	Guard systems
1	Personal security
1	Victims of avalanche
1	Elderly persons
1	Mental institutions etc.
2	Building management systems
2	Radio call alert
1	Baby/nursery monitor - non domestic
2	Detection
2	Offender monitoring

Table A.4

Class	Application
	Other Applications
2	Video cordless terminals
2	Cordless local networks
2	Identification of rail wagons
1	Identification/Access control
2	Domestic transmission of sound & vision
1	Medical telemetry
2	Deaf education systems
2	Surface probing radar
2	Vehicle detection/monitoring

History

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