



SLOVENSKI STANDARD

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ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Short Range Devices (SRD); 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: Technical characteristics and test methods

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ETSI EN 300 220-1 V1.3.1 (2000-09)

European Standard (Telecommunications series)

**Electromagnetic compatibility and
Radio spectrum Matters (ERM);
Short Range Devices (SRD);
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: Technical characteristics and test methods**

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

For non EU countries the present document may be used for regulatory (Type Approval) purposes.

The present document is part 1 of a multi-part deliverable, covering the Short Range Devices (SRD); Radio equipment to be used in the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW, as identified below:

- Part 1: "Technical characteristics and test methods";**
- Part 2: "Supplementary parameters not intended for conformity purposes";
- Part 3: "Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive".

Clauses 1 and 3 provide a general description on the types of equipment covered by the present document and the definitions and abbreviations used. Clause 4 provides a guide as to the number of samples required in order that type tests may be carried out, and any markings on the equipment which the manufacturer should provide.

Clauses 5 and 6 gives guidance on the test and general conditions for testing of the device. Clause 7 gives the maximum measurement uncertainty values.

Clause 8 and 9 specifies the spectrum utilization parameters which are required to be measured. These are the maximum limits which have been chosen to minimize harmful interference to other equipment and services. The clauses provide details on how the equipment should be tested and the conditions which should be applied.

Annex A provides specifications concerning radiated measurements.

Annex B contains specifications for adjacent channel power measurement arrangements.

Annex C provides information on the spectrum analyser specification.

Annex D is a graphical representation of subclause 4.2, referring to the presentation of equipment for testing purposes.

National transposition dates	
Date of adoption of this EN:	1 September 2000
Date of latest announcement of this EN (doa):	31 December 2000
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 June 2001
Date of withdrawal of any conflicting National Standard (dow):	30 June 2001

1 Scope

The present document applies to short range device radio transmitters and receivers:

- 1) transmitters in the range from 25 MHz to 1 000 MHz and with power levels ranging up to 500 mW;
- 2) receivers in the range from 25 MHz to 1 000 MHz.

The present document contains the technical characteristics for radio equipment referencing CEPT/ERC Decisions and Recommendation CEPT ERC/Recommendation 70-03 [5].

The present document does not necessarily include all the characteristics which may be required by a user, nor does it necessarily represent the optimum performance achievable. It is a product family standard which may be completely or partially superseded by specific standards covering specific applications.

The present document applies to short range devices:

- either with a Radio Frequency (RF) output connection and/or with an integral antenna;
- for alarms, identification, telecommand, telemetry, etc., applications;
- with or without speech.

When selecting parameters for new SRDs, which may have inherent safety of human life implications, manufacturers and users should pay particular attention to the potential for interference from other systems operating in the same or adjacent bands.

The present document covers fixed stations, mobile stations and portable stations. In the present document requirements are given for the different frequency bands, channel separations etc., where appropriate.

All types of modulation are covered, in the present document, provided the requirements of subclauses 8.5 or 8.6, whichever is applicable, are met.

The radio equipment, covered by SRDs is divided into several power classes based on maximum output power (see table 1). The power class designation is based on CEPT/ERC Recommendation 70-03 [5].

Table 1

Power class	Power level (conducted or radiated) mW
5a	0,025
7a	5
8	10
9	25
11	100
12	500

For non-harmonized parameters, national regulatory conditions can apply regarding the type of modulation, channel/frequency separations, maximum transmitter output power/effective radiated power, duty cycle, equipment marking and the inclusion of an automatic transmitter shut-off facility as a condition of the issue of an individual or general licence, or, as a condition of use under licence exemption. The extreme temperature ranges are fixed and are given in subclause 5.4.1.2.

In the case of systems employing transponders, the transponders should be measured together with the associated transmitter

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] ETSI EN 300 220-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW; Part 2: Supplementary parameters not intended for conformity purposes".
 - [2] ETSI EN 301 489-3: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 25 GHz".
 - [3] "Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications equipment and the mutual recognition of their conformity".
 - [4] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.
 - [5] CEPT/ERC Recommendation 70-03: "Relating to the use of Short Range Devices (SRD)".
 - [6] ITU-T Recommendation O.153: "Basic parameters for the measurement of error performance at bit rates below the primary rate".
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 - [7] ETSI ETR 028: "Radio Equipment and Systems (RES); Uncertainties in the measurement of mobile radio equipment characteristics".
 - [8] CISPR 16-1: "Specification for radio disturbance and immunity measuring apparatus and methods; Part 1: Radio disturbance and immunity measuring apparatus".
 - [9] ITU-T Recommendation O.41: "Psophometer for use on telephone-type circuits".
 - [10] "Council Directive 98/34/EC laying down a procedure for the provision of information in the field of technical standards and regulations".
 - [11] ETSI EN 300 220-3: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW; Part 3: Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive".
 - [12] ETSI ETR 273: "Electromagnetic compatibility and Radio Spectrum Matters (ERM); Improvement of radiated methods of measurement (using test sites) and evaluation of the corresponding measurement uncertainties".
 - [13] ANSI C63.5 (1988): "Electromagnetic Compatibility-Radiated Emission Measurements in Electromagnetic Interference (EMI) Control - Calibration of Antennas".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

alarm: use of radio communication for indicating an alarm condition at a distant location

assigned frequency band: frequency band within which the device is authorized to operate

conducted measurements: measurements which are made using a direct 50 Ω connection to the equipment under test

dedicated antenna: removable antenna supplied and type tested with the radio equipment, designed as an indispensable part of the equipment

fixed station: equipment intended for use in a fixed location

full tests: all tests specified in the present document

integral antenna: permanent fixed antenna, which may be built-in, designed as an indispensable part of the equipment

limited tests: limited tests (see subclauses 4.2.1 to 4.2.10) are as follows:

- transmitter frequency error, see subclause 8.1;
- transmitter carrier power conducted, see subclause 8.2;
- transmitter effective radiated power, see subclause 8.3;
- transmitter adjacent channel power, see subclause 8.5.

manufacturer: means the manufacturer, or his authorized representative or the person responsible for placing on the market

mobile station: equipment normally fixed in a vehicle

portable station: equipment intended to be carried, attached or implanted

radiated measurements: measurements which involve the absolute measurement of a radiated field

transponder: a device that responds to an interrogation signal

telecommand: use of radio communication for the transmission of signals to initiate, modify or terminate functions of equipment at a distance

telemetry: use of radio communication for indicating or recording data at a distance

wide band: equipment to be used in a non-channelized continuous frequency band covering more than 25 kHz, or to be used in a channelized frequency band with a channel spacing greater than 25 kHz

3.2 Symbols

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

AR0, AR1, ...	categories of Alignment Range (see subclause 4.2.3)
dB	decibel
E	field strength
FR _L	Lower end of Frequency Range
FR _C	Centre of Frequency Range
FR _H	Higher end of Frequency Range
FT	Full Test (see subclause 3.1)
LT	Limited Tests (see subclause 3.1)

NaCl	sodium chloride
E _o	reference field strength
R	distance
R _o	reference distance
SND/ND	Signal + Noise + Distortion / Noise + Distortion
λ	wavelength

3.3 Abbreviations

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

ac/AC	alternating current
EMC	ElectroMagnetic Compatibility
emf	electromotive force
ERP	Effective Radiated Power
IF	Intermediate Frequency
MPAD	Maximum Permissible Amplitude modulation Depth
MPFD	Maximum Permissible Frequency Deviation
OFR	Operating Frequency Range
R&TTE	Radio and Telecommunications Terminal Equipment
RE	Radio Equipment
RF	Radio Frequency
rms	root-mean-square
Rx	Receiver
SR	Switching Range
SRD	Short Range Device
Tx	Transmitter
VSWR	Voltage Standing Wave Ratio

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4 Technical requirement specifications

4.1 General requirements

4.1.1 Receiver classification

The receiver used in short range radio devices is divided into three classes of receiver, see table 2, each having its own set of minimum performance criteria. This classification is based upon the impact on persons in case the equipment does not operate above the specified minimum performance level.

Table 2

Receiver class	Relevant receiver clauses	Risk assessment of receiver performance
1	9.1, 9.2, 9.3 and 9.4	Highly reliable SRD communication media; e.g. serving human life inherent systems (may result in a physical risk to a person)
2	9.3 and 9.4	Medium reliable SRD communication media e.g. causing Inconvenience to persons, which cannot simply be overcome by other means
3	9.4	Standard reliable SRD communication media e.g. Inconvenience to persons, which can simply be overcome by other means (e.g. manual)
NOTE:	With reference to the present document manufacturers are recommended to declare classification of their devices in accordance with table 2 and EN 300 220-3 [11], subclause 4.2, as relevant. In particular where an SRD which may have an inherent safety of human life implications, manufacturers and users should pay particular attention to the potential for interference from other systems operating in the same or adjacent bands.	

4.1.2 General performance criteria

For the purpose of the receiver performance tests, the receiver will produce an appropriate output under normal conditions as indicated below. Where the indicated performance cannot be achieved, the manufacturer shall declare and publish the performance criteria used to determine the performance of the receiver:

- a SND/ND ratio of 20 dB, measured at the receiver output through a telephone psophometric weighting network as described in ITU-T Recommendation O.41 [9]; or
- after demodulation, a data signal with a bit error ratio of 10^{-2} ; or
- after demodulation, a message acceptance ratio of 80 %.

4.2 Presentation of equipment for testing purposes

Each equipment submitted for testing shall fulfil the requirements of the present document on all frequencies over which it is intended to operate.

Where appropriate the manufacturer should choose the appropriate frequencies for testing in consultation with the Administration(s) from whom conformity to the R&TTE Directive[3] or type approval is sought and in accordance with subclauses 4.2.4 to 4.2.12 (see annex D).

If an equipment is designed to operate with different carrier powers, measurement of each transmitter parameter shall be performed at the highest power level at which the transmitter is intended to operate.

To simplify and harmonize the testing procedures between the different testing laboratories, measurements shall be performed, according to the present document, on samples of equipment defined in subclauses 4.2.1 to 4.2.12 (see also annex D).

These subclauses are intended to give confidence that the requirements set out in the present document have been met without the necessity of performing measurements on all frequencies.

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4.2.1 Choice of model for testing

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The manufacturer shall provide one or more samples of the equipment, as appropriate, for testing.

If an equipment has several optional features, considered not to affect the RF parameters then tests need only be performed on the equipment configured with that combination of features considered to be the most complex, as proposed by the manufacturer and agreed by the test laboratory.

In the case of hand portable equipment without a 50 Ω external antenna connector, see subclause 4.2.12.

4.2.2 Definitions of Switching Range (SR), alignment range and operational frequency range

4.2.2.1 Definition of SR

The manufacturer shall state the SR of the receiver and the transmitter (which may differ).

The SR is the maximum frequency range, as specified by the manufacturer, over which the receiver or the transmitter can be operated within the alignment range without reprogramming or realignment.

4.2.2.2 Definition of alignment range

The manufacturer shall also, when submitting equipment for testing, state the alignment ranges for the receiver and the transmitter.

The alignment range is defined as the frequency range over which the receiver and/or the transmitter can be programmed and/or aligned to operate, without any change to the circuit other than the substitution of programmable read only memories or crystals (for the receiver and transmitter) and the trimming of discrete components.

Trimming is an act by which the value (in this case relating to frequency) of a component is changed within the circuit. This act may include the physical alteration, substitution (by components of similar size and type) or activation/de-activation (via the setting of soldered bridges) of components.

For the purpose of all measurements, the receiver and transmitter shall be considered separately.

4.2.2.3 Definition of operating frequency range

The Operating Frequency Range (OFR) is the total range of frequencies covered either by one type, or by a family of equipment.

It is noted that a family of equipment may be capable of covering a wider frequency range than the alignment frequency range of one type of equipment.

4.2.3 Definition of the categories of the alignment range (AR0, AR1, AR2 and AR3)

The alignment range falls into one of four categories:

- the first category, defined as AR0, corresponds to equipment having an alignment range of less than or equal to 5 MHz;
- the second category, defined as AR1, corresponds to an alignment range greater than 5 MHz but less than or equal to 30 MHz;
- the third category, defined as AR2, corresponds to an alignment range greater than 30 MHz, but less than or equal to 60 MHz;
- the fourth category, defined as AR3, corresponds to an alignment range greater than 60 MHz.

4.2.4 Testing of equipment of category AR0

Full tests (see subclause 3.1) shall be carried out on a frequency within 50 kHz of the centre frequency of the alignment range, category AR0.

4.2.5 Testing of equipment of category AR1

Full tests (see subclause 3.1) shall be carried out on a frequency within 50 kHz of the highest frequency of the alignment range, and full tests (see subclause 3.1) on a frequency within 50 kHz of the lowest frequency of the alignment range.

4.2.6 Testing of equipment of category AR2

Full tests (see subclause 3.1) shall be carried on a frequency within 50 kHz of the highest frequency of the alignment range and full tests on a frequency within 50 kHz of the lowest frequency of the alignment range.

Limited tests (see subclause 3.1) shall be carried out on a frequency within 50 kHz of the centre frequency of the alignment range.

4.2.7 Testing of equipment of category AR3

Full test (see subclause 3.1) shall be carried out on 2 frequencies, one within 50 kHz of the highest, and one within 50 kHz of the lowest frequency of the alignment range.

Limited tests (see subclause 3.1) shall be carried out on intermediate test frequencies, equally spaced (± 50 kHz) over the alignment range and chosen such that the gaps between the test frequencies do not exceed 30 MHz.