
9`Y_fca U[bYfbUnXfi y`^j cgh]b`nUXYj Yj`nj Yn]`n`fUX]`g_`ja`gdY_fca`fØFAŁĚ
BUdfUj Y`fUh_Y[UXcgY[UfGF8 gŁĚFUX]`g_UcdfYa UnUi dcfUvc`j`ZY_j Yb bYa
cVa c`f`cX`%Xc`(\$); <nĚ`%`XY.`HY b] bY`UfU_hyf]gh_Y]b`dfYg_i gbY`a YtcXY

Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Part 1: Technical characteristics and test methods

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[ac50639c72b0/sist-en-300-440-1-v1-3-1-2003](https://standards.iteh.ai/catalog/standards/sist/7f9d8b13-4f79-4a64-9780-ac50639c72b0/sist-en-300-440-1-v1-3-1-2003)

Ta slovenski standard je istoveten z: EN 300 440-1 Version 1.3.1

ICS:

33.060.20	Sprejemna in oddajna oprema	Receiving and transmitting equipment
33.100.01	Elektromagnetna združljivost na splošno	Electromagnetic compatibility in general

SIST EN 300 440-1 V1.3.1:2003 **en**

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<https://standards.iteh.ai/catalog/standards/sist/79d8b13-4f79-4a64-9780-ac50639c72b0/sist-en-300-440-1-v1-3-1-2003>

ETSI EN 300 440-1 V1.3.1 (2001-09)

European Standard (Telecommunications series)

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
Short range devices;
Radio equipment to be used
in the 1 GHz to 40 GHz frequency range;
Part 1: Technical characteristics and test methods**

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Reference

REN/ERM-RP08-0406-1

Keywords

radio, testing, SRD

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Sous-Préfecture de Grasse (06) N° 7803/88

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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 Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range, as identified below:

Part 1: "Technical characteristics and test methods";

Part 2: "Harmonized EN under article 3.2 of the R&TTE Directive".

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National transposition dates	
Date of adoption of this EN:	7 September 2001
Date of latest announcement of this EN (doa):	31 December 2001
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 June 2002
Date of withdrawal of any conflicting National Standard (dow):	30 June 2002

1 Scope

The present document applies to Short Range Devices (SRDs) transmitters and receivers:

- a) transmitters operating in range from 1 GHz to 40 GHz with power levels ranging up to 4W;
- b) receivers operating in the range from 1 GHz to 40 GHz;

The present document contains the technical characteristics for radio equipment and is referencing CEPT/ERC Recommendation for SRDs CEPT/ERC Recommendation 70-03 [1] and ERC Decisions.

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 generic SRDs:

- either with a Radio Frequency (RF) output connection and specified antenna, or with an integral antenna;
- for alarms, identification systems, radio-determination, telecommand, telemetry etc. applications;
- for all types of modulation;
- 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. If a system includes transponders, these are measured together with the transmitter.

All types of modulation for radio devices are covered by the present document, provided the requirements of clause 7.2 are met.

The radio equipment, covered by the classification SRD 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 [1] or ERC Decisions.

Table 1: Maximum radiated peak power (e.i.r.p.)

Power Class (see note 1)	Power level (conducted or radiated)
8	10 mW
9	25 mW
11	100 mW
12	500 mW (see note 2)
13	1 W
14	2 W
14a	4 W (see note 2)
NOTE 1: Class designation is based on CEPT/ERC Recommendation 70-03 [1].	
NOTE 2: For RFID applications, see annex C of the present document.	

On non-harmonized parameters, national administrations may impose conditions on the type of modulation, frequency, channel/frequency separations, maximum transmitter radiated field strength/maximum output current to a defined antenna, duty cycle, equipment marking and the inclusion of an automatic transmitter shut-off facility, as a condition for the issue of an individual or general licence, or as a condition for use under licence exemption.

The present document does not require measurements for radiated emissions below 25 MHz.

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.

- [1] CEPT/ERC Recommendation 70-03 (1997): "Relating to the use of Short Range Devices (SRD)".
- [2] CEPT/ERC Recommendation 74-01 (1998): "Spurious emissions".
- [3] CISPR 16-1: "Specification for radio disturbance and immunity measuring apparatus and methods; Part 1: Radio disturbance and immunity measuring apparatus".
- [4] 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".
- [5] ETSI EN 300 440-2 (V1.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive".
- [6] ETSI ETR 028: "Radio Equipment and Systems (RES); Uncertainties in the measurement of mobile radio equipment characteristics".
- [7] ITU-T Recommendation O.41: "Psophometer for use on telephone-type circuits".
- [8] ITU-T Recommendation O.153: "Basic parameters for the measurement of error performance at bit rates below the primary rate".
- <http://standards.iteh.ai/catalog/standards/sist/79d8b13-4f79-4a64-9780-ac50639c72b0/sist-en-300-440-1-v1-3-1-2003>

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

artificial antenna: non-radiating dummy load equal to the nominal impedance specified by the applicant

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

chip: unit of modulation used in Direct Sequence Spread Spectrum (DSSS) modulation

chip rate: number of chips per second

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

Direct Sequence Spread Spectrum (DSSS): form of modulation where a combination of data to be transmitted and a fixed code sequence (chip sequence) is used to directly modulate a carrier, e.g. by phase shift keying. The code sequence length determines the occupied bandwidth

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

Frequency Hopping Spread Spectrum (FHSS): a spread spectrum technique in which the transmitter signal occupies a number of frequencies in time, each for some period of time, referred to as the dwell time

NOTE 1: Transmitter and receiver follow the same frequency hop pattern. The number of hop positions and the bandwidth per hop position determine the occupied bandwidth.

identification system: equipment consisting of a transmitter(s), receiver(s) (or a combination of the two) and an antenna(s) to identify objects by means of a transponder

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

mobile station: equipment normally fixed in a vehicle or used as a transportable station

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

operating frequency: nominal frequency at which equipment is operated; this is also referred to as the operating centre frequency

NOTE 2: Equipment may be able to operate at more than one operating frequency.

operating frequency range: range of operating frequencies over which the equipment can be adjusted through tuning, switching or reprogramming

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

radio determination: determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the propagation properties of radio waves

spread spectrum: modulation technique in which the energy of a transmitted signal is spread throughout a large portion of the frequency spectrum

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

transponder: device which responds to an interrogation signal

wideband: equipment to be used in a non-channelized continuous frequency band, or to be used in a channelized frequency band using more than one consecutive channel

3.2 Symbols

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

E	Electrical field strength
E ₀	Reference electrical field strength, (see annex A)
f	Frequency
P	Power
R	Distance
R ₀	Reference distance, (see annex A)
t	Time
λ	wavelength

3.3 Abbreviations

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

dB	Decibel
dBi	gain in decibels relative to an isotropic antenna
DSSS	Direct Sequence Spread Spectrum
eirp	equivalent isotropically radiated power
EMC	ElectroMagnetic Compatibility
ERC	European Radiocommunication Committee
FHSS	Frequency Hopping Spread Spectrum
DSSS	Direct Sequence Spread Spectrum
PSTN	Public Switched Telephone Network
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
RFID	Radio Frequency Identification
SRD	Short Range Device
Tx	Transmitter
VSWR	Voltage Standing Wave Ratio

4 Technical requirements specifications

4.1 General requirements

4.1.1 Receiver classification

The product family of short range radio devices is divided into three equipment classes, 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	8.1, 8.2, 8.3 and 8.4	Highly reliable SRD communication media; e.g. serving human life inherent systems (may result in a physical risk to a person).
2	8.3 and 8.4	Medium reliable SRD communication media e.g. causing Inconvenience to persons, which cannot simply be overcome by other means.
3	8.4	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 300 440-2 [5] clause 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 [7]; 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, where applicable, shall fulfil the requirements of the present document on all frequencies over which it is intended to operate.

Where appropriate the applicant should chose appropriate frequencies in consultation with the Administration(s) from whom type approval is sought.

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

Additionally, technical documentation and operating manuals, sufficient to allow testing to be performed, shall be supplied.

A test fixture for equipment with an integral antenna may be supplied by the applicant (see clause 6.3).

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 clauses 4.2.1 to 4.2.3.2.

These clauses 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.

4.2.1 Choice of model for testing

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

Stand alone equipment shall be offered by the applicant complete with any ancillary equipment needed for testing.

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

Where practicable, equipment offered for testing shall provide a 50 Ω connector for conducted RF power measurements.

In the case of integral antenna equipment, if the equipment does not have a internal permanent 50 Ω connector then it is permissible to supply a second sample of the equipment with a temporary antenna connector fitted to facilitate testing, see clause 4.2.3.

4.2.2 Testing of equipment with alternative power levels

If a family of equipment has alternative output power levels provided by the use of separate power modules or add on stages, or additionally has alternative frequency coverage, then all these shall be declared by the applicant. Each module or add on stage shall be tested in combination with the equipment. The necessary samples and tests can be proposed by the applicant and/or the test laboratory and shall be agreed with the Administration(s), based on the requirements of clause 4.2. As a minimum, measurements of the radiated power (eirp) and spurious emissions shall be performed for each combination and shall be stated in the test report.