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Radijska oprema in sistemi (RES) - Naprave kratkega dosega (SRDs) - Tehnične karakteristike in preskušalne metode za radijsko opremo, ki se uporablja v frekvenčnem območju od 25 MHz do 1 000 MHz z nivoji izhodne moči do 500 mW

Radio Equipment and Systems (RES); Short Range Devices (SRDs); 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

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Foreword

This Interim European Telecommunication Standard (I-ETS) has been prepared by the Radio Equipment and Systems (RES) Technical Committee of the European Telecommunications Standards Institute (ETSI) and having passed through ETSI standards approval procedure, is now published.

This is a general standard based upon CEPT Recommendations T/R 20-03 [1] and T/R 20-04 [2].

All types of modulation for radio devices, except Code Division Multiple Access (CDMA), are covered by this I-ETS.

For regulatory purposes the equipment is divided into four main classes based on frequency range and maximum output power (see table 1), and further divided into classes based on the use inside or outside the Industrial Scientific and Medical (ISM) bands and on the use of the antenna (see table 2).

Table 1

Class	Frequency range MHz	Power level (conducted or radiated) milliWatts (mW)
I	25 to 1 000	10
II	300 to 1 000	25
III	25 to 300	100
IV	300 to 1 000	500

Table 2

Sub-class	Frequency band	Antenna type/connector
a	I.S.M.	Integral
b	Non-I.S.M.	Integral
c	I.S.M.	External socket
d	Non-I.S.M.	External socket

The CEPT Recommendation T/R 01-04 [6] covering Low Power Devices (LPD) is supported by class I.a., from the above tables, see Annex A, Clause A.1.

For non-harmonised parameters, national administrations may impose conditions on the type of modulation, channel/frequency separations, maximum transmitter output power/effective radiated power, 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.

This I-ETS does not cover requirements for radiated emissions below 25 MHz.

Additional standards or specifications may be required for equipment such as that intended for connection to the Public Switched Telephone Network (PSTN).

Introduction

This I-ETS is intended to specify the minimum performance and the methods of measurement for short range devices as specified in the scope.

When ETSI publishes a standard covering a specific application for short range devices, it will supersede this general standard.

Interference from other services and systems has not been taken into account in this I-ETS.

Included are methods of measurement for equipments fitted with antenna sockets and/or integral antenna. Equipment designed for use with an integral antenna may be supplied with a temporary external/internal or permanent internal 50 ohm connector for the purpose of testing, providing, the characteristics being measured are not expected to be affected.

The performance of the equipment submitted for type testing should be representative of the performance of the corresponding production model. In order to avoid any ambiguity in that assessment, this I-ETS contains instructions for the presentation of equipment for type testing purposes (see subclause 4.1), conditions of testing (see Clause 5).

This I-ETS was drafted on the assumption that:

- "Type test measurements, performed in an accredited test laboratory, shall be accepted by the various National Regulatory Authorities in order to grant type approval, provided the National regulatory requirements are met. In addition national administrations may accept a "certificate of conformity" based on the type test report".

This is in compliance with CEPT Recommendation T/R 71-03 [7].
Clauses 1 and 3 provide a general description on the types of equipment covered by this I-ETS 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 applicant should provide.

Clauses 7 and 8 provide the limits of the parameters which are required to be tested. These limits have been chosen to minimise harmful interference to other equipment and services. It also provides details on how the equipment should be tested and the conditions which should be applied.

Clause 9 gives the maximum measurement uncertainty values.

Annex A provides information on specific applications covered by this I-ETS.

Annex B provides specifications concerning radiated measurements.

Annex C contains specifications for adjacent channel power measurement arrangements.

Annex D is a graphic representation of subclause 4.1, referring to the presentation of equipment for testing purposes.

Annex E provides information on the correction curve to be used for pulsed systems.

Annex F provides information on the spectrum analyser specification.

1 Scope

This I-ETS covers the minimum characteristics considered necessary in order to make the best use of the available frequencies.

It does not necessarily include all the characteristics which may be required by a user, nor does it necessarily represent the optimum performance achievable.

It applies to short range devices:

- with an antenna connection and/or with an integral antenna;
- for alarms, telecommand, telemetry, etc., applications;
- with or without speech;
- operating on radio frequencies between 25 MHz and 1 000 MHz, with power levels up to 500 mW, radiated or terminated.

This I-ETS covers fixed stations, mobile stations and portable stations. It applies also to Low Power Devices (LPD), as defined in the CEPT Recommendation T/R 01-04 [6]. In this I-ETS basic requirements are given for the different frequency bands, channel separation etc., where appropriate.

2 Normative references

This I-ETS incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this I-ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] CEPT Recommendation T/R 20-03: "Low power telecommand and telemetry equipment operating on collective frequencies in the ISM frequency bands".

[2] CEPT Recommendation T/R 20-04: "Low power narrow band telecommand and telemetry equipment for use outside the ISM frequency bands".

[3] CCITT Recommendation O.153: "Basic parameters for the measurement of error performance at bit rates below the primary rate".

[4] CISPR Publication 16: "Specifications for radio interference measuring apparatus and measurement methods".

[5] ETR 028: "Radio Equipment and Systems; Uncertainties in the measurement of mobile radio equipment characteristics".

[6] CEPT Recommendation T/R 01-04: "Use of Low Power Devices (LPD) using integral antennas and operating in harmonised frequency bands".

[7] CEPT Recommendation T/R 71-03: "Procedures for type testing and approval for radio equipment intended for non public systems".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purpose of this I-ETS the following definitions apply.

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

Assigned frequency band: the frequency band within which the device is authorised to operate.

Conducted measurements: measurements which are made using a direct 50 ohm connection to the equipment under test.

Fixed station: equipment intended for use in a fixed location.

Full tests: in all cases except where qualified as "limited", tests shall be performed according to this I-ETS.

Integral antenna: an antenna, with or without a connector, designed as an indispensable part of the equipment.

Limited tests: the limited tests, see subclauses 4.1.1 to 4.1.10, are as follows:

- transmitter frequency error, see subclause 7.1;
- transmitter carrier power conducted, see subclause 7.2;
- transmitter effective radiated power, see subclause 7.3;
- transmitter adjacent channel power, see subclause 7.5.

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.

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

Telemetry: the use of radio communication for indicating or recording data at a distance.

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

3.2 Symbols

For the purposes of this I-ETS the following symbols apply.

E	field strength
NaCl	Sodium chloride
Eo	reference field strength
R	distance
Ro	reference distance
λ	wavelength

3.3 Abbreviations

For the purposes of this I-ETS the following abbreviations apply.

AR1	Alignment Range 1 (see subclauses 4.1.2 and 4.1.3)
AR2	Alignment Range 2 (see subclauses 4.1.2 and 4.1.3)
CDMA	Code Division Multiple Access (spread spectrum)
EMC	Electro-Magnetic Compatibility
ETR	ETSI Technical Report
IF	Intermediate Frequency
ISM	Industrial, Scientific and Medical

NOTE: This I-ETS includes the following designated ISM frequency bands:

- 26,957 MHz - 27,283 MHz;
- 40,660 MHz - 40,700 MHz;
- 433,050 MHz - 434,790 MHz.

RF	Radio Frequency
rms	root-mean-squared
Tx	Transmitter
VSWR	Voltage Standing Wave Ratio

4 General

4.1 Presentation of equipment for testing purposes

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

The applicant shall complete the appropriate application form when submitting equipment for type testing.

To simplify and harmonise the type testing procedures between the different test laboratories, measurements shall be performed, according to this I-ETS, on samples of equipment defined in subclauses 4.1.1 to 4.1.12.

The measurements, wherever possible, shall be made by use of a direct connection to the equipment under test (antenna socket or temporary 50 ohm connector) as stated in this I-ETS, in order to ensure that the measurement uncertainties are minimised.

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

4.1.1 Choice of model for type testing

The applicant shall provide one or more production model(s) of the equipment, as appropriate, for type testing.

If type approval is given on the basis of tests on a preliminary model, the corresponding production models must be identical in all electrical and functional respects with the preliminary model tested.

In the case of portable equipment without an external antenna connector, see subclause 4.1.12.

4.1.2 Definitions of alignment range and switching range

The applicant shall, when submitting equipment for test, state the alignment ranges of the receiver and transmitter.

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

The applicant shall also state the switching range of the receiver and the transmitter (which may differ).

The switching range is the maximum frequency range over which the receiver or the transmitter can be operated without reprogramming or realignment.

4.1.3 Definition of the categories of the alignment range (AR1 and AR2)

The alignment range for the receiver and transmitter, which may be different, falls into one of two categories:

AR1: this corresponds to a limit of less than or equal to 10 % of the highest frequency of the alignment range, which is equal to or less than 500 MHz, or less than or equal to 5 % where the highest alignment frequency is above 500 MHz;

AR2: this corresponds to a limit of greater than 10 % of the highest frequency of the alignment range, which is equal to or less than 500 MHz, or greater than 5 % where the highest alignment frequency is above 500 MHz.

4.1.4 Choice of frequencies

The frequencies for testing shall be chosen by the applicant, in accordance with subclauses 4.1.5 to 4.1.11 and Annex D.

4.1.5 Testing of single frequency equipment of category AR1

Full tests shall be carried out on a frequency within 100 kHz of the centre frequency of the alignment range on one sample of the equipment.

4.1.6 Testing of single frequency equipment of category AR2

Three samples shall be tested. Tests shall be carried out on a total of three frequencies:

- sample one shall be within 100 kHz of the highest frequency of the alignment range;
- sample two shall be within 100 kHz of the lowest frequency of the alignment range;
- sample three shall be within 100 kHz of the centre frequency of the alignment range.

Full tests shall be carried out on all three frequencies.

4.1.7 Testing of two frequencies equipment of category AR1

One sample shall be submitted to enable tests to be carried out on both frequencies.

The upper frequency shall be within 100 kHz of the highest frequency of the switching range. The lower frequency shall be within 100 kHz of the lowest frequency of the switching range. In addition the average of the two frequencies shall be within 100 kHz of the centre frequency of the alignment range.

Full tests shall be carried out on the upper frequency and limited tests on the lower frequency.

4.1.8 Testing of two frequency equipment of category AR2

Three samples of the equipment shall be tested. Tests shall be carried out on a total of four frequencies:

- sample one, two frequencies shall be measured. The highest frequency shall be within 100 kHz of the centre frequency of the alignment range. The upper frequency shall be within 100 kHz of the highest

frequency of the switching range and the lower frequency shall be within 100 kHz of the lowest frequency of the switching range.

Full tests shall be carried out on the upper frequency and limited tests on the lower frequency;

- sample two, the frequency shall be within 100 kHz of the highest frequency of the alignment range.

  Full tests shall be carried out on this frequency;

- sample three, the frequency shall be within 100 kHz of the lowest frequency of the alignment range.

  Full tests shall be carried out on this frequency.

4.1.9 Testing of multi-frequency equipment (more than two frequencies) of category AR1

One sample of the equipment shall be submitted to enable tests to be carried out on three frequencies.

The centre frequency of the switching range shall be within 100 kHz of the centre frequency of the alignment range. The upper frequency shall be within 100 kHz of the highest frequency of the switching range and the lower frequency shall be within 100 kHz of the lowest frequency of the switching range.

Full tests shall be carried out on the centre frequency and limited tests on the upper and lower frequency.

4.1.10 Testing of multi-frequency equipment (more than two frequencies) of category AR2 (switching range less than alignment range)

Three samples of the equipment shall be tested. Tests shall be carried out on a total of five frequencies:

- sample one, three frequencies shall be measured. The centre frequency of the switching range shall be within 100 kHz of the centre frequency of the alignment range. The upper frequency shall be within 100 kHz of the highest frequency of the switching range and the lower frequency shall be within 100 kHz of the lowest frequency of the switching range.

  Full tests shall be carried out on the centre frequency and limited tests on the upper and lower frequency;

- sample two, the frequency shall be within 100 kHz of the highest frequency of the alignment range;

- full tests shall be carried out on this frequency;

- sample three, the frequency shall be within 100 kHz of the lowest frequency of the alignment range.

  Full tests shall be carried out on this frequency.

4.1.11 Testing of multi-frequency equipment (more than two frequencies) of category AR2 (switching range equals the alignment range)

One sample of the equipment shall be submitted to enable tests to be carried out on three frequencies.

The switching range of the sample shall correspond to the alignment range.

The centre frequency shall be within 100 kHz of the centre frequency of the switching range. The upper frequency shall be within 100 kHz of the highest frequency of the switching range and the lower frequency shall be within 100 kHz of the lowest frequency of the switching range.

Full tests shall be carried out on all three frequencies.