



**SLOVENSKI STANDARD**  
**SIST EN 300 328-1 V1.3.1:2003**  
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Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband  
Transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band  
and using spread spectrum modulation techniques; Part 1: Technical characteristics and  
test conditions

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# ETSI EN 300 328-1 V1.3.1 (2001-12)

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*European Standard (Telecommunications series)*

**Electromagnetic compatibility  
and Radio spectrum Matters (ERM);  
Wideband Transmission systems;  
Data transmission equipment operating  
in the 2,4 GHz ISM band and  
using spread spectrum modulation techniques;  
Part 1: Technical characteristics and test conditions**

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F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C  
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# Contents

Intellectual Property Rights .....	5
Foreword.....	5
Introduction .....	6
1 Scope .....	7
2 References .....	8
3 Definitions, abbreviations and symbols .....	9
3.1 Definitions .....	9
3.2 Abbreviations .....	10
3.3 Symbols.....	10
4 General .....	11
4.1 Manufacturer declarations .....	11
4.2 Presentation of equipment for type testing .....	11
4.2.1 Choice of model.....	11
4.2.2 Presentation.....	12
4.2.3 Choice of operating frequencies .....	12
4.3 Design .....	12
4.3.1 General.....	12
4.3.2 Controls .....	12
4.4 Interpretation of the measurement results .....	12
5 Technical characteristics .....	13
5.1 Modulation .....	13
5.1.1 FHSS modulation.....	13
5.1.2 DSSS and other forms of modulation .....	13
5.2 Transmitter parameter limits .....	13
5.2.1 Effective radiated power .....	13
5.2.2 Peak power density .....	13
5.2.3 Frequency range.....	13
5.2.4 Spurious emissions .....	14
5.3 Receiver parameter limits.....	14
5.3.1 General.....	14
5.3.2 Spurious emissions .....	15
6 Test conditions .....	15
6.1 Normal and extreme test conditions .....	15
6.2 Power sources.....	15
6.2.1 Power sources for stand-alone equipment .....	15
6.2.2 Power sources for plug-in radio devices .....	16
6.3 Normal test conditions.....	16
6.3.1 Normal temperature and humidity .....	16
6.3.2 Normal power source.....	16
6.3.2.1 Mains voltage .....	16
6.3.2.2 Lead-acid battery power sources used on vehicles.....	16
6.3.2.3 Other power sources.....	16
6.4 Extreme test conditions .....	16
6.4.1 Extreme temperatures .....	16
6.4.2 Extreme power source voltages .....	17
6.4.2.1 Mains voltage .....	17
6.4.2.2 Lead-acid battery power sources used on vehicles.....	17
6.4.2.3 Power sources using other types of batteries.....	17
6.4.2.4 Other power sources.....	17
6.4.3 Procedure for tests at extreme temperatures .....	17
6.5 Testing of host connected equipment and plug-in radio devices .....	18
6.5.1 The use of a host or test jig for testing Plug-In radio devices .....	18

6.5.2	Testing of combinations.....	18
6.5.2.1	Alternative A: General approach for combinations.....	18
6.5.2.2	Alternative B: For host equipment with a plug-in radio device .....	18
6.5.2.3	Alternative C: For combined equipment with a plug-in radio device .....	18
6.5.2.4	Alternative D: For equipment with multiple radios .....	18
6.6	Test data sequence.....	19
7	Methods of measurement .....	19
7.1	General .....	19
7.2	Measurements of transmitter parameters.....	19
7.2.1	Effective radiated power .....	19
7.2.1.1	Radiated measurements.....	19
7.2.1.2	Conducted Measurements .....	20
7.2.2	Peak power density .....	21
7.2.3	Frequency range of equipment using FHSS modulation .....	22
7.2.4	Frequency range of equipment using other forms of modulation .....	23
7.2.5	Spurious emissions .....	23
7.3	Measurements of receiver parameters .....	25
7.3.1	General.....	25
7.3.2	Spurious emissions .....	25
8	Measurement uncertainty values .....	26
<b>Annex A (normative): Test sites and arrangements for radiated measurements.....</b>		<b>27</b>
A.1	Test sites.....	27
A.1.1	Open air test sites .....	27
A.1.2	Anechoic chamber .....	28
A.1.2.1	General.....	28
A.1.2.2	Description.....	28
A.1.2.3	Influence of parasitic reflections.....	28
A.1.2.4	Calibration and mode of use .....	28
A.2	Test antenna.....	30
A.3	Substitution antenna .....	30
<b>Annex B (normative): General description of measurement .....</b>		<b>31</b>
B.1	Conducted measurements and use of test fixture .....	31
B.2	Radiated measurements.....	31
B.3	Substitution measurement .....	32
<b>Annex C (informative): Bibliography.....</b>		<b>33</b>
History .....		34

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## Foreword

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

The present document is part 1 of a multi-part deliverable covering the Wideband Transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using spread spectrum modulation techniques, as identified below:

**Part 1: "Technical characteristics and test conditions";**

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

Annex A provides additional requirements concerning radiated measurements.

Annex B contains normative specifications for the adjustment of the measurement equipment and of the equipment to be measured in order to achieve correct results.

Annex C provides a Bibliography.

### National transposition dates

Date of adoption of this EN:	30 November 2001
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Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 August 2002
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## Introduction

Wideband radio data transmission systems are rapidly being introduced into a variety of commercial and industrial applications and the technology employed by these systems is still developing.

The present document may be used for the assessment of the performance of the equipment. The performance of the equipment submitted for type testing should be representative for the performance of the corresponding production model. In order to avoid any ambiguity in that assessment, the present document contains instructions for the presentation of equipment for type testing purposes where required (clause 4), testing conditions (clause 6) and methods of measurement (clause 7).

It is intended to include requirements for multi-radio equipment in the present document, but at this time the technical considerations are still ongoing. Upon completion of this work, the present document will be revised to include these requirements.

ETSI intend to recommend to CEPT that the requirement for a minimum aggregate bit rate (250 kbit/s) is removed from the CEPT Recommendation 70-03 (annex 3) [1]. When CEPT have made this decision, the present document will be revised to reflect this decision.

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# 1 Scope

The present document covers equipment referred to in CEPT/ERC Recommendation 70-03 (annex 3) [1]. The present document covers the minimum technical characteristics for radio data transmission equipment having the following technical parameters:

- wideband radio modulation techniques;
- aggregate bit rates in excess of 250 kbits/s;
- operation in the 2,4 GHz to 2,4835 GHz Industrial, Scientific and Medical (ISM) band;
- effective radiated power of up to -10 dBW (100 mW);
- power density of up to -10 dBW (100 mW) per 100 kHz for frequency hopping modulation;
- power density of up to -20 dBW (10 mW) per 1 MHz for other forms of spread spectrum modulation.

The present document only addresses the transceivers, transmitters and receivers of equipment offered for testing and includes such technologies as IEEE 802.11 [5], HomeRF™.

The equipment offered for testing may be used in fixed, mobile or portable applications, e.g.:

- stand-alone radio equipment with or without their own control provisions;
- plug-in radio devices intended for use with or within a variety of host systems, e.g. personal computers, hand-held terminals, etc.;
- plug-in radio devices intended for use within combined equipment, e.g. cable modems, set-top boxes, access points, etc.;
- combined equipment or a combination of a plug-in radio device and a specific type of host equipment.

The equipment may be fitted with integral antennae and/or antenna connectors.

CEPT/ERC Recommendation 70-03 (annex 3) [1] defines the total power and power density limits for systems using spread spectrum modulation together with a minimum aggregate bit rate of 250 kbit/s. The recommendation does not address the details of these modulation techniques. Therefore, the present document does not cover the design or operation of the equipment being tested but describes a common set of measurements to be applied to various types of such equipment, including those employing Frequency Hopping Spread Spectrum (FHSS) modulation and Direct Sequence Spread Spectrum (DSSS) modulation.

CEPT/ERC Recommendation 70-03 (annex 3) [1] specifies that spread spectrum modulation be used and it gives power density values for FHSS and DSSS modulation. The present document specifies the minimum technical parameters of FHSS modulation such that it can be clearly differentiated from other types of modulation, including DSSS modulation.

The present document describes measurements for operating frequency range(s), effective radiated power and power density as well as spurious emissions for transmitters and receivers.

The measurement methods have been adapted from TR 100 027 [2] where possible.

The present document specifies test site characteristics, test conditions, equipment calibration and methods of measurement.

The present document is a general standard which may be superseded by specific standards covering specific applications.

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

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## 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 Recommendation 70-03 (annex 3): "Relating to the use of Short Range Devices (SRD)".
- [2] ETSI TR 100 027: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Methods of measurement for private mobile radio equipment".
- [3] ETSI TR 100 028-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1".
- [4] ETSI TR 100 028-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".
- [5] IEEE 802.11: "IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".

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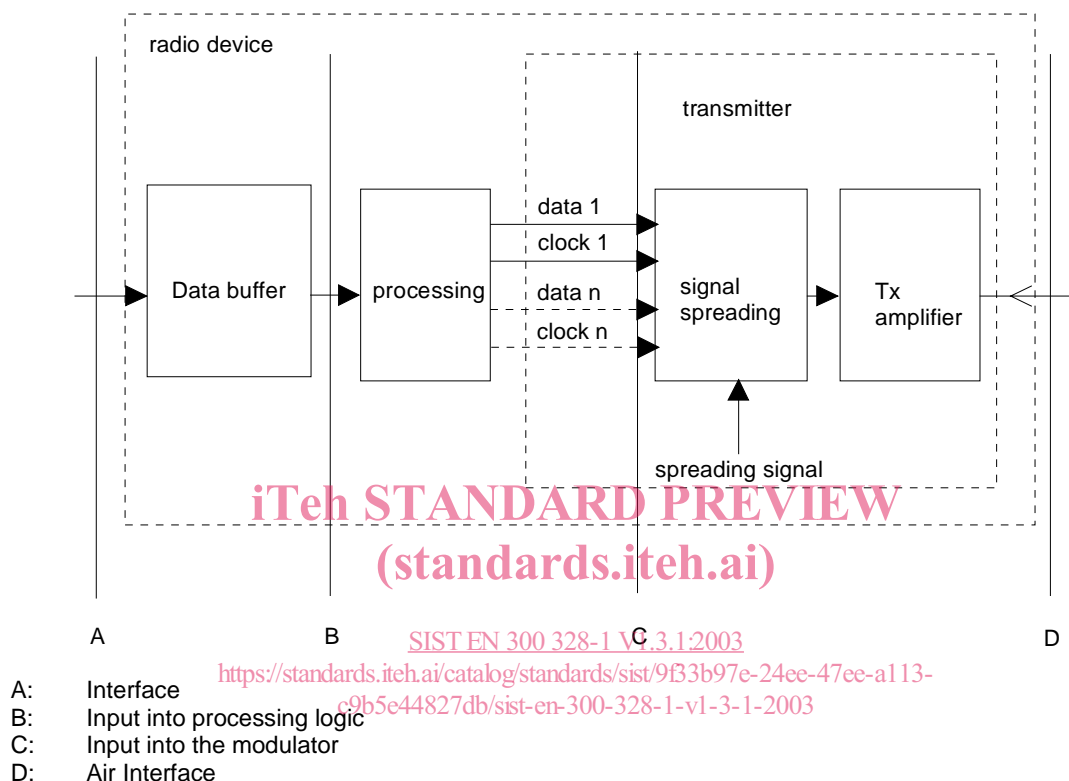
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## 3 Definitions, abbreviations and symbols

### 3.1 Definitions

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

**aggregate bit rate:** bit rate at the air interface (see point D in figure 1) including protocol overhead where applicable and excluding the effects of signal spreading



**Figure 1: Parameters related to the aggregate bit rate**

**chip:** unit of modulation used in direct sequence spread spectrum modulation

**chip rate:** number of chips per second

**chip sequence:** sequence of chips with defined length and defined chip polarities

**direct sequence spread spectrum modulation:** form of modulation where a combination of data to be transmitted and a known code sequence (chip sequence) is used to directly modulate a carrier, e.g. by phase shift keying

NOTE: The transmitted bandwidth is determined by the chip rate and the modulation scheme.

**fixed station:** equipment intended for use in a fixed location and fitted with one or more antennae

NOTE: The equipment may be fitted with either antenna socket(s) or integral antenna(e) or both.

**frequency hopping spread spectrum modulation:** 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: Transmitter and receiver follow the same frequency hop pattern. The frequency range is determined by the lowest and highest hop positions and the bandwidth per hop position (see clause 5.2.3).

**frequency range:** range of operating frequencies over which the equipment can be adjusted

**hand-portable station:** equipment normally used on a stand-alone basis and to be carried by a person or held in the hand

NOTE: The equipment may be fitted with one or more antennae. The equipment may be fitted with either antenna socket(s) or integral antenna(e) or both.

**host:** host equipment is any equipment which has complete user functionality when not connected to the radio equipment part and to which the radio equipment part provides additional functionality and to which connection is necessary for the radio equipment part to offer functionality

**integral antenna:** antenna designed to be connected to the equipment without the use of a standard connector and considered to be part of the equipment

NOTE: An integral antenna may be fitted internally or externally to the equipment.

**manufacturer:** for the purposes of the present document "manufacturer" is understood to refer to the manufacturer or applicant of equipment offered for testing

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

NOTE: The equipment may be fitted with one or more antennae. The equipment may be fitted with either antenna socket(s) or integral antenna(e) or both.

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

NOTE: Equipment may be adjustable for operation at more than one operating frequency.

**plug-in radio device:** radio equipment module intended to be used with or within host, combined or multi-radio equipment, using their control functions and power supply

**combined equipment:** any combination of non-radio equipment that requires a plug-in radio device to offer full functionality

**multi-radio equipment:** radio, host or combined equipment using more than one radio transceiver

**power envelope:** frequency/power contour within which the useful RF power is generated

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

**stand-alone radio equipment:** equipment that is intended primarily as communications equipment and that is normally used on a stand-alone basis

## 3.2 Abbreviations

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

DSSS	Direct Sequence Spread Spectrum
e.i.r.p.	equivalent isotropically radiated power
FHSS	Frequency Hopping Spread Spectrum
ISM	Industrial, Scientific and Medical
RF	Radio Frequency
Tx	Transmitter

## 3.3 Symbols

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

dBm	dB relative to 1 milliwatt power
dBW	dB relative to 1 watt power