SLOVENSKI STANDARD
SIST EN 300 328 V1.7.1:2006

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Elektromagnetna združljivost in zadeve v zvezi z radijskim spektrom (ERM) ï Širokopasovni prenosni sistemi - Oprema za prenos podatkov v frekvenļnem pasu 2,4 GHz ISM, ki uporablja širokopasovne modulacijske tehnike - Harmonizirani EN, ki zajema bistvene zahteve ļ lena 3.2 direktive R&TTE

Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive

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Harmonized 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 wide band modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive

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Foreword

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

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [3] (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Directive 1999/5/EC [1] 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 ("the R&TTE Directive [1]").

Requirements and their corresponding test specifications relevant to Directive 1999/5/EC [1] are given in annex A.

National transposition dates	
Date of adoption of this EN:	22 September 2006
Date of latest announcement of this EN (doa):	31 December 2006
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 June 2007
Date of withdrawal of any conflicting National Standard (dow):	30 June 2008

Introduction

The present document is part of a set of standards developed by ETSI and is designed to fit in a modular structure to cover all radio and telecommunications terminal equipment within the scope of the R&TTE Directive. The modular structure is shown in EG 201 399 [4].

1 Scope

The present document applies to Wide Band Data Transmission equipment which is used in wireless local area networks. Such networks provide high speed data communications in between devices connected to the wireless infrastructure. The present document also applies to ad-hoc networking where these devices communicate directly with each other, without the use of a wireless infrastructure. The equipment uses a medium access protocol designed to facilitate spectrum sharing with other devices in the wireless network.

Wide Band Data Transmission equipment covered by the present document is operated in accordance with the ERC Decision (01)07 or ERC Recommendation 70.03 annex 3.

Examples of Wide Band Data Transmission equipment are equipment using IEEE 802.11 (see bibliography) RLANs, HomeRF™ and Bluetooth™ wireless technologies, Zigbee™, etc.

This equipment can 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.

This radio equipment is capable of operating in all or any part of the frequency band shown in table 1.

Table 1: Industrial, Scientific and Medical (ISM) frequency band

Direction of transmission	Industrial, Scientific and Medical (ISM) frequency band
Transmit/Receive	2,4 GHz to 2,4835 GHz

The present document is intended to cover the provisions of Directive 1999/5/EC [1] (R&TTE Directive) article 3.2, which states that "… radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communications and orbital resources so as to avoid harmful interference".

NOTE: A list of such ENs is included on the web site http://www.newapproach.org.

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.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

[1] 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 (R&TTE Directive).

[2] ETSI TR 100 028-1 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1".

[3] Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.

[4] ETSI EG 201 399 (V2.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of candidate Harmonized Standards for application under the R&TTE Directive".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in the R&TTE Directive [1] and the following apply:

adaptive frequency hopping: mechanism that allows a frequency hopping device to adapt to its environment by identifying channels that are being used and excluding them from the list of available channels

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

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

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.

environmental profile: range of environmental conditions under which equipment within the scope of EN 300 328 is required to comply with the provisions of EN 300 328

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.

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.

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.

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

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

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

smart antenna systems: equipment that combines multiple antenna elements, transmit and/or receive chains with a signal processing function to optimise its radiation and/or reception capabilities (e.g. techniques such as spatial multiplexing, beam forming, cyclic delay diversity, MIMO, etc.)

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

wide band modulation: wide band modulation is considered to include FHSS or DSSS modulation as well as other forms of modulation that meet the emission requirements as defined in EN 300 328

3.2 Symbols

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

dBm	dB relative to 1 milliwatt
dBW	dB relative to 1 Watt
GHz	GigaHertz
Hz	Hertz
kHz	kiloHertz
MHz	MegaHertz
mW	milliWatt

3.3 Abbreviations

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

AC	Alternating Current
AFH	Adaptive Frequency Hopping
BW	BandWidth
DSSS	Direct Sequence Spread Spectrum
e.i.r.p.	equivalent isotropically radiated power
EMC	ElectroMagnetic Compatibility
FHSS	Frequency Hopping Spread Spectrum
IF	Intermediate Frequency
ISM	Industrial, Scientific and Medical
OFDM	Orthogonal Frequency Division Multiplexing
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
Tx	Transmitter
UUT	Unit Under Test

4 Technical specifications

4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be stated by the supplier. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the required operational environmental profile.

4.2 Modulation

The manufacturer shall state the modulation characteristics of the equipment to be tested. For the purpose of deciding which level of power density applies to the equipment, the present document defines two categories of equipment:

- equipment conforming to the stated characteristics of FHSS modulation (see clause 4.2.1); and
- equipment not conforming to these characteristics.(see clause 4.2.2).

4.2.1 FHSS modulation

FHSS modulation shall:

either:

a) make use of at least 15 well defined, non-overlapping hopping channels separated by the channel bandwidth as measured at 20 dB below peak power;

or if capable of adaptive frequency hopping:

b) at least be capable of operating over a minimum of 90 % of the band specified in table 1, from which at any given time a minimum of 20 channels or hopping channels shall be used.

For both cases, the minimum channel separation shall be 1 MHz, while the dwell time per channel shall not exceed 0,4 s.

While the equipment is operating (transmitting and/or receiving) each channel of the hopping sequence shall be occupied at least once during a period not exceeding four times the product of the dwell time per hop and the number of channels. Systems that meet the above constraints shall be tested according to the requirements for FHSS modulation.

4.2.2 DSSS and other forms of modulation

For the purposes of the present document, other forms of modulation which do not satisfy the constraints of the specification given in clause 4.2.1, shall be considered equivalent to DSSS modulation. Systems using these other forms of modulation shall be considered equivalent to DSSS systems and shall be tested according to the requirements for DSSS modulation.

4.3 Technical requirements

4.3.1 Maximum transmit power

4.3.1.1 Definition

The maximum transmit power is defined as the maximum isotropic radiated power of the equipment.

4.3.1.2 Limit

The equivalent isotropic radiated power (e.i.r.p.) shall be equal to or less than -10 dBW (100 mW). This limit shall apply for any combination of power level and intended antenna assembly.

4.3.2 Maximum e.i.r.p. spectral density

4.3.2.1 Definition

The maximum e.i.r.p. spectral density is defined as the highest e.i.r.p. level in Watts per Hertz generated by the transmitter within the power envelope.

4.3.2.2 Limit

For wide band modulations other then FHSS (e.g. DSSS, OFDM, etc.), the maximum e.i.r.p. spectral density is limited to 10 mW per MHz.

4.3.3 Frequency range

4.3.3.1 Definition

The frequency range of the equipment is determined by the lowest and highest frequencies occupied by the spectrum envelope.

f_H is the highest frequency of the spectrum envelope; it is the frequency furthest above the frequency of maximum power where the e.i.r.p. spectral density drops below the level of -80 dBm/Hz (-30 dBm if measured in a 100 kHz bandwidth).

f_L is the lowest frequency of the spectrum envelope; it is the frequency furthest below the frequency of maximum power where the e.i.r.p. spectral density drops below the level of -80 dBm/Hz (or -30 dBm if measured in a 100 kHz bandwidth).

For a given operating frequency, the width of the spectrum envelope is (f_H - f_L). In equipment that allows adjustment or selection of different operating frequencies, the power envelope takes up different positions in the allocated band. The frequency range is determined by the lowest value of f_L and the highest value of f_H resulting from the adjustment of the equipment to the lowest and highest operating frequencies.

4.3.3.2 Limit

For all equipment the frequency range shall lie within the band 2,4 GHz to 2,4835 GHz (f_L > 2,4 GHz and f_H < 2,4835 GHz).

4.3.4 Frequency hopping requirements

The requirements in this clause are only applicable to equipment using Frequency Hopping Spread Spectrum (FHSS) modulation.

4.3.4.1 Dwell time

4.3.4.1.1 Definition

The dwell time is the time spent at a particular frequency during any single hop.

4.3.4.1.2 Limit

The maximum dwell time shall be 0,4 s.