ETSI EN 300 328 V2.1.1 (2016-11)

Wideband transmission systems;
Data transmission equipment operating
in the 2,4 GHz ISM band and
using wide band modulation techniques;
Harmonised Standard covering the essential requirements
of article 3.2 of Directive 2014/53/EU

Reference
REN/ERM-TG11-011

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Foreword

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

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.14] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.1].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A.1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

National transposition dates	
Date of adoption of this EN:	14 November 2016
Date of latest announcement of this EN (doa):	28 February 2017
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Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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Introduction

The present document covers Wide Band Data Transmission equipment.

Examples of Wide Band Data Transmission equipment are equipments such as IEEE 802.11™ RLANs [i.3], Bluetooth® wireless technologies, Zigbee™, etc.

1 Scope

The present document applies to Wide Band Data Transmission equipment.

The present document also describes spectrum access requirements to facilitate spectrum sharing with other equipment.

Wide Band Data Transmission equipment covered by the present document is operated in accordance with the ERC Recommendation 70-03 [i.6], annex 3 or Commission Decision 2006/771/EC [i.7] (and its amendments).

This radio equipment is capable of operating in the band provided in table 1.

Table 1: Service frequency bands

	Service frequency bands
Transmit	2 400 MHz to 2 483,5 MHz
Receive	2 400 MHz to 2 483,5 MHz

Equipment using Ultra Wide Band (UWB) technology is not covered by the present document.

The present document contains requirements to demonstrate that radio equipment both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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

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The following referenced documents are necessary for the application of the present document.

Not applicable.

2.2 Informative references

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.

[i.2] Void.

[i.3] IEEE Std. 802.11™-2012: "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".

[i.4] IEEE Std. 802.15.4™-2011: "IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements. Part 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (WPANs)".

[i.5] Void.

[i.6] CEPT ERC Recommendation 70-03 (1997): "Relating to the use of Short Range Devices (SRD)".

[i.7] Commission Decision 2006/771/EC of 9 November 2006 on harmonisation of the radio spectrum for use by short-range devices.

[i.8] ETSI TR 102 273-2 (V1.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 2: Anechoic chamber".

[i.9] ETSI TR 102 273-3 (V1.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 3: Anechoic chamber with a ground plane".

[i.10] ETSI TR 102 273-4 (V1.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 4: Open area test site".

[i.11] ETSI TR 100 028-2 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".

[i.12] Void.

[i.13] Void.

[i.14] Commission Implementing Decision C(2015) 5376 final of 4.8.2015 on a standardisation request to the European Committee for Electrotechnical Standardisation and to the European Telecommunications Standards Institute as regards radio equipment in support of Directive 2014/53/EU of the European Parliament and of the Council.

[i.15] ETSI TR 100 028-1 (V1.4.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in Directive 2014/53/EU [i.1] and the following apply:

adaptive equipment: equipment operating in an adaptive mode

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

adaptive mode: mode in which equipment can adapt its medium access to its radio environment by identifying other transmissions present in the band

adjacent channel: channels on either side of the nominal channel separated by the nominal channel bandwidth

adjacent hopping frequency: neighbouring hopping frequency which is separated by the minimum hopping frequency separation

antenna assembly: combination of the antenna (integral or dedicated), its feeder (e.g. coaxial cable) and if applicable, its antenna connector and associated switching components

NOTE: The gain of an antenna assembly (G) in dBi, does not include the additional gain that may result out of beamforming. This term (antenna assembly) refers to an antenna connected to one transmit chain.

beamforming gain: additional (antenna) gain realized by using beamforming techniques in smart antenna systems

NOTE: Beamforming gain as used in the present document, does not include the gain of the antenna assembly.

blacklisted frequency: hopping frequency occupied by frequency hopping equipment without having transmissions during the dwell time

clear channel assessment: mechanism used by an equipment to identify other transmissions in the channel

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

dedicated antenna: removable antenna(s) assessed together with the radio equipment against the requirements of the present document

detect and avoid: mechanism which mitigates interference potential by avoiding use of frequencies upon detection of other transmissions on those frequencies

direct sequence spread spectrum: 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

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

dwell time: time between frequency changes for Frequency Hopping equipment

NOTE: The Dwell Time might comprise transmit, receive and idle phases of the equipment.

energy detect: mechanism used by an LBT based adaptive equipment to determine the presence of other devices operating on the channel based on detecting the signal level of that other device

environmental profile: range of environmental conditions for the equipment

frame based equipment: equipment where the transmit/receive structure is not directly demand-driven but has fixed timing

frequency hopping spread spectrum: spread spectrum technique in which the equipment 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.

geo-location capability: capability of equipment to determine its geographical location

hopping frequency: any of the (centre) frequencies defined within the hopping sequence of an FHSS equipment

host equipment: 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

idle period: period in time following a transmission sequence during which the equipment does not transmit

integral antenna: antenna designed as a fixed part of the equipment, without the use of an external connector and which cannot be disconnected from the equipment by a user with the intent to connect another antenna

NOTE: An integral antenna may be fitted internally or externally. In the case where the antenna is external, a non-detachable cable may be used. An antenna using internal connectors to connect to the internal radio part (e.g. printed circuit board) is considered to be an integral antenna.

Listen Before Talk (LBT): mechanism by which an equipment first applies CCA before using the channel

load based equipment: equipment where the transmit/receive structure is demand-driven

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

necessary bandwidth: width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions

nominal channel bandwidth: band of frequencies assigned to a single channel

NOTE: The Nominal Channel Bandwidth is declared by the manufacturer as outlined in clause 5.4.1.

operating frequency: nominal frequency at which the equipment can be operated

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

out-of-band emission: emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding emissions in the spurious domain

plug-in radio equipment: 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: RF power versus frequency contour

power spectral density: mean power in a given reference bandwidth

receive chain: receiver circuit with an associated antenna assembly

NOTE: Two or more receive chains are combined in a smart antenna assembly.

smart antenna systems: equipment that combines multiple transmit and/or receive chains with a signal processing function to increase the throughput and/or to optimize its radiation and/or reception capabilities

NOTE: These are techniques such as spatial multiplexing, beamforming, cyclic delay diversity, MIMO, etc.

spurious emissions: emissions on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information

NOTE: Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.

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

transmission burst: period in time during a transmission during which the transmitter is continuously on

transmit chain: transmitter circuit with an associated antenna assembly

NOTE: Two or more transmit chains are combined in a smart antenna system.

ultra wide band technology: technology for short-range radiocommunication, involving the intentional generation and transmission of radio-frequency energy that spreads over a very large frequency range, which may overlap several frequency bands allocated to radiocommunication services

wide band modulation: modulation such as FHSS, DSSS, OFDM, etc.

3.2 Symbols

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

A_{ch}	number of active transmit chains
BW_{CHAN}	Channel Bandwidth
dBm	dB relative to 1 milliwatt
dBr	dB relative to peak power