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Wideband Data Transmission Systems (WDTS) for Fixed Network Radio Equipment operating in the 57 GHz to 71 GHz band; Harmonised Standard for access to radio spectrum

Reference
DEN/BRAN-230025

Keywords
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Foreword

This Harmonised European Standard (EN) has been produced by ETSI Technical Committee Broadband Radio Access Networks (BRAN).

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.2] 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.5].

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:	10 March 2022
Date of latest announcement of this EN (doa):	30 June 2022
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 December 2022
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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).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document specifies technical characteristics and methods of measurements for Wideband Data Transmission Systems (WDTS) fixed network radio equipment operating in the 57 GHz to 71 GHz band taking into consideration ERC Recommendation 70-03 [i.3], annex 3 (frequency bands c2 and c3) and Commission Decision 2006/771/EC [i.4] bands 75a and 75b.

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

Table 1: Radiocommunications service frequency band

Transmit/Receive	Radiocommunications service frequency band
Transmit	57 GHz to 71 GHz
Receive	57 GHz to 71 GHz

NOTE 1: The technical characteristics of applications using these radio equipment are further described in ETSI TR 103 583 [i.1].

NOTE 2: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.5] is given in annex A.

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 https://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.

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

Not applicable.

2.2 Informative 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.

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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] ETSI TR 103 583 (V1.1.1): "System Reference document (SRdoc); Technical characteristics of Multiple Gigabit Wireless Systems (MGWS) in radio spectrum between 57 GHz and 71 GHz".

[i.2] 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.3] ERC Recommendation 70-03 (Tromsø 1997 and subsequent amendments): "Related to the Use of Short Range Devices (SRD)".

[i.4] Commission Decision 2006/771/EC of 9 November 2006 on harmonisation of the radio spectrum for use by short-range devices (notified under document number C(2006) 5304) (Text with EEA relevance).

NOTE: Available at http://data.europa.eu/eli/dec/2006/771(2)/2019-08-13.

[i.5] 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.6] Commission Implementing Decision (EU) 2019/1345 of 2 August 2019 amending Decision 2006/771/EC updating harmonised technical conditions in the area of radio spectrum use for short-range devices (notified under document C(2019) 5660) Text with EEA relevance.

[i.7] ERC Recommendation 74-01 (approved 1998 and subsequent amendments): "Unwanted emissions in the spurious domain".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in Directive 2014/53/EU [i.2] and the following apply:

60 GHz range or 60 GHz band: one of the variously permitted frequencies of operation, between 57 GHz to 71 GHz

activity factor: percentage over any one-minute time period when equipment is operating under a given set of conditions

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

automatic transmit power control: mechanism that automatically reduces the transmit power based on the power at the receiver

channel separation: minimum separation (in MHz) between the centre frequencies of two adjacent channels in the channel plan of the radio equipment

integral antenna: antenna which is declared to be part of the radio equipment by the manufacturer

NOTE 1: In some cases, it may not be possible to remove an integral antenna or expose an antenna connector without changing the output characteristics of the radio equipment.

NOTE 2: Even with an integral antenna, it might still be possible to separate the antenna from the equipment using a special tool.

mean power: average power (transmitted or received) during the On Time of the signal

nominal channel bandwidth: bandwidth assigned to a single channel

NOTE: The nominal channel bandwidth is part of the product information as outlined in clause 5.2.1.

occupied bandwidth: bandwidth of the signal containing 99 % of the transmitted mean power

NOTE: Both below the lower and above the upper frequency limits, the mean power emitted is equal to 0,5 % of the total mean power of the emission.

smart antenna system: equipment that combines multiple transmit and/or receive antenna elements with a signal processing function to increase its radiation and/or reception capabilities

NOTE: This includes techniques such as spatial multiplexing, beam forming, cyclic delay diversity, etc.

3.2 Symbols

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

dBc	decibel relative to the maximum spectral power density of the transmitted signal
dBi	decibel relative to the gain of an isotropic antenna
dBm	decibel relative to one milliwatt
dBr	decibel relative to a given maximum power level
GHz	thousand millions of cycles per second
kHz	thousands of cycles per second
µs	millionths of seconds

3.3 Abbreviations

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

ACM	Adaptive Code and Modulation
ALA	Automatic Link Adaptation
ATPC	Automatic Transmit Power Control
BW	BandWidth
ChS	Channel Separation
CW	Continuous Wave
DC	Duty Cycle
EFTA	European Free Trade Association
EIRP	Equivalent Isotropically Radiated Power
$EIRP_0$	Equivalent Isotropically Radiated Power spectral density
ERP	Effective Radiated Power
FER	Frame Error Rate
MCS	Modulation and Coding Scheme
mW	milliWatt
PD	Power Density
PDL	spectral Power Density Limit
PSD	Power Spectral Density
RBW	Resolution BandWidth
RF	Radio Frequency
RMS	Root Mean Square
UUT	Unit Under Test
WDTS	Wideband Data Transmission Systems

4 Technical requirements 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 in accordance with its intended use. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the operational environmental profile defined by its intended use.

4.2 Conformance requirements

4.2.1 Spectral power density

4.2.1.0 Applicability

The present requirement applies to all equipment within the scope of the present document.

4.2.1.1 Definition

The spectral power density is the mean Equivalent Isotropically Radiated Power (EIRP) density ($EIRP_0$) during a transmission burst.

4.2.1.2 Limit

The maximum spectral power density is applicable to the system as a whole when operated at the highest power spectral density level ($EIRP_0$). The maximum spectral power density shall be as indicated in table 2.

Table 2: Power Spectral Density (PSD) limit

Condition	Maximum $EIRP_0$
Fixed outdoor installations with ≥ 30 dBi transmit antenna gain	38 dBm/MHz
Otherwise	23 dBm/MHz

NOTE: Information on PSD limit is aligned with the Commission Implementing Decision (EU) 2019/1345 [i.6] (see Annex, Table 2, Bands 75a and 75b).

4.2.1.3 Conformance

Conformance tests as defined in clause 5.2.3 shall be carried out and result compared to the limit.

4.2.2 RF output power

4.2.2.0 Applicability

The present requirement applies to all equipment within the scope of the present document.

4.2.2.1 Definition

The RF output power is the mean Equivalent Isotropically Radiated Power (EIRP) for the equipment during a transmission burst.

4.2.2.2 Limit

The maximum RF output power is applicable to the system as a whole when operated at the highest stated power level. For a smart antenna system, the limit applies to the configuration that results in the highest EIRP. In case of multiple (adjacent or non-adjacent) channels the total RF output power of all channels shall be less than or equal to the limits in table 3.

The maximum RF output power shall be as indicated in table 3.

Table 3: RF output power limit

Antenna Gain (G_A)	Additional Conditions	Maximum power level (EIRP)
G_A < 13 dBi		27 dBm + G_A
13 dBi ≤ G_A < 30 dBi		40 dBm
30 dBi ≤ G_A		40 dBm
	Fixed outdoor installations	55 dBm

NOTE: Information on RF output power limit is aligned with the Commission Implementing Decision (EU) 2019/1345 [i.6] (see Annex, Table 2, Bands 75a and 75b).

4.2.2.3 Conformance

Conformance tests as defined in clause 5.2.4 shall be carried out and result compared to the limit.

4.2.3 Transmitter unwanted emissions in the spurious domain

4.2.3.0 Applicability

The present requirement applies to all equipment within the scope of the present document.

4.2.3.1 Definition

Transmitter unwanted emissions are unwanted emissions in the spurious domain while the equipment is transmitting.

4.2.3.2 Limit

The level of unwanted emissions in the spurious domain shall be less than or equal to the limits given in table 4,where the lower boundary between the spurious domain and the out-of-band domain shall be at a frequency F_L:

- F_L = min (57 GHz; f_C - min(2,5 × nominal channel BW, 1,5 × nominal channel BW + 500 MHz))

where f_C is the nominal centre frequency of the transmission.

The upper boundary between the spurious domain and the out-of-band domain shall be at a frequency F_H:

- F_H = max (71 GHz; f_C + min(2,5 × nominal channel BW, 1,5 × nominal channel BW + 500 MHz))

Table 4: Transmitter unwanted emissions in the spurious domain

Frequency range	Emission Limit ERP (≤ 1 GHz) EIRP (> 1 GHz)	Measurement Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 694 MHz	-54 dBm	100 kHz
694 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to F_L GHz	-30 dBm	1 MHz
F_H GHz to 142 GHz	-30 dBm	1 MHz

NOTE: Information on limits for transmitter unwanted emissions in the spurious domain is based on ERC Recommendation 74-01 [i.7].

4.2.3.3 Conformance

Conformance tests as defined in clause 5.2.5 shall be carried out and result compared to the limit.

4.2.4 Transmitter out-of-band emissions

4.2.4.0 Applicability

The present requirement applies to all equipment within the scope of the present document.

4.2.4.1 Definition

Transmitter unwanted emissions in the out-of-band domain are emissions when the equipment is in transmit mode, on frequencies immediately outside the necessary bandwidth which results from the modulation process but excluding spurious emissions.

4.2.4.2 Limit

The transmitter unwanted emissions in the out-of-band domain shall be less than or equal to the relative limits provided in figure 1, where the x-axis is the ratio of frequency offset from centre frequency (f - f_C) to declared nominal channel BandWidth (BW), or an absolute level of -30 dBm within a 1 MHz bandwidth, whichever is greater. Non-adjacent channels shall be tested separately. Within the 57 to 71 GHz band and outside -Rd to +Rd ratio of frequency offset from centre frequency to declared nominal bandwidth range the -30 dBr or -30 dBm in 1 MHz whichever is the greater shall apply, where Rd = min(2,5, 1,5 + 500 MHz/BW).

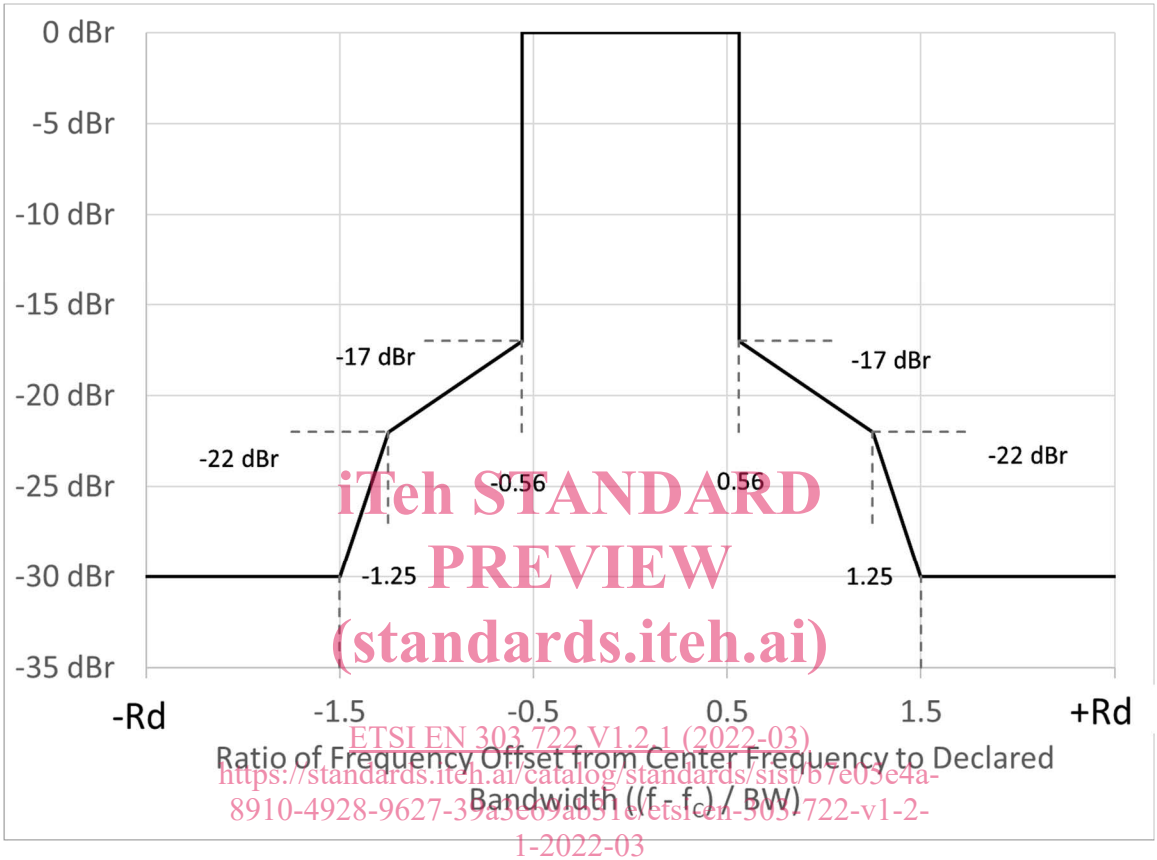

Figure 1: Transmit Mask

4.2.4.3 Conformance

Conformance tests as defined in clause 5.2.6 shall be carried out and result compared to the limit.

4.2.5 Adaptivity (medium access protocol)

4.2.5.1 Applicability

The present requirement applies to all equipment within the scope of the present document.

4.2.5.2 Definition

Automatic Transmit Power Control (ATPC) and Automatic Link Adaptation (ALA), also known as Automatic Adaptive Coding and Modulation (ACM), are adaptivity (medium access protocol) mechanisms designed to facilitate spectrum sharing with other devices. ATPC automatically reduces transmit power when there is excess link margin such that link performance (throughput and FER) are not impacted. ALA automatically adapts the coding and modulation to maximize spectral efficiency, thus reducing the transmission time of a given amount of payload. Both ATPC and ALA reduce the interference caused to other links in the band and facilitates spectrum sharing. Equipment may support either, or both, types of adaptivity mechanisms.