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Multiple-Gigabit/s radio equipment operating in the 60 GHz band; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

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Foreword

This final draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Broadband Radio Access Networks (BRAN), and is now submitted for the Vote phase of the ETSI standards EN Approval Procedure.

The present document has been prepared under the Commission's standardization 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.6].

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.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

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.

Introduction

60 GHz radio equipment are capable of operating at data rates of multiple-gigabit per second.

The spectrum usage conditions for this equipment are set in Commission Decision 2006/771/EC [i.5] and ERC Recommendation 70-03 [i.3], annex 3.

1 Scope

The present document specifies technical characteristics and methods of measurements for radio equipment with integral antennas operating indoor or outdoor at data rates of multiple-gigabit per second in the 60 GHz frequency range.

These radio equipments operate with very wideband communications using a variety of directional medium and high gain antennas to enable a high degree of spectrum reuse, and may use a flexible bandwidth scheme under which they normally operate in a wideband mode, and periodically reduce their bandwidth (e.g. for antenna training and other activities).

The technical characteristics of applications using these radio equipments are further described in ETSI TR 102 555 [i.1].

Equipment in this frequency range intended for outdoor Fixed Local Area Network Extension (FLANE) or Fixed Point-to-Point applications are not in the scope of the present document.

These radio equipment types are capable of operating in all or any part of the frequency bands given in table 1.

Table 1: Radiocommunications service frequency bands

	Radiocommunications service frequency bands
Transmit	57 GHz to 66 GHz
Receive	57 GHz to 66 GHz

The present document covers the essential requirements of article 3.2 of Directive 2014/53/EU [i.6] under the conditions identified in annex A.

2 References

2.1 Normative references

References are specific, identified by date of publication and/or edition number or version number. Only the cited version 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.

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 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 102 555: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Technical characteristics of multiple gigabit wireless systems in the 60 GHz range System Reference Document".

[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] Void.

[i.5] Commission Decision 2006/771/EC of 9 November 2006 on harmonisation of the radio spectrum for use by short-range devices.

[i.6] 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.7] 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.8] ETSI TR 100 028 (V1.4.1) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

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.6] and the following apply:

60 GHz range or 60 GHz band: one of the variously permitted frequencies of operation, typically from 57 GHz to 66 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

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 an interval of time sufficiently long to capture the On Time of the signal

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 5.3.1.

occupied bandwidth: frequency bandwidth of the signal including 99 % of the energy 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 systems: 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	spectral density relative to the maximum spectral power density of the transmitted signal
dBm	decibel relative to one milliwatt
dBr	decibel relative to a given maximum power level
GHz	thousand millions of cycles
kHz	thousands of cycles
µs	millionths of seconds

3.3 Abbreviations

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

BW	BandWidth
CCA	Clear Channel Assessment
CW	Continuous Wave
EIRP	Equivalent Isotropically Radiated Power
ERP	Effective Radiated Power
FER	Frame Error Rate
FLANE	Fixed Local Area Network Extension
LBT	Listen Before Talk
MCS	Modulation and Coding Scheme
PD	Power Density
PDL	spectral Power Density Limit
RBW	Resolution BandWidth
RF	Radio Frequency
RMS	Root Mean Square
UUT	Unit Under Test
VBW	Video BandWidth

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 declared by the manufacturer. The equipment shall comply with all the technical requirements of the present document which are identified as applicable in annex A at all times when operating within the boundary limits of the declared operational environmental profile.

4.2 Conformance requirements

4.2.1 Spectral power density

4.2.1.1 Definition

The spectral power density is the mean Equivalent Isotropically Radiated Power (EIRP) density in dBm per Megahertz 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). The maximum spectral power density shall be as indicated in table 2.

Table 2: Spectral power density limit (PDL)

Maximum spectral power density (EIRP)
13 dBm / MHz

4.2.1.3 Conformance

Conformance tests as defined in clause 5.3.3 shall be carried out.

4.2.2 RF output power

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

Maximum power level (EIRP)
40 dBm

4.2.2.3 Conformance

Conformance tests as defined in clause 5.3.4 shall be carried out.

4.2.3 Transmitter unwanted emissions

4.2.3.1 Definition

Transmitter unwanted emissions are unwanted emissions in the spurious domain while the equipment is transmitting. The boundary where the spurious domain begins is considered to be the offset from the nominal centre frequency of the transmission by ±250 % of the nominal channel BW for nominal channel BW ≤ 500 MHz and ± (500 MHz + 1,5 × nominal channel BW) for nominal channel BW > 500 MHz.

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.

Table 4: Transmitter spurious emissions

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 790 MHz	-54 dBm	100 kHz
790 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 132 GHz	-30 dBm	1 MHz

4.2.3.3 Conformance

Conformance tests as defined in clause 5.3.5 shall be carried out.

4.2.4 Receiver unwanted emissions

4.2.4.1 Definition

These are unwanted emissions in the spurious domain while the equipment is receiving a transmission.

4.2.4.2 Limit

The level of unwanted emissions in the spurious domain shall be less than or equal to the limits given in table 5.

Table 5: Receiver spurious emissions

Frequency band	Emission Limit ERP (≤ 1 GHz) EIRP (> 1 GHz)	Measurement Bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 132 GHz	-47 dBm	1 MHz

4.2.4.3 Conformance

Conformance tests as defined in clause 5.3.6 shall be carried out.