

# ETSI EN 303 687 V1.1.1 (2023-06)



**6 GHz WAS/RLAN;  
Harmonised Standard for access to radio spectrum  
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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.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:	27 June 2023
Date of latest announcement of this EN (doa):	30 September 2023
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 March 2024
Date of withdrawal of any conflicting National Standard (dow):	31 March 2025



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## Introduction

6 GHz Wireless Access Systems (WAS) including RLAN equipment are used in wireless local area networks which provide high speed data communications in between devices connected to the wireless infrastructure. The present document also addresses ad-hoc networking where devices communicate directly with each other, without the use of a wireless infrastructure.

The spectrum usage conditions for equipment within the scope of the present document are set in the ECC Decision (20)01 [i.3] and Commission Implementing Decision (EU) 2021/1067 of 17.6.2021 [i.11].

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# 1 Scope

The present document specifies technical characteristics and methods of measurements for 6 GHz Wireless Access Systems including Radio Local Area Network (WAS/RLAN) equipment.

6 GHz WAS/RLAN equipment within the scope of the present document are covered by ECC and EU regulation as follows:

- ECC Decision (20)01 on the harmonised use of frequency band 5 945 MHz to 6 425 MHz for WAS/RLAN [i.3].
- Commission Implementing Decision (EU) 2021/1067 on the harmonised use of radio spectrum in the 5 945 MHz to 6 425 MHz frequency band for the implementation of wireless access systems including radio local area networks (WAS/RLANs) [i.11].

NOTE 1: Descriptions of 6 GHz WAS/RLAN equipment categories and sub-categories are provided in clause 4.2.

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

**Table 1: Service frequency band**

	Service frequency band
Transmit	5 945 MHz to 6 425 MHz
Receive	5 945 MHz to 6 425 MHz

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

NOTE 2: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.1] 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.

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

- [1] [IEEE 802.11ax™-2021](#): "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 - Amendment 1: Enhancements for High-Efficiency WLAN".
- [2] [ETSI TS 138 141-1 \(V17.8.0\) \(01-2023\)](#): "5G; NR; Base Station (BS) conformance testing Part 1: Conducted conformance testing (3GPP TS 38.141-1 version 17.8.0 Release 17)".
- [3] [ETSI TS 138 141-2 \(V17.8.0\) \(01-2023\)](#): "5G; NR; Base Station (BS) conformance testing Part 2: Radiated conformance testing (3GPP TS 38.141-2 version 17.8.0 Release 17)".

## 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] [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] [ECC/DEC/\(20\)01 \(11-2020\)](#): "On the harmonised use of the frequency band 5945-6425 MHz for Wireless Access Systems including Radio Local Area Networks (WAS/RLAN)".
- [i.4] ETSI EG 203 367 (V1.1.1) (06-2016): "Guide to the application of harmonised standards covering articles 3.1b and 3.2 of the Directive 2014/53/EU (RED) to multi-radio and combined radio and non-radio equipment".
- [i.5] 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".
- [i.6] ETSI TR 100 028-2 (V1.4.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".
- [i.7] ETSI TR 102 273-2 (V1.2.1) (12-2001): "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.8] ETSI TR 102 273-3 (V1.2.1) (12-2001): "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.9] ETSI TR 102 273-4 (V1.2.1) (12-2001): "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.10] [ERC Recommendation 74-01](#) (approved 1998, amended 29 May 2019, updated 1 October 2021 and corrected 23 May 2022): "Unwanted emissions in the spurious domain".
- [i.11] [Commission Implementing Decision \(EU\) 2021/1067 of 17.6.2021](#) on the harmonised use of radio spectrum in the 5 945-6 425 MHz frequency band for the implementation of wireless access systems including radio local area networks (WAS/RLANs).
- [i.12] ETSI EN 301 893: "5 GHz RLAN; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU".

## 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.1] and the following apply:

**6 GHz WAS/RLAN band:** frequency range of 5 945 MHz to 6 425 MHz

**adjacent signal:** signal adjacent to the wanted signal

**alternate adjacent channels:** channel(s) offset from the wanted channel by twice the channel spacing

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

NOTE 1: This term (antenna assembly) refers to an antenna connected to one transmit chain.

NOTE 2: The gain of an antenna assembly  $G$  in dBi, does not include the additional gain that may result out of beamforming.

**backoff procedure:** procedure that facilitates the sharing of the medium by randomizing the transmission attempts from multiple devices competing for access to a channel

**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.

**burst:** period during which radio waves are intentionally transmitted, preceded and succeeded by periods during which no data transmission is made

**channel:** continuous part of the radio-frequency spectrum used for transmission and reception by WAS/RLAN equipment and identified by a nominal centre frequency and a nominal bandwidth

NOTE: WAS/RLAN equipment is permitted to operate (transmit/receive) in one or more adjacent or non-adjacent channels simultaneously.

**channel access engine:** mechanism that determines when a transmission attempt is permitted

**channel plan:** list of channels with their centre frequencies and for each of the centre frequencies, the nominal bandwidth(s)

**Clear Channel Assessment (CCA):** mechanism used by an equipment to identify other transmissions in the channel

**Contention Window (CW):** main parameter that determines the duration of the backoff procedure

**dedicated antenna:** antenna external to the equipment, using an antenna connector with a cable or a wave-guide and which has been designed or developed for one or more specific types of equipment

**Energy Detect (ED):** mechanism used to determine the presence of transmissions in the channel based on detecting the signal energy of the transmission

**environmental profile:** range of environmental conditions under which equipment within the scope of the present document is required to comply with the provisions of the present document

**Fixed Frame Period (FFP):** periodic timing of the transmit/receive structure for Frame Based Equipment (FBE)

**Frame Based Equipment (FBE):** equipment where the transmit/receive structure has a periodic timing with a periodicity equal to the Fixed Frame Period (FFP)

**frequency hopping:** mechanism in which equipment switches between different hop frequencies within the 6 GHz WAS/RLAN band for its operations

**hop frequency:** centre frequency used for operations in the context of frequency hopping

**initiating device:** equipment that initiates a sequence of one or more transmissions

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

NOTE 1: The term integral antenna is equivalent to integrated antenna.

NOTE 2: An integral antenna may be fitted internally or externally. In the case where the antenna is external, a non-detachable cable or wave-guide can be used.

**Listen Before Talk (LBT):** mechanism by which an equipment applies Clear Channel Assessment (CCA) before using the channel

**Load Based Equipment (LBE):** equipment where the transmit/receive structure is not fixed in time but demand-driven

**Low Power Indoor Access Point (LPI AP):** LPI access point or LPI bridge

**NarrowBand (NB) device:** VLP device that operates with a bandwidth below 20 MHz

**observation slot:** period during which the channel is checked for the presence of other transmissions

**occupied channel:** channel on which the channel access mechanism detected transmissions

**post backoff :** backoff procedure that is applied after every successful transmission

**prioritization period:** period consisting of an initial deferral period followed by an observation period during which the channel is checked for the presence of other transmissions

**receive chain:** receiver circuit with an associated antenna

**responding device:** equipment that transmits in response to the actions of an initiating device

**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

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

**unoccupied channel:** channel on which the channel access mechanism did not detect transmissions

**WAS/RLAN:** broadband radio systems that allow wireless access for public and private applications regardless of the underlying network topology

**WAS/RLAN devices:** components or sub-assemblies which intentionally emit and/or receive radio waves for the purpose of radio communication and are intended for incorporation into WAS/RLAN equipment

NOTE: Categories and sub-categories are provided in clause 4.2.

## 3.2 Symbols

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

A	measured power output
$CW_{\min}$	minimum Contention Window size
$CW_{\max}$	maximum Contention Window size
D	measured Power Spectral Density
dB	decibel
dBc	dB relative to the transmit power
dB <sub>i</sub>	dB relative to the gain of an isotropic antenna
dBm	dB relative to 1 mW
dB <sub>r</sub>	dB relative to the reference level
E	field strength
$E_0$	reference field strength
$f_c$	nominal centre frequency for 20 MHz channels
$f_{c\_offset}$	frequency offset from the nominal centre frequency
G	antenna Gain
GHz	Gigahertz

h	running index
Hz	Hertz
kHz	kiloHertz
M	frequency separation between the lower edge of the lowest channel in use and the higher edge of the highest channel in use in case of multi-channel operation where in a group of adjacent channels the lowest channel(s) and/or the highest channel(s) is/are not used for transmission
MHz	Megahertz
ms	millisecond
mW	milliwatt
N	Nominal bandwidth of a channel (or a group of channels in case of multi-channel operation)
n <sub>ch</sub>	channel identifier
p	prioritization period related counter
P <sub>burst</sub>	RMS (mean) power over the transmission burst
P <sub>max</sub>	configured maximum transmit power (per channel, in dBm)
PD	calculated Power Spectral Density
q	backoff procedure related counter
Samples/s	Samples per second
T <sub>ch</sub>	number of active transmit chains
Tx	Transmitter
TxOff	Transmitter off
TxOn	Transmitter on
U	total bandwidth of adjacent channels used for transmission in case of multi-channel operation where in a group of adjacent channels two or more channels not used for transmission are in between channels used for transmission
x	observed duty cycle
Y	beamforming (antenna) gain

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### 3.3 Abbreviations

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

ACK	Acknowledgement
AP	Access Point
ATT	ATTenuator
AWGN	Additive White Gaussian Noise
CCA	Clear Channel Assessment
COT	Channel Occupancy Time
CW	Contention Window
DC	Direct Current
ED	Energy Detect
EDT	Energy Detect Threshold
EFTA	European Free Trade Association
EIRP	Equivalent Isotropically Radiated Power
ERP	Effective Radiated Power
FAR	Fully Anechoic Room
FBE	Frame Based Equipment
FER	Frame Error Rate
FFP	Fixed Frame Period
IEEE	Institute of Electrical and Electronic Engineers
IF	Intermediate Frequency
LBE	Load Based Equipment
LBT	Listen Before Talk
LO	Local Oscillator
LPDA	Logarithmic Periodic Dipole Antenna
LPI	Low Power Indoor
NB	NarrowBand
NR	New Radio
OATS	Open Area Test Site
OFDM	Orthogonal Frequency Division Multiplexing
PER	Packet Error Rate
PFD	Power Flux Density

PHY	Physical layer
PSD	Power Spectral Density
RBW	Resolution Bandwidth
RF	Radio Frequency
RLAN	Radio Local Area Network
RMS	Root Mean Square
SAR	Semi Anechoic Room
SCS	Short Control Signalling
UAR	User Access Restrictions
UDP	User Datagram Protocol
UUT	Unit Under Test
VBW	Video BandWidth
VLP	Very Low Power
VSWR	Voltage Standing Wave Ratio
WAS	Wireless Access Systems

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## 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. Conformance tests shall be carried out under environmental conditions as defined in clause 5.1.

Where multiple combinations of radio equipment and antenna (antenna assemblies) are intended, each combination shall comply with all the technical requirements of the present document.

### 4.2 Equipment categories

#### 4.2.1 Description of categories

The present document applies to WAS/RLAN equipment that operate under the LPI and VLP categories as defined in Commission Implementing Decision (EU) 2021/1067 final of 17.6.2021 [i.11].

The categories that apply to the equipment shall be noted in the test report, see clause 5.4.1, item a).

#### 4.2.2 LPI category

There are two sub-categories of LPI devices as follows:

- LPI AP/bridge sub-category device
- LPI client sub-category device

#### 4.2.3 VLP category

There is one category of VLP device.

NOTE: The VLP device may support NarrowBand (NB) usage as further defined in clause 4.3.3.2 and clause 4.3.3.3.