

Draft **ETSI EN 303 687** V1.0.0 (2022-04)



6 GHz WAS/RLAN;
Harmonised Standard for access to radio spectrum
(standards.itech.ai)

[ETSI EN 303 687 V1.0.0 \(2022-04\)](https://standards.itech.ai/catalog/standards/sist/56f4bb32-87f9-48bc-bbf2-b14c8a054408/etsi-en-303-687-v1-0-0-2022-04)
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ReferenceDEN/BRAN-230021

Keywordsaccess, broadband, LAN, radio, regulation, testing

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Contents

Intellectual Property Rights	8
Foreword.....	8
Modal verbs terminology.....	9
Introduction	9
1 Scope	10
2 References	10
2.1 Normative references	10
2.2 Informative references.....	11
3 Definition of terms, symbols and abbreviations.....	12
3.1 Terms.....	12
3.2 Symbols.....	13
3.3 Abbreviations	14
4 Technical requirements specifications	15
4.1 Environmental profile.....	15
4.2 Equipment categories	15
4.2.1 Description of categories	15
4.2.2 LPI category.....	15
4.2.3 VLP category	15
4.3 Conformance requirements	16
4.3.1 Nominal centre frequencies and nominal bandwidth.....	16
4.3.1.1 General	16
4.3.1.2 Definition	16
4.3.1.3 Limits	16
4.3.1.4 Conformance.....	16
4.3.2 RF output power	16
4.3.2.1 Definition	16
4.3.2.2 Limits	17
4.3.2.3 Conformance.....	17
4.3.3 Power Spectral Density.....	17
4.3.3.1 Definition	17
4.3.3.2 Limits	17
4.3.3.3 VLP NB usage with a PSD above 1 dBm/MHz.....	17
4.3.3.4 Conformance.....	18
4.3.4 Transmitter unwanted emissions.....	18
4.3.4.1 Transmitter unwanted emissions in the out-of-band domain	18
4.3.4.1.1 Definition.....	18
4.3.4.1.2 Limits	18
4.3.4.1.3 Conformance	18
4.3.4.2 Transmitter unwanted emissions in the spurious domain.....	18
4.3.4.2.1 Definition.....	18
4.3.4.2.2 Limits	19
4.3.4.2.3 Conformance	19
4.3.4.3 Transmitter unwanted emissions within the 6 GHz WAS/RLAN band.....	19
4.3.4.3.1 Definition.....	19
4.3.4.3.2 Limits	19
4.3.4.3.3 Conformance	21
4.3.5 Receiver spurious emissions	22
4.3.5.1 Definition	22
4.3.5.2 Limits	22
4.3.5.3 Conformance.....	22
4.3.6 Channel access mechanism.....	22
4.3.6.1 Applicability.....	22
4.3.6.2 Definition	22
4.3.6.3 Requirements and limits.....	22

4.3.6.3.1	Channel access mechanism for Frame Based Equipment (FBE).....	22
4.3.6.3.2	Channel access mechanism for Load Based Equipment (LBE)	24
4.3.6.3.3	ED Threshold level (Energy Detection Threshold level, FBE and LBE).....	29
4.3.6.3.4	Short Control Signalling transmissions (FBE and LBE)	30
4.3.6.4	Conformance.....	30
4.3.7	Receiver blocking	30
4.3.7.1	Definition	30
4.3.7.2	Performance criteria	30
4.3.7.3	Limits	30
4.3.7.4	Conformance.....	31
4.3.8	Receiver selectivity.....	31
4.3.8.1	Definition	31
4.3.8.2	Performance criteria	32
4.3.8.3	Limits	32
4.3.8.4	Conformance.....	32
4.3.9	Mechanical and electrical design	32
4.3.9.1	Power feeding	32
4.3.9.1.1	Description of types of power supply	32
4.3.9.1.2	Wired power connection equipment.....	33
4.3.9.2	Antenna design.....	33
4.3.9.2.1	Description of types of antenna design.....	33
4.3.9.2.2	Integral antenna	33
4.3.9.3	Conformance.....	33
4.3.10	User Access Restrictions	33
4.3.10.1	Definition	33
4.3.10.2	Requirements	33
4.3.10.3	Conformance.....	33
5	Testing for compliance with technical requirements.....	34
5.1	Environmental conditions for testing	34
5.1.1	Introduction.....	34
5.1.2	Normal test conditions	34
5.1.2.1	Normal temperature and humidity	34
5.1.2.2	Normal power source	34
5.1.3	Extreme test conditions	34
5.2	Interpretation of the measurement results	34
5.3	Definition of other test conditions	34
5.3.1	Test sequences	34
5.3.2	Test channels	35
5.3.3	Antennas	36
5.3.3.1	Integrated and dedicated antennas.....	36
5.3.3.2	Transmit operating modes.....	36
5.3.3.2.1	Operating mode 1 (single antenna).....	36
5.3.3.2.2	Operating mode 2 (multiple antennas, no beamforming)	37
5.3.3.2.3	Operating mode 3 (multiple antennas, with beamforming).....	37
5.3.4	Presentation of equipment	37
5.3.5	Measurement methods	37
5.4	Essential radio test suites.....	38
5.4.1	Product information	38
5.4.2	Nominal centre frequencies	39
5.4.2.1	Test conditions	39
5.4.2.2	Test methods	39
5.4.2.2.1	Conducted measurement.....	39
5.4.2.2.2	Radiated measurement.....	40
5.4.2.2.3	Test fixture measurement	40
5.4.3	RF output power	40
5.4.3.1	Test conditions	40
5.4.3.2	Test methods	41
5.4.3.2.1	Conducted measurement.....	41
5.4.3.2.2	Radiated measurement.....	42
5.4.3.2.3	Test fixture measurement	43
5.4.4	Power Spectral Density.....	43

5.4.4.1	Test conditions	43
5.4.4.2	Test methods	43
5.4.4.2.1	Conducted measurement.....	43
5.4.4.2.2	Radiated measurement.....	46
5.4.4.2.3	Test fixture measurement	46
5.4.5	Transmitter unwanted emissions outside the 6 GHz WAS/RLAN band	46
5.4.5.1	Test conditions	46
5.4.5.2	Test method.....	46
5.4.5.2.1	Conducted measurement.....	46
5.4.5.2.2	Radiated measurement.....	49
5.4.5.2.3	Test fixture measurement	49
5.4.6	Transmitter unwanted emissions within the 6 GHz WAS/RLAN band.....	49
5.4.6.1	Test conditions	49
5.4.6.2	Test method.....	49
5.4.6.2.1	Conducted measurement.....	49
5.4.6.2.2	Radiated measurement.....	51
5.4.6.2.3	Test fixture measurement	51
5.4.7	Receiver spurious emissions	51
5.4.7.1	Test conditions	51
5.4.7.2	Test methods	52
5.4.7.2.1	Conducted measurement.....	52
5.4.7.2.2	Radiated measurement.....	54
5.4.7.2.3	Test fixture measurement	54
5.4.8	Channel access mechanism.....	54
5.4.8.1	Test conditions	54
5.4.8.2	Test method for FBE.....	54
5.4.8.2.1	Additional test conditions	54
5.4.8.2.2	Conducted measurements.....	54
5.4.8.2.3	Generic test procedure for measuring channel/frequency usage	58
5.4.8.2.4	Radiated measurements	58
5.4.8.2.5	Test fixture measurement	59
5.4.8.3	Test method for LBE.....	59
5.4.8.3.1	Additional test conditions	59
5.4.8.3.2	Conducted measurements.....	59
5.4.8.3.3	Generic test procedure for measuring channel/frequency usage	67
5.4.8.3.4	Radiated measurements	67
5.4.8.3.5	Test fixture measurement	68
5.4.9	Receiver blocking	68
5.4.9.1	Test conditions	68
5.4.9.2	Test methods	68
5.4.9.2.1	Conducted measurement.....	68
5.4.9.2.2	Radiated measurement.....	69
5.4.9.2.3	Test fixture measurement	69
5.4.10	Receiver selectivity.....	70
5.4.10.1	Test conditions	70
5.4.10.2	Test methods	70
5.4.10.2.1	Conducted measurement.....	70
5.4.10.2.2	Radiated measurements	71
5.4.10.2.3	Test fixture measurement	71
5.4.11	Mechanical and electrical design	71
5.4.12	VLP NB operation with a PSD exceeding 1 dBm/MHz	72
5.4.12.1	Test conditions	72
5.4.12.2	Test methods	72
5.4.12.2.1	Conducted measurements	72
5.4.12.2.2	Radiated measurements	73
5.4.12.2.3	Test fixture measurement	73
5.4.13	Assessment procedure for UAR.....	73
5.4.13.1	Introduction.....	73
5.4.13.2	Test conditions	73
5.4.13.3	Test Method	74

Annex A (informative):	Relationship between the present document and the essential requirements of Directive 2014/53/EU	75
Annex B (normative):	Test sites and arrangements for radiated measurements.....	77
B.1	Introduction	77
B.2	Radiation test sites.....	77
B.2.1	Open Area Test Site (OATS)	77
B.2.2	Semi Anechoic Room (SAR)	78
B.2.3	Fully Anechoic Room (FAR)	79
B.2.4	Measurement distance	80
B.3	Antennas.....	81
B.3.1	Introduction	81
B.3.2	Measurement antenna.....	81
B.3.3	Substitution antenna	81
B.4	Test fixture	81
B.4.1	Introduction	81
B.4.2	Description of the test fixture.....	82
B.4.3	Using the test fixture for relative measurements at the extremes of the temperature range	82
B.4.4	Using the test fixture for normalized measurements	82
B.4.5	Using the test fixture for level independent measurements.....	83
B.5	Guidance on the use of radiation test sites	83
B.5.1	Introduction	83
B.5.2	Power supplies for the battery powered UUT	83
B.5.3	Site preparation	83
B.6	Coupling of signals.....	84
B.6.1	General	84
B.6.2	Data signals	84
B.7	Interference signals used for channel access mechanism tests.....	84
B.7.1	Additive White Gaussian Noise (AWGN) test signal	84
B.7.2	OFDM test signal 1.....	84
B.7.3	OFDM test signal 2.....	85
B.7.4	Verification of interference signal characteristics.....	85
B.7.5	Waveforms for test signals	86
Annex C (normative):	Procedures for radiated measurements.....	87
C.1	Introduction	87
C.2	Radiated measurements in an OATS or SAR.....	87
C.3	Radiated measurements in a FAR	88
C.4	Substitution measurement	88
C.5	Guidance for testing technical requirements	88
C.5.1	Radio test suites and corresponding test sites.....	88
C.5.2	Guidance for testing channel access mechanism.....	89
C.5.2.1	Introduction.....	89
C.5.2.2	Measurement set up	89
C.5.2.3	Calibration of the measurement set up.....	89
C.5.2.4	Test method	90
C.5.3	Guidance for testing receiver blocking.....	90
C.5.3.1	Introduction.....	90
C.5.3.2	Measurement set up	90
C.5.3.3	Calibration of the measurement set up.....	90
C.5.3.4	Test method	91
C.5.4	Guidance for testing receiver selectivity	91
C.5.4.1	Introduction.....	91
C.5.4.2	Measurement set up	91

C.5.4.3	Calibration of the measurement set up.....	92
C.5.4.4	Test method	92
Annex D (informative):	Maximum measurement uncertainties	93
Annex E (informative):	Examples of spectrum masks.....	94
E.1	Introduction	94
E.2	Equipment configured for multi-channel operation in groups of four adjacent channels	94
E.2.1	Example 1.....	94
E.2.2	Example 2.....	94
E.2.3	Example 3.....	95
E.2.4	Example 4.....	95
E.3	Equipment configured for multi-channel operation in 8 adjacent channels.....	96
E.3.1	Example 5.....	96
E.3.2	Example 6.....	96
E.3.3	Example 7.....	97
E.3.4	Example 8.....	97
E.3.5	Example 9.....	98
Annex F (informative):	Change history	99
History		100

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[ETSI EN 303 687 V1.0.0 \(2022-04\)](https://standards.iteh.ai/catalog/standards/sist/56f4bb32-87f9-48bc-bbf2-b14c8a054408/etsi-en-303-687-v1-0-0-2022-04)
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Foreword

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

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.

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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.

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2 References ETSI EN 303 687 V1.0.0 (2022-04)

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

- [1] IEEE 802.11™-2020: "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".
- [2] 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".
- [3] ETSI TS 138 141-1 (V16.9.0) (10-2021): "5G; NR; Base Station (BS) conformance testing Part 1: Conducted conformance testing (3GPP TS 38.141-1 version 16.9.0 Release 16)".

- [4] ETSI TS 138 141-2 (V16.9.0) (10-2021): "5G; NR; Base Station (BS) conformance testing Part 2: Radiated conformance testing (3GPP TS 38.141-2 version 16.9.0 Release 16)".

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".
<https://standards.iteh.ai/catalog/standards/sist/56f4bb32-8794-486c-bb12-b14c8a054408/etsi-en-303-687-1-0-0-2022-04>
- [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): "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 intentional 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 declared 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)

initiating device: device 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: device 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 _i	dB relative to the gain of an isotropic antenna
dB _m	dB relative to 1 mW
dB _r	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_{ch}	channel identifier
p	prioritization period related counter
P_{burst}	RMS (mean) power over the transmission burst
P_{max}	configured maximum transmit power (per channel, in dBm)
PD	calculated Power Spectral Density
q	backoff procedure related counter
Samples/s	Samples per second
T_{ch}	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

3.3 Abbreviations **ITeH STANDARD**

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

AP	Access Point
ACK	Acknowledgement
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
LBT	Listen Before Talk
LBE	Load Based Equipment
LPDA	Logarithmic Periodic Dipole Antenna
LPI	Low Power Indoor
LO	Local Oscillator
NR	New Radio
NB	NarrowBand
OATS	Open Area Test Site
OFDM	Orthogonal Frequency Division Multiplexing
PER	Packet Error Rate
PHY	Physical layer
PFD	Power Flux Density
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

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.

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 [1].

The manufacturer shall declare the equipment to be one or more of the following categories, 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.