



**5 GHz RLAN;
Harmonised Standard covering the essential requirements
of article 3.2 of Directive 2014/53/EU**

*iTeh STANDARDS PREVIEW
(standards.iteh.ai)
Full standard available at
<https://standards.iteh.ai/catalog/standards/sis/30189-3-v2.1-2017-05-45fe-969c-acd179ca9eec/etsi-en-301-893-v2.1-2017-05>*

ReferenceREN/BRAN-0060015

Keywordsaccess, broadband, LAN, layer 1, radio,
regulation, testing**ETSI**650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:
<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at
<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:
<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2017.
All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.
3GPP™ and **LTE™** are Trade Marks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.
GSM® and the GSM logo are Trade Marks registered and owned by the GSM Association.

Contents

Intellectual Property Rights	8
Foreword.....	8
Modal verbs terminology.....	8
Introduction	8
1 Scope	9
2 References	9
2.1 Normative references	9
2.2 Informative references.....	10
3 Definitions, symbols and abbreviations	11
3.1 Definitions	11
3.2 Symbols.....	13
3.3 Abbreviations	14
4 Technical requirements specifications	14
4.1 Environmental profile.....	14
4.2 Conformance requirements	15
4.2.1 Nominal Centre frequencies	15
4.2.1.1 General	15
4.2.1.2 Definition	15
4.2.1.3 Limits	15
4.2.1.4 Conformance.....	15
4.2.2 Nominal Channel Bandwidth and Occupied Channel Bandwidth	15
4.2.2.1 Definition	15
4.2.2.2 Limits	15
4.2.2.3 Conformance.....	16
4.2.3 RF output power, Transmit Power Control (TPC) and Power Density.....	16
4.2.3.1 Definitions	16
4.2.3.1.1 RF Output Power	16
4.2.3.1.2 Transmit Power Control (TPC)	16
4.2.3.1.3 Power Density	16
4.2.3.2 Limits	16
4.2.3.2.1 General	16
4.2.3.2.2 Limits for RF output power and Power Density at the highest power level	16
4.2.3.2.3 Limit for RF output power at the lowest power level (P_L) of the TPC range	17
4.2.3.3 Conformance.....	17
4.2.4 Transmitter unwanted emissions.....	17
4.2.4.1 Transmitter unwanted emissions outside the 5 GHz RLAN bands	17
4.2.4.1.1 Definition.....	17
4.2.4.1.2 Limits	17
4.2.4.1.3 Conformance	18
4.2.4.2 Transmitter unwanted emissions within the 5 GHz RLAN bands	18
4.2.4.2.1 Definition.....	18
4.2.4.2.2 Limits	18
4.2.4.2.3 Conformance	19
4.2.5 Receiver spurious emissions	19
4.2.5.1 Definition	19
4.2.5.2 Limits	19
4.2.5.3 Conformance.....	19
4.2.6 Dynamic Frequency Selection (DFS)	19
4.2.6.1 Introduction.....	19
4.2.6.1.1 General	19
4.2.6.1.2 DFS applicable frequency range.....	20
4.2.6.1.3 DFS operational modes	20
4.2.6.1.4 DFS operation.....	20
4.2.6.2 DFS technical requirements specifications	21

4.2.6.2.1	Applicability	21
4.2.6.2.2	Channel Availability Check.....	22
4.2.6.2.3	Off-Channel CAC (Off-Channel Channel Availability Check).....	22
4.2.6.2.4	In-Service Monitoring	22
4.2.6.2.5	Channel Shutdown.....	23
4.2.6.2.6	Non-Occupancy Period	23
4.2.6.2.7	Uniform Spreading	24
4.2.7	Adaptivity (Channel Access Mechanism).....	24
4.2.7.1	Applicability.....	24
4.2.7.2	Definition	24
4.2.7.3	Requirements and limits.....	25
4.2.7.3.1	Frame Based Equipment (FBE).....	25
4.2.7.3.2	Load Based Equipment (LBE)	27
4.2.7.3.3	Short Control Signalling Transmissions (FBE and LBE).....	32
4.2.7.4	Conformance.....	32
4.2.8	Receiver Blocking	32
4.2.8.1	Applicability.....	32
4.2.8.2	Definition	33
4.2.8.3	Performance Criteria	33
4.2.8.4	Limits	33
4.2.8.5	Conformance.....	33
4.2.9	User Access Restrictions	33
4.2.9.1	Definition	33
4.2.9.2	Requirement	33
4.2.10	Geo-location capability	34
4.2.10.1	Applicability.....	34
4.2.10.2	Definition	34
4.2.10.3	Requirements	34
4.2.10.4	Conformance.....	34
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	35
5.1.2.1	Normal temperature and humidity	35
5.1.2.2	Normal power source	35
5.1.3	Extreme test conditions	35
5.2	Interpretation of the measurement results	35
5.3	Definition of other test conditions	36
5.3.1	Test sequences and traffic load	36
5.3.1.1	General test transmission sequences	36
5.3.1.2	Test transmission sequences for DFS tests.....	36
5.3.2	Test channels	36
5.3.3	Antennas	37
5.3.3.1	Integrated and dedicated antennas.....	37
5.3.3.2	Transmit operating modes	37
5.3.3.2.1	Operating mode 1 (single antenna).....	37
5.3.3.2.2	Operating mode 2 (multiple antennas, no beamforming)	38
5.3.3.2.3	Operating mode 3 (multiple antennas, with beamforming)	38
5.3.4	Presentation of equipment	38
5.3.5	Conducted measurements, radiated measurements, relative measurements	38
5.4	Essential radio test suites.....	38
5.4.1	Product information	38
5.4.2	Carrier frequencies.....	40
5.4.2.1	Test conditions	40
5.4.2.2	Test methods	41
5.4.2.2.1	Conducted measurement.....	41
5.4.2.2.2	Radiated measurement.....	41
5.4.3	Occupied Channel Bandwidth	41
5.4.3.1	Test conditions	41
5.4.3.2	Test method.....	42
5.4.3.2.1	Conducted measurement.....	42

5.4.3.2.2	Radiated measurement.....	42
5.4.4	RF output power, Transmit Power Control (TPC) and Power Density.....	42
5.4.4.1	Test conditions	42
5.4.4.2	Test method.....	43
5.4.4.2.1	Conducted measurement.....	43
5.4.4.2.2	Radiated measurement.....	53
5.4.5	Transmitter unwanted emissions outside the 5 GHz RLAN bands.....	54
5.4.5.1	Test conditions	54
5.4.5.2	Test method.....	54
5.4.5.2.1	Conducted measurement.....	54
5.4.5.2.2	Radiated measurement.....	56
5.4.6	Transmitter unwanted emissions within the 5 GHz RLAN bands	56
5.4.6.1	Test conditions	56
5.4.6.2	Test method.....	57
5.4.6.2.1	Conducted measurement.....	57
5.4.6.2.2	Radiated measurement.....	58
5.4.7	Receiver spurious emissions	58
5.4.7.1	Test conditions	58
5.4.7.2	Test method.....	58
5.4.7.2.1	Conducted measurement.....	58
5.4.7.2.2	Radiated measurement.....	60
5.4.8	Dynamic Frequency Selection (DFS)	60
5.4.8.1	Test conditions	60
5.4.8.1.1	General	60
5.4.8.1.2	Selection of radar test signals	61
5.4.8.1.3	Test set-ups.....	61
5.4.8.2	Test method.....	62
5.4.8.2.1	Conducted measurement.....	62
5.4.8.2.2	Radiated measurement.....	70
5.4.9	Adaptivity (channel access mechanism).....	70
5.4.9.1	Test conditions	70
5.4.9.2	Test method for Frame Based Equipment.....	70
5.4.9.2.1	Additional test conditions	70
5.4.9.2.2	Conducted measurements	71
5.4.9.2.3	Generic test procedure for measuring channel/frequency usage	74
5.4.9.2.4	Radiated measurements	75
5.4.9.3	Test method for Load Based Equipment.....	75
5.4.9.3.1	Additional test conditions	75
5.4.9.3.2	Conducted measurements	76
5.4.9.3.3	Generic test procedure for measuring channel/frequency usage	83
5.4.9.3.4	Radiated measurements	84
5.4.10	Receiver Blocking	84
5.4.10.1	Test conditions	84
5.4.10.2	Test Method	85
5.4.10.2.1	Conducted measurements	85
5.4.10.2.2	Radiated measurements	86

Annex A (informative):	Relationship between the present document and the essential requirements of Directive 2014/53/EU	87
-------------------------------	---	-----------

Annex B (normative):	Test sites and arrangements for radiated measurements.....	90
-----------------------------	---	-----------

B.1	Introduction	90
B.2	Radiation test sites.....	90
B.2.1	Open Area Test Site (OATS)	90
B.2.2	Semi Anechoic Room.....	91
B.2.3	Fully Anechoic Room (FAR).....	92
B.2.4	Measurement Distance	93
B.3	Antennas.....	94
B.3.1	Introduction	94
B.3.2	Measurement antenna.....	94

B.3.3	Substitution antenna	94
B.4	Test fixture	94
B.4.1	Introduction	94
B.4.2	Description of the test fixture	95
B.4.3	Using the test fixture for relative measurements	95
B.5	Guidance on the use of radiation test sites	95
B.5.1	Introduction	95
B.5.2	Power supplies for the battery powered UUT	95
B.5.3	Site preparation	96
B.6	Coupling of signals.....	96
B.6.1	General	96
B.6.2	Data Signals.....	96
B.7	Interference Signals used for Adaptivity Tests	97
B.7.1	Additive white Gaussian noise (AWGN)	97
B.7.2	OFDM test signal	97
B.7.3	LTE test signal	97
B.7.4	Test procedure	97
B.7.5	Waveforms for test signals	98
Annex C (normative): Procedures for radiated measurements.....		99
C.1	Introduction	99
C.2	Radiated measurements in an OATS or SAR.....	99
C.3	Radiated measurements in a FAR	100
C.4	Substitution measurement	100
C.5	Guidance for testing technical requirements	100
C.5.1	Radio test suites and corresponding test sites.....	100
C.5.2	Guidance for testing Adaptivity (Channel Access Mechanism).....	101
C.5.2.1	Introduction.....	101
C.5.2.2	Measurement Set-up	101
C.5.2.3	Calibration of the measurement Set-up.....	101
C.5.2.4	Test method	102
C.5.3	Guidance for testing Receiver Blocking.....	102
C.5.3.1	Introduction.....	102
C.5.3.2	Measurement Set-up	102
C.5.3.3	Calibration of the measurement Set-up.....	102
C.5.3.4	Test method	103
Annex D (normative): DFS parameters		104
Annex F (informative): Adaptivity Flowchart.....		107
Annex G (informative): Application form for testing.....		108
G.0	The right to copy	108
G.1	Introduction	108
G.2	Information as required by ETSI EN 301 893 (V2.1.1), clause 5.4.1	108
G.3	Additional information provided by the manufacturer.....	117
G.3.1	Modulation	117
G.3.2	Duty Cycle.....	117
G.3.3	About the UUT.....	117
G.3.4	List of ancillary and/or support equipment provided by the manufacturer.....	117
Annex H (informative): Bibliography		118
Annex I (informative): Change history		119

History120

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
<https://standards.iteh.ai/catalog/standards/sist/b89ea02-52ad-45fe-969c-acd179ca9eec/etsi-en-301-893-v2.1.1-2017-05>

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

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 standardisation request C(2015) 5376 final [i.4] 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 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

5 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 (04)08 [i.8] and the Commission Decision 2005/513/EC [i.9] as amended by the Commission Decision 2007/90/EC [i.10].

1 Scope

The present document specifies technical characteristics and methods of measurements for 5 GHz wireless access systems (WAS) including RLAN equipment.

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

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

Table 1: Service frequency bands

	Service frequency bands
Transmit	5 150 MHz to 5 350 MHz
Receive	5 150 MHz to 5 350 MHz
Transmit	5 470 MHz to 5 725 MHz
Receive	5 470 MHz to 5 725 MHz

The present document covers the essential requirements of article 3.2 of Directive 2014/53/EU 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.

- [1] Void.
- [2] Void.
- [3] Void.
- [4] Void.
- [5] Void.
- [6] Void.
- [7] Void.
- [8] ETSI TS 136 141 (V13.5.0) (2016-10): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) conformance testing (3GPP TS 36.141 version 13.5.0 Release 13)".
- [9] IEEE 802.11™-2016: "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".

2.2 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] 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] Void.
- [i.4] 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.5] 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.6] 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.7] 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.8] ECC/DEC/(04)08: "ECC Decision of 9 July 2004 on the harmonised use of the 5 GHz frequency bands for the implementation of Wireless Access Systems including Radio Local Area Networks (WAS/RLANs) (30/10/2009)".
- [i.9] Commission Decision 2005/513/EC of 11 July 2005 on the harmonised use of radio spectrum in the 5 GHz frequency band for the implementation of Wireless Access Systems including Radio Local Area Networks (WAS/RLANs).
- [i.10] Commission Decision 2007/90/EC of 12 February 2007 amending Decision 2005/513/EC on the harmonised use of radio spectrum in the 5 GHz frequency band for the implementation of Wireless Access Systems including Radio Local Area Networks (WAS/RLANs).
- [i.11] 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.12] 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.13] 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".

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:

5 GHz RLAN bands: total frequency range that consists of the 5 150 MHz to 5 350 MHz and the 5470 MHz to 5 725 MHz sub-bands

adaptive equipment: equipment operating in an adaptive mode

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

ad-hoc mode: operating mode in which an RLAN device establishes a temporary wireless connection with other RLAN devices without a controlling network infrastructure

antenna array: two or more antennas connected to a single device and operating simultaneously

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.

available channel: channel identified as available for immediate use as an *Operating Channel*

NOTE: *Usable Channels* whose nominal bandwidth falls completely within the band 5 150 MHz to 5 250 MHz can be considered as *Available Channels* without further testing.

backoff procedure: procedure that facilitates the sharing of the medium by randomizing the transmission attempts from multiple devices competing for access to an *Operating 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: minimum amount of spectrum used by a single RLAN device

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

EXAMPLE: For the purpose of the present document, an IEEE 802.11™ [9] device operating in a 40 MHz mode may be considered as operating in 2 adjacent 20 MHz channels simultaneously.

Channel Access Engine (CAE): mechanism that determines when a transmission attempt is permitted

channel plan: combination of the centre frequencies and for each of the centre frequencies, the declared nominal bandwidth(s)

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

combined equipment: equipment consisting of two or more products where at least one of which is radio equipment within the scope of the present document

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: mechanism used by an adaptive system to determine the presence of another device operating on the channel based on detecting the signal level of that other device

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

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

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: 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

master mode: mode which relates to the DFS functionality where the RLAN device uses a Radar Interference Detection function and controls the transmissions of RLAN devices operating in slave mode

multi-radio equipment: combined equipment consisting of two or more radio products (transmitters, receivers or transceivers) or a single radio product operating in two or more bands simultaneously

Observation Slot: period during which the operating channel is checked for the presence of other RLAN transmissions

operating channel: *Available Channel* on which the RLAN has started 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 Operating Channel is checked for the presence of other RLAN transmissions

receive chain: receiver circuit with an associated antenna

RLAN devices: 5 GHz wireless access systems (WAS) including RLAN equipment

simulated radar burst: series of periodic radio wave pulses for test purposes

slave mode: mode which relates to the DFS functionality where the transmissions of the RLAN are under control of an RLAN device operating in master mode

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.

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

sub-band: portion of the 5 GHz RLAN bands

NOTE: See definition for "5 GHz RLAN bands".

total occupied bandwidth: total of the *Nominal Channel Bandwidths* in case of simultaneous transmissions in adjacent or non-adjacent channels

transmit chain: transmitter circuit with an associated antenna

Transmit Power Control (TPC): technique in which the transmitter output power is controlled resulting in reduced interference to other systems

unavailable channel: channel which cannot be considered by the RLAN device for a certain period of time (*Non Occupancy Period*) after a radar signal was detected on that channel

unusable channel: channel from the declared channel plan which may be declared as permanently unavailable due to one or more radar detections on the channel

usable channel: any channel from the declared channel plan, which may be considered by the RLAN for possible use

3.2 Symbols

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

A	Measured power output
T_{ch}	Number of active transmit chains
B	Radar burst period
Ch_r	Channel in which radar test signals are inserted to simulate the presence of a radar
CW_{min}	Minimum Contention Window size
CW_{max}	Maximum Contention Window size
D	Measured Power Density
dB	decibel
dBm	dB relative to 1 mW
E	Field strength
E_o	Reference field strength
f_c	Carrier frequency
G	Antenna gain
GHz	gigahertz
Hz	hertz
kHz	kilohertz
L	Radar burst length
MHz	megahertz
ms	millisecond
Samples/s	Samples per second
mW	milliwatt
n	Number of channels
p	Prioritization period related counter
P_H	Calculated e.i.r.p. at highest power level
P_L	Calculated e.i.r.p. at lowest power level
P_{burst}	RMS (mean) power over the transmission burst
PD	Calculated Power Density
P_d	Detection Probability
q	Backoff procedure related counter
R	Distance
R_{ch}	Number of active receive chains
R_o	Reference distance
S0	Signal power
T0	Time instant
T1	Time instant
T2	Time instant
T3	Time instant
W	Radar pulse width
x	Observed duty cycle
Y	Beamforming (antenna) gain