

# **SLOVENSKI STANDARD**

## **SIST EN 301 893 V1.6.1:2012**

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**Širokopasovna radijska dostopovna omrežja (BRAN) - Zelo zmogljivo radijsko lokalno omrežje (RLAN) na 5 GHz - Harmonizirani EN, ki zajema bistvene zahteve člena 3.2 direktive R&TTE**

Broadband Radio Access Networks (BRAN) - 5 GHz high performance RLAN - Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive

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# ETSI EN 301 893 V1.6.1 (2011-11)



**Broadband Radio Access Networks (BRAN);  
5 GHz high performance RLAN;  
Harmonized EN covering the essential requirements  
of article 3.2 of the R&TTE Directive**

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## Foreword

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

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Directive 98/34/EC as amended by Directive 98/48/EC [i.1].

The title and reference to the present document are intended to be included in the publication in the Official Journal of the European Union of titles and references of Harmonized Standard under the Directive 1999/5/EC [1].

See article 5.1 of Directive 1999/5/EC [1] for information on presumption of conformity and Harmonised Standards or parts thereof the references of which have been published in the Official Journal of the European Union.

The requirements relevant to Directive 1999/5/EC [1] are summarised in annex A.

National transposition dates	
Date of adoption of this EN:	11 November 2011
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Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 August 2012
Date of withdrawal of any conflicting National Standard (dow):	31 December 2012

## Introduction

The present document is part of a set of standards developed by ETSI and is designed to fit in a modular structure to cover all radio and telecommunications terminal equipment within the scope of the R&TTE Directive [1]. The modular structure is shown in EG 201 399 [i.3].

# 1 Scope

The present document applies to 5 GHz high performance wireless access systems (WAS) including RLAN equipment which is used in wireless local area networks. Such networks provide high speed data communications in between devices connected to the wireless infrastructure. The present document also applies to ad-hoc networking where these devices communicate directly with each other, without the use of a wireless infrastructure.

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

5 GHz high performance wireless access systems (WAS) including RLAN equipment are further referred to as RLAN equipment in the present document.

The spectrum usage conditions for this RLAN equipment are set in the ECC Decision (04)08 [5] and the Commission Decision 2005/513/EC [6] as amended by the Commission Decision 2007/90/EC [7].

The equipment is intended to operate in the frequency ranges 5 150 MHz to 5 350 MHz and 5 470 MHz to 5 725 MHz which have been allocated by WRC-03 to the *mobile service* on a primary basis for the implementation of WAS/RLANs covered by the present document.

The present document is intended to cover the provisions of article 3.2 of R&TTE Directive [1], which states that: "...radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communications and orbital resources so as to avoid harmful interference".

# 2 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 reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://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.

## 2.1 Normative references

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

- [1] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).
- [2] ETSI TR 100 028-1 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1".
- [3] 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".
- [4] CISPR 16-1-1 (2010-11 Ed. 3.1 Consolidated Edition with am1): "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus".
- [5] 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).
- [6] 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).

- [7] Commission Decision 2007/90/EC of 12 February 2007 amending Decision 2005/513/EC on the harmonized use of radio spectrum in the 5 GHz frequency band for the implementation of Wireless Access Systems including Radio Local Area Networks (WAS/RLANs).
- [8] Void.
- [9] IEEE Std. 802.11™-2007: "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".
- [10] IEEE Std. 802.11n™-2009: "IEEE Standard for Information Technology - Telecommunications and information exchange between systems - Local and Metropolitan networks - Specific requirements-Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications. Amendment 5: Enhancements for Higher Throughput".

## 2.2 Informative references

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 98/48/EC of the European Parliament and of the Council of 20 July 1998 amending Directive 98/34/EC laying down a procedure for the provision of information in the field of technical standards and regulations.
- [i.2] IEEE Std. 802.11ac™: "Draft Standard for Information Technology - Telecommunications and information exchange between systems - Local and Metropolitan networks - Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications. Amendment 5: Enhancements for Higher Throughput for Operation in Bands below 6 GHz".
- [i.3] ETSI EG 201 399 (V2.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of candidate Harmonized Standards for application under the R&TTE Directive".

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in the R&TTE Directive [1] and the following apply:

**5 GHz RLAN bands:** total frequency range that consists of 2 sub-bands:

- 5 150 MHz to 5 350 MHz; and
- 5 470 MHz to 5 725 MHz

**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

**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.

**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 802.11n™ [10] device operating in a 40 MHz mode may be considered as operating in 2 adjacent 20 MHz channels simultaneously.

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

**combined equipment:** any combination of non-radio equipment that requires a plug-in radio device to offer full functionality

**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

NOTE: It is the combination of dedicated antenna and radio equipment that is expected to be compliant with the regulations.

**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

**host equipment:** any equipment which has complete user functionality when not connected to the radio equipment part and to which the radio equipment part provides additional functionality and to which connection is necessary for the radio equipment part to offer functionality

**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.

**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

NOTE: In this mode it is able to select a channel and initiate a network by sending enabling signals to other RLAN devices. An RLAN network always has at least one RLAN device operating in master mode when operating in the bands 5 250 MHz to 5 350 MHz and 5 470 MHz to 5 725 MHz.

**multi-radio equipment:** radio, host or combined equipment using more than one radio transceiver

**operating channel:** *Available Channel* on which the RLAN has started transmissions

NOTE: An *Operating Channel* becomes again an *Available Channel* if the RLAN stopped all transmissions on that channel and no radar signal was detected by the *In-Service Monitoring*.

**plug-in radio device:** radio equipment module intended to be used with or within host, combined or multi-radio equipment, using their control functions and power supply

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

NOTE: Two or more receive chains are combined in a smart antenna system.

**RLAN devices:** 5 GHz high performance 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

NOTE: An RLAN device in slave mode may use a Radar Interference Detection function.

**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: E.g. techniques such as spatial multiplexing, beamforming, cyclic delay diversity, MIMO, etc.

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

**sub-band:** portion of the 5 GHz RLAN bands (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

NOTE: The Total Occupied Bandwidth may change with time/payload.

**transmit chain:** transmitter circuit with an associated antenna

NOTE: Two or more transmit chains are combined in a smart antenna system.

**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, unless it is precluded by either:

- 1) the intended outdoor usage of the RLAN; or
- 2) previous detection of a radar on the channel (*Unavailable Channel* or *Unusable Channel*); or
- 3) national regulations; or
- 4) the restriction to only operate in the band 5 150 MHz to 5 250 MHz for RLAN devices without a radar detection capability.

## 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
D	Measured power density
E	Field strength
$E_o$	Reference field strength
$f_c$	Carrier frequency
G	Antenna gain
L	Radar burst length
n	Number of channels
$P_H$	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
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

### 3.3 Abbreviations

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

BIT	Burst Interval Time
CAC	Channel Availability Check
CCA	Clear Channel Assessment
CISPR	International Special Committee on Radio Interference (Comité International Spécial des Perturbations Radioélectriques)
CSD	Cyclic Shift Diversity
dB/div	dB per division
DFS	Dynamic Frequency Selection
e.i.r.p.	Equivalent Isotropically Radiated Power
e.r.p.	Effective Radiated Power
EMC	Electro-Magnetic Compatibility
HT20	High Throughput in a 20 MHz channel
HT40	High Throughput in a 40 MHz channel
IEEE	Institute of Electrical and Electronic Engineers
MCS	Modulation Coding Scheme
MIMO	Multiple Input, Multiple Output
PPB	Pulses Per Burst
ppm	parts per million
PRF	Pulse Repetition Frequency
PSD	Power Spectral Density
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
RLAN	Radio Local Area Network
RMS	Root Mean Square
TL	Threshold Level
TPC	Transmit Power Control
Tx	Transmit, Transmitter
UUT	Unit Under Test
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 stated by the manufacturer.

The equipment shall comply in any of the operating modes with all the technical requirements of the present document at all times when operating within the boundary limits of the stated operational environmental profile.

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 Centre frequencies

### 4.2.1 Definition

The centre frequency is the centre of the channel declared by the manufacturer as part of the declared channel plan(s).

### 4.2.2 Limits

The actual centre frequency for any given channel declared by the manufacturer shall be maintained within the range  $f_c \pm 20$  ppm.

### 4.2.3 Conformance

Conformance tests as defined in clause 5.3.2 shall be carried out.

## 4.3 Nominal Channel Bandwidth and Occupied Channel Bandwidth

### 4.3.1 Definition iTeh STANDARD PREVIEW

The Nominal Channel Bandwidth is the widest band of frequencies, inclusive of guard bands, assigned to a single channel.

The Occupied Channel Bandwidth is the bandwidth containing 99 % of the power of the signal.

NOTE: A device is permitted to operate in one or more adjacent or non-adjacent channels simultaneously.

When equipment has simultaneous transmissions in adjacent channels, these transmissions may be considered as one signal with an actual Nominal Channel Bandwidth of 'n' times the individual Nominal Channel Bandwidth where 'n' is the number of adjacent channels. When equipment has simultaneous transmissions in non-adjacent channels, each power envelope shall be considered separately.

### 4.3.2 Limits

The Nominal Channel Bandwidth shall be at least 5 MHz at all times.

The Occupied Channel Bandwidth shall be between 80 % and 100 % of the declared Nominal Channel Bandwidth. In case of smart antenna systems (devices with multiple transmit chains) each of the transmit chains shall meet this requirement.

NOTE: During an established communication, a device is allowed to operate temporarily in a mode where its Occupied Channel Bandwidth may be reduced to as low as 40 % of its Nominal Channel Bandwidth with a minimum of 4 MHz.

### 4.3.3 Conformance

Conformance tests as defined in clause 5.3.3 shall be carried out to determine the occupied channel bandwidth.