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HARMONISED EUROPEAN STANDARD

Intelligent Transport Systems (ITS); Radiocommunications equipment operating in the 5 855 MHz to 5 925 MHz frequency band; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

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Foreword

This draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), 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.5] 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.4].

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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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).

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1 Scope

The present document applies to radio transmitters and receivers for Intelligent Transport Systems (ITS) operating in the frequency range 5 855 GHz to 5 925 GHz. The spectrum usage conditions are set out in ECC Decision (08)01 [i.1] for the frequency range 5 875 GHz to 5 925 GHz and in ECC Recommendation (08)01 [i.2] for the frequency range 5 855 GHz to 5 875 GHz. The Commission Decision 2008/671/EC [i.3] mandates a harmonised use of the frequency band 5 875 GHz to 5 905 GHz dedicated to safety-related applications of ITS throughout the member states of the European Union. Table 1 outlines the 5 GHz ITS frequency band segmentation.

Table 1: 5 GHz ITS frequency band segmentation

Frequency band	Frequency range	Usage	Regulation
ITS-G5B	5 855 MHz to 5 875 MHz	ITS non-safety applications	ECC Recommendation (08)01 [i.2]
ITS-G5A	5 875 MHz to 5 905 MHz	ITS road safety	Commission Decision 2008/671/EC [i.3], ECC Decision (08)01 [i.1]
ITS-G5D	5 905 MHz to 5 925 MHz	Future ITS applications	ECC Decision (08)01 [i.1]

The present document contains requirements to demonstrate that radio equipment both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference.

Interference mitigation techniques in the present document are provided to protect road tolling applications using CEN DSRC or HDR DSRC.

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] ETSI TS 102 792 (V1.2.1) (06-2015): "Intelligent Transport Systems (ITS); Mitigation techniques to avoid interference between European CEN Dedicated Short Range Communication (CEN DSRC) equipment and Intelligent Transport Systems (ITS) operating in the 5 GHz frequency range".

[2] ETSI EN 302 637-2 (V1.3.2) (11-2014): "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Cooperative Awareness Basic Service".

[3] Void.

[4] CISPR 16 (parts 1-1 (2015), 1-4 (2010) and 1-5 (2014)): "Specifications for radio disturbance and immunity measuring apparatus and methods; Part 1: Radio disturbance and immunity measuring apparatus".

[5] ETSI TS 102 687 (V1.1.1) (07-2011): "Intelligent Transport Systems (ITS); Decentralized Congestion Control Mechanisms for Intelligent Transport Systems operating in the 5 GHz range; Access layer part".

[6] ETSI TS 103 175 (V1.1.1) (06-2015): "Intelligent Transport Systems (ITS); Cross Layer DCC Management Entity for operation in the ITS G5A and ITS G5B medium".

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[7] CEN EN 12253:2004: "Road transport and traffic telematics - Dedicated short-range communication - Physical layer using microwave at 5,8 GHz".

[8] ETSI ES 200 674-1 (V2.4.1) (05-2013): "Intelligent Transport Systems (ITS); Road Transport and Traffic Telematics (RTTT); Dedicated Short Range Communications (DSRC); Part 1: Technical characteristics and test methods for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band".

[9] ETSI TS 102 917-1 (V1.1.1) (01-2013): "Intelligent Transport Systems (ITS); Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range; Part 1: Protocol Implementation Conformance Statement (PICS)".

[10] ETSI TS 102 917-2 (V1.1.1) (01-2013): "Intelligent Transport Systems (ITS); Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range; Part 2: Test Suite Structure and Test Purposes (TSS & TP)".

[11] ETSI TS 102 917-3 (V1.1.1) (01-2013): "Intelligent Transport Systems (ITS); Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range; Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT)".

[12] IEEE 802.11™-2012: "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

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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] ECC Decision (08)01: "ECC Decision of 14 March 2008 on the harmonised use of the 5875-5925 frequency band for Intelligent Transport Systems (ITS)", approved 14 March 2008 and amended 3 July 2015.

[i.2] ECC Recommendation (08)01:"Use of band 5855-5875 MHz for Intelligent Transport Systems (ITS)," approved 21 February 2008 and amended 3 July 2015.

[i.3] Commission Decision 2008/671/EC of 5 August on the harmonised use of radio spectrum in the 5875-5905 MHz frequency band for safety related application of Intelligent Transport Systems (ITS).

[i.4] 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.5] 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.6] ETSI TR 100 028 (all parts) (V1.4.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

[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".

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.4] and the following apply:

5 GHz ITS frequency band: frequency bands ITS-G5A, ITS-G5B and ITS-G5D as outlined in Table 1

dedicated antenna: removable antenna supplied and tested with the radio equipment, designed as an indispensable part of the equipment

NOTE: The dedicated antenna has been designed or developed for one or more specific types of equipment. It is the combination of dedicated antenna and radio equipment that is expected to be compliant with the regulations.

duty cycle: defined as the ratio, expressed as a percentage of the maximum transmitter "on" time on one carrier frequency, relative to a second period

integral antenna: antenna designed as a fixed part of the equipment, without the use of an external connector and as such which cannot be disconnected from the equipment by the user

NOTE: An integral antenna may be fitted internally or externally.

protected status: status of a CEN DSRC or a HDR DSRC station that is eligible to deploy a roadside unit certificate to sign a protected zone CAM or/and is included in the official protected zone database

radiated measurements: measurements which involve the absolute measurement of a radiated field

vehicle: all kinds of land mobile vehicle

EXAMPLE: Road vehicle and rail vehicle.

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3.2 Symbols

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

dB	decibel
dBi	antenna gain relative to isotropic radiator in decibel
dBc	decibel relative to carrier power
E	electrical field strength
f	frequency
f_c	nominal centre frequency
G	antenna gain
P_H	highest power level
P_L	lowest power level
R	distance
T_{max}	maximum temperature
T_{min}	minimum temperature
T_{off}	minimum time between two transmissions
T_{on}	maximum duration of a transmission
V_{max}	maximum voltage
V_{min}	minimum voltage
$V_{nominal}$	nominal voltage
Ω	ohm
μs	microsecond

3.3 Abbreviations

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

AC	Alternative Current
BPSK	Binary Phase Shift Keying
CAM	Cooperative Awareness Message
CBR	Channel Busy Ratio
CCH	Control Channel
CEN	Comité Européen de Normalisation (European Committee for Standardization)
CISPR	Comité International Spécial des Perturbations Radioélectriques (International Special Committee on Radio Interference)
DC	Direct Current
DCC	Decentralized Congestion Control
DSRC	Dedicated Short Range Communication (CEN DRSC = tolling at 5,8 GHz)
DUT	Device Under Test
e.i.r.p.	equivalent isotropically radiated power
e.r.p.	effective radiated power
EC	European Commission
ECC	Electronic Communication Committee
EMC	ElectroMagnetic Compatibility
HDR	High Data Rate
HS	Harmonised Standard
ITS	Intelligent Transport Systems
LP	Linear Polarized
OOB	Out-Of-Band
PD	mean Power Density
PER	Packet Error Rate
ppm	parts per million = 10^{-6}
PSD	Power Spectral Density
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RMS	Root Mean Square
TPC	Transmit Power Control
VSWR	Voltage Standing Wave Ratio

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

Recommended environmental profile parameters are summarized in Annex D.

4.2 Conformance requirements

4.2.1 Transmitter frequency stability

4.2.1.1 Definition

The equipment is required to operate on the applicable specific carrier centre frequencies that correspond to the nominal carrier frequencies, f_c, as defined in Table 2.

Table 2: Nominal carrier frequency allocations

Channel name	Carrier centre frequency f_c, (MHz)	Maximum channel bandwidth (MHz)
G5-SCH4	5 860	10
G5-SCH3	5 870	10
G5-SCH1	5 880	10
G5-SCH2	5 890	10
G5-CCH	5 900	10
G5-SCH5	5 910	10
G5-SCH6	5 920	10

The frequency channels together with the channel names contained in the three different frequency bands are depicted in Figure 1.

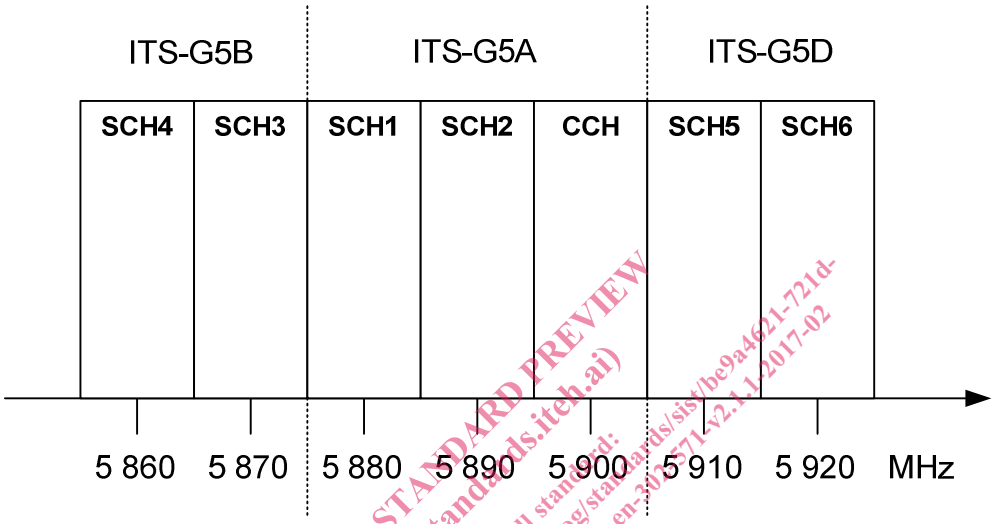

Figure 1: An overview of the three different frequency bands together with the channel names in each frequency band

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4.2.1.2 Limits

The actual carrier centre frequency for any given channel given in Table 2 shall be maintained within the range $f_c \pm 20$ ppm.

4.2.1.3 Conformance

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

4.2.2 RF output power

4.2.2.1 Definition

The radio frequency (RF) output power is the mean equivalent isotropically radiated power (e.i.r.p.) during transmission bursts.

4.2.2.2 Limits

The maximum RF output power shall not exceed 33 dBm e.i.r.p.

4.2.2.3 Conformance

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