ETSI EN 301 357 V2.1.1 (2017-06)

Cordless audio devices in the range 25 MHz to 2 000 MHz; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

Reference

REN/ERM-TG17-19-2

Keywords

audio, harmonised standard, radio, radio MIC, 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

Contents

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 Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.9] 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 and table A.2 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:	6 June 2017
Date of latest announcement of this EN (doa):	30 September 2017
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 March 2018
Date of withdrawal of any conflicting National Standard (dow):	31 March 2019

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

The present document applies to cordless audio devices in the range 25 MHz to 2 000 MHz.

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.

1 Scope

The present document specifies technical characteristics and methods of measurements for cordless audio devices in the range 25 MHz to 2 000 MHz, including:

- cordless headphones;
- cordless loudspeakers;
- consumer radio microphones in the range 863 MHz to 865 MHz;
- in-ear monitoring equipment using either 300 kHz bandwidth analogue modulation or 300 kHz, 600 kHz, 1 200 kHz digital FDMA modulation in the range 863 MHz to 865 MHz;
- in-vehicle cordless;
- personal cordless;
- broadband multi channel audio systems;
- Band II LPD (low power devices) in the 87,5 MHz to 108 MHz range (Broadcasting Band II) using up to 200 kHz bandwidth and analogue modulation;
- and other devices and frequency bands defined within CEPT/ERC/REC 70-03 [i.2], European or National regulation.

NOTE 1: The frequency bands for this equipment may differ from country to country as specified in their national regulations. All equipment is intended to be used with integral antennas.

Table 1: Radiocommunications service frequency bands

	Radiocommunications service frequency bands
Transmit	25 MHz to 2 000 MHz
Receive	25 MHz to 2 000 MHz

NOTE 2: Cordless audio devices covered within the present document are considered, by definition, Short Range Devices (SRD), the power limits for different frequency bands can be found in the current version of CEPT/ERC/REC 70-03 [i.2], annex 13 (or European or national regulations).

NOTE 3: Electromagnetic Compatibility (EMC) requirements are covered by ETSI EN 301 489-9 [i.4].

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] Recommendation ITU-R BS.559-2 (1990): "Objective measurement of radio-frequency protection ratios in LF, MF and HF broadcasting".

[2] IEC 60244-13 (1991): "Methods of measurement for radio transmitters - Part 13: Performance characteristics for FM sound broadcasting".

[3] ANSI C63.5 (2006): "American National Standard for Calibration of Antennas Used for Radiated Emission Measurements in Electro Magnetic Interference".

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] CEPT/ERC/REC 70-03 relating to the use of Short Range Devices (SRD), annex 13.

[i.3] ETSI EN 300 220 (all parts): "Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz".

[i.4] ETSI EN 301 489-9: "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 9: Specific conditions for wireless microphones, similar Radio Frequency (RF) audio link equipment, cordless audio and in-ear monitoring devices; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU".

[i.5] ETSI EN 301 908-1: "IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 1: Introduction and common requirements".

[i.6] ETSI EN 301 511: "Global System for Mobile communications (GSM); Mobile Stations (MS) equipment; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU".

[i.7] ETSI EN 301 489-1: "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU".

[i.8] CEPT/ECC Report 73: "Compatibility of SRD in the FM radio broadcasting band".

[i.9] 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.10] European Commission: "The 'Blue Guide' on the implementation of EU products rules 2016 (2016/C 272/01)".

[i.11] ETSI TR 102 273 (all parts) (2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties".

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

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

allocated or applicable band: frequency band as defined in radio regulations of national administrations

artificial antenna: tuned reduced-radiating dummy load equal to the nominal impedance specified by the manufacturer

Broadband multi channel audio systems: used for the transmission of high quality digital audio. These can be e.g. surround sound systems or uncompressed audio

channel bandwidth: frequency band of defined width including safety margin for operation on adjacent channels, located symmetrically around the carrier frequency

consumer radio microphones: intended for non professional applications

cordless: link between at least two entities that does not require physical connection

NOTE: While the term "cordless" can refer to infra-red and other non-RF "wireless" links, in the context of the present document it is restricted to RF operating systems only.

integral antenna: antenna, with or without a connector, designed as, and declared as by the manufacturer, an indispensable part of the equipment

integral antenna for Band II LPD only: permanent fixed antenna, which may be built-in, designed as an indispensable part of the equipment

In-ear monitoring: equipment which is used by stage and studio performers to receive personal fold back (monitoring) of the performance

NOTE: This can be just their own voice or a complex mix of sources. This equipment is usually stereo or 2 channel audio.

necessary bandwidth: for a given class of emission, width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions

NOTE: However, the necessary bandwidths of most digital modulation formats are presently not referred to Recommendation ITU-Rs of SM series.

nominal channel frequency: channel frequency declared by the manufacturer

occupied bandwidth: width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage β/2 of the total mean power of a given emission

NOTE: Unless otherwise specified in an Recommendation ITU-R for the appropriate class of emission, the value of β/2 should be taken as 0,5 %.

port: any connection point on or within the Equipment Under Test (EUT) intended for the connection of cables to or from that equipment

radiated measurements: measurements that involve the absolute measurement of a radiated electromagnetic field

3.2 Symbols

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

λ	wavelength in metres
µF	micro Farad
µW	micro Watt
Ω	ohm
dBc	dB relative to the carrier level
E	field strength
fc	carrier frequency
fo	operating frequency
GHz	Giga Hertz
kHz	kilo Hertz
MHz	Mega Hertz
mW	milli Watt
nW	nano Watt

3.3 Abbreviations

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

ac	alternating current
AF	Audio Frequency
B	channel Bandwidth
BER	Bit Error Rate
BN	Necessary Bandwidth
CW	Continuous Wave
dc	direct current
DUT	Device Under Test
EC	European Commission
ECC	Electronic Communications Committee
EFTA	European Free Trade Association
EIRP	Equivalent Isotropically Radiated Power
EMC	ElectroMagnetic Compatibility
EN	European Standard
e.r.p.	effective radiated power
EU	European Union
EUT	Equipment Under Test
FDMA	Frequency Division Multiple Access
FM	Frequency Modulation
GSM	Global System for Mobile communications
HF	High Frequency
ITU-R	International Telecommunication Union - Radiocommunication Sector
LF	Low Frequency
LPD	Low Power Device
MF	Medium Frequency
OATS	Open Area Test Site
RBW	Resolution BandWidth
RMS	Root Mean Square
RF	Radio Frequency
SINAD	(Signal + Noise + Distortion) over (Noise + Distortion)
SRD	Short Range Devices
Tx	Transmitter
UMTS	Universal Mobile Telecommunications Service
VBW	Video BandWidth
VSWR	Voltage Standing Wave Ratio

4 Technical requirements specifications

4.0 General

Equipment within the scope of the present document is described in clauses 4.1 to 4.3.

4.1 Cordless audio

Cordless audio equipment encompasses e.g. radio linked headphones and loudspeakers. The transmitters may be installed in a building, fitted in a vehicle or body worn. Stereo equipment can be designed for required channel bandwidths of 200 kHz or less, however consumer wideband (multi channel) audio equipment and stereo equipment using for example pilot tone systems or digital modulation may need wider bandwidths as defined in the present document.

4.1.1 In-vehicle cordless

In-vehicle systems are used for private listening in automobiles and other methods of transport (where permitted).

4.1.2 Personal cordless

Personal cordless transmitters are to enable the body worn personal stereo equipment to be wire free.

4.1.3 Broadband multi channel audio systems

Broadband multi channel systems are used for the transmission of high quality digital audio. These can be e.g. surround sound systems or uncompressed audio. They are intended to be used in spectrum above 1 GHz.

4.1.4 Band II LPD

Short range low power FM transmitters operating in the FM Broadcast band 87,5 MHz to 108 MHz are used for the provision of an RF link between a personal audio device, including mobile phone, and the in-car or home entertainment system.

4.2 Consumer radio microphones

Consumer radio microphones are intended for non professional applications.

4.3 In-ear monitoring

In-ear monitoring equipment is used by stage and studio performers to receive personal fold back (monitoring) of the performance. This can be just their own voice or a complex mix of sources. This equipment is usually stereo or 2 channel audio.

4.4 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the manufacturer. The equipment shall comply with all the technical requirements of the present document which are identified as applicable in annex A at all times when operating within the boundary limits of the declared operational environmental profile.

5 Testing for compliance with technical requirements

5.1 Presentation of equipment for testing purposes

5.1.1 Introduction

Each equipment submitted for performance testing shall fulfil the requirements of the present document on all channels over which it is intended to operate.

The manufacturer shall complete the appropriate test plan when submitting equipment for testing.

The manufacturer shall state the frequency range over which the equipment is designed to operate.

The manufacturer shall also supply all relevant interface information and any tools and test fixtures to allow:

- direct current (dc) power connection;
- analogue audio connection;
- the deviation limiting of the transmitter; and
- the setting of any input audio level controls and input signal level for normal operation, for a sinusoidal input signal of 500 Hz (or 1kHz in the case of Band II LPD). The manufacturer shall specify the settings of any other controls necessary to avoid invalidating the test measurements.

In the case of Band II LPD it may be necessary, for integrated equipment, to create a stored data file of 1 kHz stereo sinusoidal tones to stimulate the input to the transmitter. The amplitude of such tones should be variable (but the same amplitude for each tone) to enable the correct adjustment of ±75 kHz FM deviation of the transmitter output.

Besides the technical documentation, the manufacturer should also supply an operating manual, identical in content to that supplied with the production model(s) available to the public, for the device(s).

To simplify and harmonize the testing procedures between manufacturers and test laboratories, measurements shall be performed, according to the present document, on samples of equipment defined in clauses 5.1.2 to 5.1.7.2.

These clauses are intended to give confidence that the requirements set out in the present document have been met without the necessity of performing measurements on all channels.

5.1.2 Choice of model for performance testing

The manufacturer shall provide one sample of each model to be tested.

The equipment tested shall be representative in all technical respects of a production model.

5.1.3 Definitions of alignment and switching ranges

The alignment range is defined as the frequency range over which the receiver and the transmitter can be programmed and/or re-aligned to operate with a single oscillator frequency multiplication, without any physical change of components other than:

- programmable read only memories supplied by the manufacturer or the manufacturer's nominee;
- crystals;
- frequency setting elements (for the receiver and transmitter). These elements shall not be accessible to the end user and shall be declared by the manufacturer in the application form.

The switching range is the maximum frequency range over which the receiver or the transmitter can be operated without without hardware or software modifications.