

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
Cordless audio devices in the range 25 MHz to 2 000 MHz;
Part 1: Technical characteristics and
test methods**

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the Vote phase of the ETSI standards Two-step Approval Procedure.

Consumer audio equipment intended for audio and voice operating below 50 MHz and using narrow band modulation are considered and tested according to EN 300 220 [i.3]. Consumer radio microphones and in ear monitoring equipment may be tested to either EN 300 422 [i.4] for equipment with maximum occupied bandwidth < 200 kHz or to the present document for equipment with maximum occupied bandwidth > 200 kHz with due consideration of power and operating frequency.

Electromagnetic Compatibility (EMC) requirements are covered by EN 301 489-9 [i.5].

The present document is part 1 of a multi-part deliverable covering cordless audio devices in the range 25 MHz to 2 000 MHz; as identified below:

- Part 1: "**Technical characteristics and test methods**";
- Part 2: "Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive".

Proposed 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):	6 months after doa

Introduction

In preparing the present document, attention has been given to assure a low interference probability, while at the same time allowing a maximum flexibility and service to the end-user.

The harmonized standard EN 301 357-2 [i.6] provides the necessary parameters for equipment to obtain presumption of conformity with article 3.2 of the R&TTE Directive [i.1]. Common technical specifications and harmonized frequency allocations are expected to reduce the present problems of interference and illegal use.

The present document may be used for conformity testing based on spectrum utilization parameters and does not include performance characteristics that may be required by the user or requirements for interfacing equipment.

If you are planning to use RDS please go to: <http://www.rds.org.uk/rds98/rds98.htm> for further information.

1 Scope

The present document covers the minimum characteristics for cordless audio devices considered necessary in order to make the best use of the available frequencies. It does not necessarily include all the characteristics that may be required by a user, nor does it necessarily represent the optimum performance achievable.

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).

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 e.g. Zenith-GE pilot tone systems or digital modulation may need wider bandwidths as defined in the present document.

The present document is intended to specify the minimum performance and the methods of measurement of cordless audio equipment 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.

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.

Annex A provides normative specifications concerning radiated measurements.

Annex B provides the test configuration for the measurement of necessary bandwidth.

Annex C provides informative parameters on the receiver part, which are intended to give guidance to manufacturers.

Annex D provides information on the derivation of radiated emissions limits for Band II LPD.

Annex E provides a justification for field strength limits for Band II LPD.

Annex F provides details of a typical test layout for Band II LPD.

Annex G contains the Bibliography.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
 - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
 - for informative references.

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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 indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

- [1] ITU-R Recommendation 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] 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".
- [4] ANSI C63.5 (2006): "American National Standard for Calibration of Antennas Used for Radiated Emission Measurements in Electro Magnetic Interference".
- [5] IEC 60489-3 (1988): "Methods of measurement for radio equipment used in the mobile services. Part 3: Receivers for A3E or F3E emissions".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

- [i.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).
- [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): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW".
- [i.4] ETSI EN 300 422: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range".
- [i.5] ETSI EN 301 489-9: "Electromagnetic compatibility and Radio spectrum Matters (ERM); 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".
- [i.6] ETSI EN 301 357-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Cordless audio devices in the range 25 MHz to 2 000 MHz; Part 2: Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive".
- [i.7] Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.
- [i.8] Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC (EMC Directive).
- [i.9] Commission directive 2006/28/EC of 6 March 2006 amending, for the purposes of their adaptation to technical progress, Council Directive 72/245/EEC of 20 June 1972 relating to the radio interference (electromagnetic compatibility) of vehicles and Council Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers.
- [i.10] ETSI EN 301 908-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS), Repeaters and User Equipment (UE) for IMT-2000 Third-Generation cellular networks; Part 1: Harmonized EN for IMT-2000, introduction and common requirements, covering essential requirements of article 3.2 of the R&TTE Directive".
- [i.11] ETSI EN 301 511: "Global System for Mobile communications (GSM); Harmonized EN for mobile stations in the GSM 900 and GSM 1800 bands covering essential requirements under article 3.2 of the R&TTE directive (1999/5/EC)".
- [i.12] ETSI TR 100 028: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [i.13] ETSI TR 100 027: "ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Methods of measurement for private mobile radio equipment".
- [i.14] ETSI EN 301 489-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements".
- [i.15] CEPT/ECC Report 73: "Compatibility of SRD in the FM radio broadcasting band".

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 applicant

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

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

necessary bandwidth: for a given class of emission, the 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 ITU-R Recommendations of SM series.

nominal channel frequency: that 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 $\beta/2$ of the total mean power of a given emission

NOTE: Unless otherwise specified in an ITU-R Recommendation for the appropriate class of emission, the value of $\beta/2$ 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

spurious emission: emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information

NOTE: Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products.

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
f _c	carrier frequency
f _o	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
B	channel Bandwidth
BN	Necessary Bandwidth
CW	Continuous Wave
dc	direct current
e.r.p.	effective radiated power
EUT	Equipment Under Test
FDMA	Frequency Division Multiple Access
FM	Frequency Modulation
HF	High Frequency
LF	Low Frequency
LPD	Low Power Device
MF	Medium Frequency
OATS	Open Area Test Site
RBW	Resolution BandWidth
RF	Radio Frequency
SINAD	(Signal + Noise + Distortion) over (Noise + Distortion)
SRD	Short Range Devices
Tx	Transmitter
VBW	Video BandWidth
VSWR	Voltage Standing Wave Ratio

4 Functional characteristics

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 e.g. Zenith-GE pilot tone systems or digital modulation may need wider bandwidths as defined in the present document.

Other equipment that may be connected to cordless audio equipment shall fulfil the standards applicable to that equipment (if any).

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 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.

Other equipment that may be connected to in-ear monitoring equipment shall fulfil the standards applicable to that equipment (if any).

5 General

5.1 Presentation of equipment for testing purposes

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

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

The applicant 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 applicant 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 5.1.1 to 5.1.9.2.

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.