

**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 Public Enquiry phase of the ETSI standards Two-step Approval Procedure.

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 provides the necessary parameters for equipment to obtain common approval throughout Europe. Common technical specifications and harmonized frequency allocations are expected to reduce the present problems of interference and illegal use.

The present document is 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.

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:

- consumer radio microphones and in ear monitoring equipment in the range 863 MHz to 865 MHz;
- Band II LPD (low power devices) in the 87,5 MHz to 108 MHz range (Broadcasting Band II);
- and other devices and frequency bands defined within CEPT/ERC/REC 70-03 or National regulation.

Consumer radio microphones and in ear monitoring equipment may be tested to either EN 300 422 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.

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1 Scope

The present document covers the minimum characteristics 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, annex 13 (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 applies to cordless audio consumer radio microphones, in ear monitoring equipment using either 300 kHz bandwidth analogue modulation or:

- 300 kHz, 600 kHz, 1 200 kHz digital FDMA modulation; and
- Band II LPD (low power devices) using up to 200 kHz bandwidth and analogue modulation.

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.

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.

Electromagnetic Compatibility (EMC) requirements are covered by EN 301 489-9.

The types of equipment covered by the present document are as follows:

- cordless headphones;
- cordless loudspeakers;
- consumer radio microphones;
- in-ear monitoring;
- in-vehicle cordless;
- personal cordless;
- broadband multi channel audio systems;
- Band II LPD.

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.

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

For online referenced documents, information sufficient to identify and locate the source shall be provided. Preferably, the primary source of the referenced document should be cited, in order to ensure traceability. Furthermore, the reference should, as far as possible, remain valid for the expected life of the document. The reference shall include the method of access to the referenced document and the full network address, with the same punctuation and use of upper case and lower case letters.

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".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

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

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.

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) to (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. The term cordless is also used to describe infra red and other non-RF "wireless" links, but in the context of the present document it is restricted to RF operating systems only. 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 application form or test plan when submitting equipment for testing.

The applicant shall state the channel bandwidth(s) within 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.

5.1.1 Choice of model for performance testing

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

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

5.1.2 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 applicant in the application form.

The switching range is the maximum frequency range over which the receiver or the transmitter can be operated without re-programming or realignment.