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ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Wide band audio links; Part 1: Technical characteristics and test methods

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Electromagnetic compatibility and Radio spectrum Matters (ERM); Wide band audio links; Part 1: Technical characteristics and test methods

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Contents

Intellectual Property Rights	6
Foreword	6
Introduction	6
1 Scope	8
2 References	8
3 Definitions, symbols and abbreviations	9
3.1 Definitions	9
3.2 Symbols	9
3.3 Abbreviations	10
4 Functional characteristics	10
4.1 Wide band audio link descriptions	10
5 General	11
5.1 Presentation of equipment for testing purposes	11
5.1.1 Choice of model for type testing	11
5.1.2 Definitions of alignment and switching ranges	12
5.1.3 Definition of the categories of the alignment range (AR1 and AR2)	12
5.1.4 Choice of frequencies	12
5.1.5 Testing of single channel equipment of category AR1	12
5.1.6 Testing of single channel equipment of category AR2	12
5.1.7 Testing of two channel equipment of category AR1	12
5.1.8 Testing of two channel equipment of category AR2	13
5.1.9 Testing of multichannel equipment (more than two channels) of category AR1	13
5.1.10 Testing of multichannel equipment (more than two channels) of category AR2 where the switching range is less than the alignment range	13
5.1.11 Testing of multichannel equipment (more than two channels) of category AR2 where the switching range is equal to the alignment range	14
5.1.12 Testing of equipment without a permanent external RF port	14
5.1.12.1 Equipment with a permanent internal RF port	14
5.1.12.2 Equipment with a temporary RF port	14
5.2 Mechanical and electrical design	14
5.2.1 General	14
5.2.2 Limiting threshold	14
5.2.3 Controls	15
5.2.4 Integral antenna	15
5.2.5 Marking (equipment identification)	15
5.3 Interpretation of the measurement results	16
6 Test conditions, power sources and ambient conditions	16
6.1 Normal and extreme test conditions	16
6.2 Test power source	16
6.3 Normal test conditions	16
6.3.1 Normal temperature and humidity	16
6.3.2 Normal test power source voltage	17
6.3.2.1 Mains voltage	17
6.3.2.2 Nickel-Cadmium cells	17
6.3.2.3 Other power sources	17
6.4 Extreme Test Conditions	17
6.4.1 Extreme temperatures	17
6.4.1.1 Procedures for tests at extreme temperatures	17
6.4.2 Extreme test power source voltages	17
6.4.2.1 Mains voltage	17
6.4.2.2 Rechargeable battery power sources	18
6.4.2.3 Power sources using other types of batteries	18

6.4.2.4	Other power sources	18
7	General conditions	18
7.1	Normal test modulation	18
7.2	Artificial antenna	19
7.3	Test fixture	20
7.4	Test site and general arrangements for radiated measurements.....	20
7.5	Modes of operation of the transmitter	20
7.6	Arrangement for test signals at the input of the transmitter.....	20
7.7	Arrangements for test signals applied to the receiver via a test fixture or a test antenna	20
8	Methods of measurement and limits for transmitter parameters	21
8.1	Frequency error	21
8.1.1	Definition	21
8.1.2	Method of measurement	21
8.1.3	Limit	21
8.2	Carrier power	21
8.2.1	Definition	21
8.2.2	Method of measurement for equipment without integral antenna.....	22
8.2.3	Method of measurement for equipment with integral antenna.....	22
8.2.3.1	Method of measurement under normal test conditions	22
8.2.3.2	Method of measurement under extreme test conditions.....	22
8.2.4	Limit	23
8.3	Channel bandwidth.....	23
8.3.1	Definition	23
8.3.2	Measurement of Necessary Bandwidth (BN)	23
8.3.3	Limits	24
8.4	Spurious emissions.....	24
8.4.1	Definitions	24
8.4.2	Method of measuring the effective radiated power	24
8.4.3	Limits	25
8.4.4	Measuring receiver	25
8.5	Transient frequency behaviour of the transmitter.....	25
8.5.1	Definitions	25
8.5.2	Method of measurement	26
8.5.3	Method of measurement for frequency changing	27
8.5.4	Limits	27
9	Receiver	28
9.1	Spurious emissions.....	28
9.1.1	Definitions	28
9.1.2	Method of measuring the power level in a specified load	28
9.1.3	Method of measuring the effective radiated power of the enclosure	28
9.1.4	Method of measuring the effective radiated power	29
9.2	Limits	29
10	Measurement uncertainty.....	30
Annex A (normative): Radiated measurement		31
A.1	Test sites and general arrangements for measurements involving the use of radiated fields.....	31
A.1.1	Outdoor test site	31
A.1.1.1	Test support for body worn equipment.....	31
A.1.1.2	Standard position.....	32
A.1.2	Test antenna	32
A.1.3	Substitution antenna	32
A.1.4	Optional additional indoor site.....	33
A.2	Guidance on the use of radiation test sites	34
A.2.1	Measuring distance	34
A.2.2	Test antenna	34
A.2.3	Substitution antenna	34
A.2.4	Artificial antenna.....	34

A.2.5	Auxiliary cables	34
A.3	Further optional alternative indoor test site using an anechoic chamber	35
A.3.1	Example of the construction of a shielded anechoic chamber.....	35
A.3.2	Influence of parasitic reflections in anechoic chambers.....	35
A.3.3	Calibration of the shielded anechoic chamber.....	36
Annex B (normative):	Measurement of Necessary Bandwidth (BN)	38
Annex C (informative):	Graphic representation of the selection of equipment and frequencies for testing of single and multi-frequency equipment	39
History.....		41

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document is part 1 of a multi-part EN covering the Electromagnetic compatibility and Radio spectrum Matters (ERM); Wide band audio links, as identified below:

Part 1: "Technical characteristics and test methods";

Part 2: "Harmonised EN under article 3.2 of the R&TTE Directive".

Every EN prepared by ETSI is a voluntary standard. The present document contains text concerning conformance testing of the equipment to which it relates. This text should be considered only as guidance and does not make the present document mandatory.

Annex A provides normative specifications concerning radiated measurements.

Annex B provides the test method for measurement of Necessary Bandwidth (BN).

Annex C presents a graphical representation of the equipment and frequencies for the testing of single and multi-frequency equipment.

National transposition dates

Date of latest announcement of this EN (doa):	31 October 2000
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 April 2001
Date of withdrawal of any conflicting National Standard (dow):	30 April 2001

Introduction

I-ETS 300 422 [1] has been a frame which led to many national prescriptions which differed, sometimes substantially, between European countries and did not directly refer to wide band audio links. The rapidly increasing use of wireless microphones with increased power for bridging longer distances (hereafter referred to as wide band audio links) in several European countries with different specifications, and the way forward to a Europe without borders, makes it necessary to set up common specifications.

The present document provides the necessary parameters for equipment to obtain common approval throughout Europe. It should also make it easier for the frequency management authorities to find harmonized frequency allocations which, together with common technical specifications, will greatly reduce the present problems of multi-national use.

In preparing the present document, much 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 close relationship between radio microphones and wide band audio links has led to many identical characteristics. Nevertheless it was found to be better to create a separate EN due to the higher power and the many extra facilities which were developed during recent years for this special use. The present document does not include performance characteristics that may be required by the user or requirements for interfacing equipment.

Type test measurements should be performed in one of the accredited test laboratories, accepted by the various National regulatory authorities in order to grant type approval, provided the National regulatory requirements are met. This is in compliance with CEPT Recommendation T/R 71-03 [2].

In addition, national administrations may accept a "certificate of conformity" based on a type test report. If equipment available on the market is required to be checked it should be tested in accordance with the methods of measurement specified in the present document.

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1 Scope

The present document specifies the minimum performance and the methods of measurement of wide band audio links.

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 which may be required by a user, nor does it necessarily represent the optimum performance achievable.

The present document applies to modulation systems operating on radio frequencies between 25 MHz and 3 GHz. Although analogue FM is at present used for the majority of wide band audio links, the present document does not preclude any other constant carrier modulation technique, e.g. Gaussian Filtered Minimum Shift Keying (GMSK) or Generalized Tamed Frequency Modulation (GTFM), provided that the modulation spectrum lies within the specified spectral mask.

The present document does not cover wide band audio links employing Time Division Multiple Access (TDMA), frequency hopping and spread spectrum or similar forms of modulation.

The present document does not cover radiated emissions below 25 MHz. Specifications related to Electro-Magnetic Compatibility (EMC) are contained within ETS 300 445 [3].

The present document has been developed from CEPT Recommendation T/R 20-06 [4].

Additional standards or specifications may be required for equipment intended to interface with the Public Switched Telephone Network (PSTN). This facility may be submitted to regulatory conditions.

The present document may be used by accredited test laboratories for type testing of the equipment. The performance of the equipment submitted for type testing should be representative for the performance of the corresponding production models.

The present document also contains instructions for the presentation of equipment for type testing purposes.

The types of equipment covered by the present document are as follows (see clause 4):

- professional wide band audio links for one-way transmission;
- professional wide band audio links for two-way transmission;
- professional wide band audio links with extra facilities.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- [1] ETSI I-ETS 300 422: "Radio Equipment and Systems (RES); Technical characteristics and test methods for wireless microphones in the 25 MHz to 3 GHz frequency range".
- [2] CEPT Recommendation T/R 71-03: "Procedures for Type Testing and Approval for Radio Equipment Intended for Non-Public Systems".
- [3] ETSI ETS 300 445: "Radio Equipment and Systems (RES); ElectroMagnetic Compatibility (EMC) standard for wireless microphones and similar Radio Frequency (RF) audio link equipment".

- [4] CEPT Recommendation T/R 20-06: "Transmitters and Receivers for Low Power Cordless Microphone Systems".
- [5] ITU-R Recommendation BS.559-2: "Objective measurement of radio-frequency protection ratios in LF, MF and HF broadcasting".
- [6] IEC 60244: "Methods of measurement for radio transmitters".
- [7] ETSI ETR 028: "Radio Equipment and Systems (RES); 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:

carrier grid: evenly spaced raster in a given frequency band for the allocation of carrier frequencies. The minimum distance of two carriers in use is a multiple of the raster dependent on type and usage of the equipment.

channel bandwidth: frequency band of defined width (as a multiple of the carrier grid) including safety margin for operation on adjacent channels, located symmetrically around a carrier frequency in the carrier grid.

conducted measurements: those measurements which are made using a direct 50 Ω connection to the equipment under test.

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

integral microphone: microphone, designed as, and declared as by the manufacturer, an indispensable fixed part of the equipment.

limiter threshold: The audio input (output) level at which the transmitter audio limiter action may be said to commence. It is specified with any accessible variable gain controls set according to the manufacturer's instructions, with a sinusoidal input signal of 500 Hz.

occupied bandwidth: that part of the channel bandwidth which is required for the modulated signal. The occupied bandwidth has to be smaller than the channel bandwidth following standardized limits.

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

radiated measurements: those measurements which involve measurement of a radiated field.

Radio Frequency (RF) port: RF port is any connection point on or within EUT intended for the connection of RF cable. The RF port will be treated as a 50 Ω connection point unless otherwise specified by the manufacturer.

wide band audio link: radio microphone of sufficient power to allow wireless (sometimes referred to as link radio microphone) connection over greater distances mainly for portable use. It may include in one mechanical unit more transmitting and receiving facilities than only for high quality audio application.

3.2 Symbols

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

E	Field strength
E _o	Reference field strength, annex A
R	Distance, annex A
R _o	Reference distance, annex A

3.3 Abbreviations

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

AR1	Alignment Range category 1 (subclause 5.1.3)
AR2	Alignment Range category 2 (subclause 5.1.3)
B	declared channel Bandwidth (see table 1)
EMC	Electro-Magnetic Compatibility
erp	effective radiated power
EUT	Equipment Under Test
GMSK	Gaussian Filtered Minimum Shift Keying
GTFM	Generalized Tamed Frequency Modulation
μ Pa	micro Pascal
PSTN	Public Switched Telephone Network
RBW	Resolution BandWidth
RF	Radio Frequency
TDMA	Time Division Multiple Access
Tx	Transmitter
VBW	Video BandWidth

4 Functional characteristics

4.1 Wide band audio link descriptions

Wide band audio links covered by the present document are privately owned, and operated, communications systems for high quality reproduction of the audio input and/or related data or control signals. The equipment operates on a continuous carrier basis and will often be in operation for many hours. A wide band audio link system will at least consist of one transmitter and the corresponding receiver. The number depends on the application, e.g. live news contributions from a widespread area of an actual event may make it necessary to use several systems on separate simultaneous frequencies.

The radio part of the transmitter and receiver are made up exclusively from equipment that has been approved according to the present document. When radio equipment or parts covered by other standards are included in the wide band audio link these shall fulfil the specifications of the applicable standards. As an example modular solutions may include, beside the main wide band transmitter, an additional receiver for narrow band communication and/or a monitor receiver for foldback signals. At the receiver end of this link, a wide band receiver, coupled with a narrow band transmitter, would be required.

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

Wide band audio links normally use wide band frequency modulation to achieve the necessary audio performance. For the majority of applications the modulated transmitter signal covers a bandwidth allowing channel spacing of 200 kHz. This allows for the use of stereo multiplex encoded signals to transmit without the need for two separate wide band channels.

5 General

5.1 Presentation of equipment for testing purposes

Each equipment submitted for type 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 when submitting equipment for type testing.

Table 1: Channel bandwidth designation (channel allocation within 25 kHz carrier grid)

Declared channel bandwidth	Designation
50 kHz	L
75 kHz	M
100 kHz	P
150 kHz	Q
200 kHz	R

The applicant shall state:

- the channel bandwidth(s) within which the equipment is designed to operate chosen from table 1; and
- the audio input limiting threshold (see subclause 5.2.2).

The applicant shall also supply all relevant interface information to allow:

- dc connection;
- RF connection;
- audio connection;
- the limiting threshold for the transmitter, and
- the setting of any input audio - level controls for normal operation, for a sinusoidal input signal of 500 Hz. The manufacturer shall specify the settings of any other controls necessary to avoid invalidating the measurement.

The applicant should also supply an operating manual for the device(s).

To simplify and harmonize the type testing procedures between the different test laboratories, measurement shall be performed, according to the present document, on samples of equipment defined in subclauses 5.1.1 to 5.1.12.2.

For audio links which are intended to use a variety of audio capsules the manufacturer shall supply the test sample with an audio test fixture to substitute the audio capsule with suitable input and output impedances.

These subclauses 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 type testing

The applicant shall provide one or more production model(s) of the equipment, including all antennae which are required to be covered by the type testing.

If type approval is given on the basis of tests on a preliminary model, the corresponding production models shall be identical in all respects with the preliminary model tested.

In the case of wide band audio link equipment without a permanent external RF port, (see subclause 5.1.12).