



SLOVENSKI STANDARD

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ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Technical characteristics and test methods for wireless microphones in the 25 MHz to 3 GHz frequency range

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European Standard (Telecommunications series)

Electromagnetic compatibility and Radio spectrum Matters (ERM); Technical characteristics and test methods for wireless microphones in the 25 MHz to 3 GHz frequency range

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Contents

Intellectual Property Rights	6
Foreword	6
Introduction	6
1 Scope	8
2 References	9
3 Definitions, symbols and abbreviations	9
3.1 Definitions	9
3.2 Symbols	10
3.3 Abbreviations	10
4 Functional characteristics	11
4.1 Radio microphone descriptions	11
4.2 In ear monitoring	11
5 General	11
5.1 Presentation of equipment for testing purposes	11
5.1.1 Choice of model for type testing	12
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	13
5.1.5 Testing of single channel equipment of category AR1	13
5.1.6 Testing of single channel equipment of category AR2	13
5.1.7 Testing of two channel equipment of category AR1	13
5.1.8 Testing of two channel equipment of category AR2	13
5.1.9 Testing of multi-channel equipment (more than two channels) of category AR1	13
5.1.10 Testing of multi-channel equipment (more than two channels) of category AR2 (switching range less than alignment range)	14
5.1.11 Testing of multi-channel equipment (more than two channels) of category AR2 (switching range equals 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	15
5.2.3 Controls	15
5.2.4 Type approval with Integral antenna	15
5.2.5 Marking (equipment identification)	15
5.2.5.1 Regulatory marking	16
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	17
6.3.1 Normal temperature and humidity	17
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	18

6.4.2.1	Mains voltage	18
6.4.2.2	Re-chargeable 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.....	19
7.1	Normal test modulation.....	19
7.2	Artificial antenna	20
7.3	Test fixture.....	20
7.4	Test site and general arrangements for radiated measurements	20
7.5	Modes of operation of the transmitter.....	21
7.6	Arrangement for test signals at the input of the transmitter	21
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	22
8.2.1	Definition	22
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.....	25
8.4.1	Definitions.....	25
8.4.2	Method of measuring the effective radiated power.....	25
8.4.3	Limits	25
8.4.4	Measuring receiver.....	25
9	Receiver	26
9.1	Spurious emissions.....	26
9.1.1	Definitions.....	26
9.1.2	Method of measuring the power level in a specified load	26
9.1.3	Method of measuring the effective radiated power of the enclosure.....	26
9.1.4	Method of measuring the effective radiated power	27
9.1.5	Limits	27
10	Measurement uncertainty	27
Annex A (normative):	Radiated measurement	28
A.1	Test sites and general arrangements for measurements involving the use of radiated fields.....	28
A.1.1	Outdoor test site.....	28
A.1.1.1	Test support for body worn equipment	28
A.1.1.2	Standard position.....	29
A.1.2	Test antenna.....	29
A.1.3	Substitution antenna.....	29
A.1.4	Optional additional indoor site	30
A.2	Guidance on the use of radiation test sites	31
A.2.1	Measuring distance	31
A.2.2	Test antenna.....	31
A.2.3	Substitution antenna.....	31
A.2.4	Artificial antenna	31
A.2.5	Auxiliary cables	31

A.3	Further optional alternative indoor test site using an anechoic chamber	32
A.3.1	Example of the construction of a shielded anechoic chamber.....	32
A.3.2	Influence of parasitic reflections in anechoic chambers.....	32
A.3.3	Calibration of the shielded anechoic chamber	33
Annex B (normative):	Measurement of Necessary Bandwidth (BN)	35
Annex C (informative):	Graphic representation of the selection of equipment and frequencies for testing of single and multi-frequency equipment	36
History.....		38

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Foreword

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

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

Annex A provides normative specifications concerning radiated measurements.

Annex B describes the test set-up for the measurement of Necessary Bandwidth (BN).

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

SIST EN 300 422 V1.2.1:2003

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Introduction

The present document is based on the CEPT Recommendation T/R 20-06 [1].

This CEPT Recommendation has been a frame that led to many national prescriptions that differed, sometimes substantially, between European countries. The rapidly increasing quantities of wireless microphones (hereafter referred to as radio microphones) in operation, both legal and illegal, together with the greater mobility of the users, either professional or private, has led to a serious situation with many occurrences of interference and irregular operation. Legal radio microphones, being fundamentally low power devices, are interfered with more than the generators of the interference, and suffer primarily from this situation.

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 present document provides the necessary parameters for equipment to obtain common approval throughout Europe. It also is intended to make it easier for the frequency management authorities to find harmonized frequency allocations. Common technical specifications and harmonized frequency allocations are expected to reduce greatly the present problems of interference and illegal use.

The present document is a type testing standard 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 Radio Microphones and In-ear monitoring systems as specified in the scope. In-ear monitoring systems may be tested to either the present document (< 200 kHz max. occupied bandwidth) or to EN 301 357 [9] (< 300 kHz max. occupied bandwidth) with due consideration of power and operating frequency.

Since the initial adoption of I-ETS 300 422 there has been the introduction of further types of equipment - Cordless headphones/loudspeakers and consumer In-ear monitoring. These are low power wideband systems that have some characteristics in common with radio microphones but are not compatible with multichannel radio microphones. This equipment is covered by EN 301 357 [9].

The present document also covers radio microphones used in the 863 MHz to 865MHz band, with a maximum power of 10 mW.

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/ERC Recommendation 01-06 [2] and ERC Decision ERC/DEC(97) 10 [3].

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 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.

The present document applies to equipment with modulation systems operating on radio frequencies between 25 MHz and 3 GHz. Although analogue Frequency Modulation (FM) is at present used for the majority of radio microphones and other equipment covered by the present document, this specification 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 a standardized spectral mask.

The present document does not apply to radio microphones or in ear monitoring equipment employing Time Division Multiple Access (TDMA), frequency hopping and spread spectrum or similar forms of modulation.

Electromagnetic compatibility (EMC) requirements are covered by ETS 300 445 [8].

Additional standards or specifications may be required for equipment intended to interface to 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 of the performance of the corresponding production models.

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

Power limits recommended in the present document have been chosen to allow maximum simultaneous reuse of frequency allocations. National regulations on power output may apply up to the limits quoted below.

NOTE: For higher power equipment reference should be made to ETS 300 454 [7] Wide band audio links.

Equipment	effective radiated power (erp) or conducted	
	Class 1	Class 2
Radio Microphones	50 mW	2 mW
In ear monitoring	10 mW	2 mW
Tour guide systems	10 mW	2 mW
Aids for the handicapped	10 mW	2 mW

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

- professional hand held radio microphones;
- professional body worn radio microphones;
- in ear monitoring systems;
- consumer radio microphones;
- tour guide systems;
- aids for the handicapped.

The classes of equipment given in the present document are as follows:

- class 1 equipment would normally be considered as a category requiring an operator licence;
- class 2 equipment would be considered in some countries as not requiring an operator licence.

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] CEPT Recommendation T/R 20-06 (1977): "Transmitters and receivers for low-power Cordless Microphone systems".
- [2] CEPT/ERC Recommendation 01-06: "Procedure for mutual recognition of type testing and type approval for radio equipment".
- [3] CEPT/ERC/DEC(97) 10: "The mutual recognition of conformity assessment procedures including marking of radio equipment and radio terminal equipment".
- [4] ITU-R Recommendation BS.559-2: "Objective measurement of radio-frequency protection ratios in LF, MF and HF broadcasting".
- [5] IEC 60244: "Methods of measurement for radio transmitters".
- [6] ETR 028: "Radio Equipment and Systems (RES); Uncertainties in the measurement of mobile radio equipment characteristics".
- [7] ETS 300 454 including A1: "Radio Equipment and Systems (RES); Wide band audio links; Technical characteristics and test methods".
- [8] ETS 300 445 including A1: "Radio Equipment and Systems (RES); ElectroMagnetic Compatibility (EMC) standard for wireless microphones and similar Radio Frequency (RF) audio link equipment".
- [9] EN 301 357: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Technical characteristics and test methods for analogue cordless wideband audio devices using integral antennas operating in the CEPT recommended 863 MHz to 865 MHz frequency range".
- [10] ITU-R Recommendation BS.468-4: "Measurement of audio-frequency noise voltage level in sound broadcasting".
- [11] CEPT/ERC Recommendation 70-03 relating to the use of short range devices (SRD).

3 Definitions, symbols and abbreviations

3.1 Definitions

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

conducted measurements: measurements that are made using a direct 50 Ω connection to the EUT

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: audio input or 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

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

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 carrier frequency in the carrier grid

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

Radio Frequency (RF) port: any connection point on or within the EUT intended for the connection of RF cables. RF ports are treated as 50 Ω connection points unless otherwise specified by the manufacturer

3.2 Symbols

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

λ	wavelength in metres
μF	microFarad
μW	microWatt
dBc	dB relative to the carrier level
E	field strength
E _o	reference field strength, (see annex A)
f _c	carrier frequency
f _o	operating frequency
GHz	gigaHertz
H	Henry
kHz	kiloHertz
lim	limiting
MHz	megaHertz
mW	milliWatt
nW	nanoWatt
R	distance, (see annex A)
R _o	reference distance, (see annex A)

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3.3 Abbreviations

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

ac	alternating current
AR1	Alignment Range 1
AR2	Alignment Range 2
B	declared channel Bandwidth (see table 1)
BN	Necessary Bandwidth
dc	direct current
erp	effective radiated power
EUT	Equipment Under Test
GMSK	Gaussian Filtered Minimum Shift Keying
GTFM	Generalized Tamed Frequency Modulation
LF	Low Frequency
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 Radio microphone descriptions

Radio microphones normally use wide band frequency modulation to achieve the necessary audio performance for professional use. For the majority of applications the modulated transmitter signal requires a channel bandwidth of 200 kHz.

The radio part of the transmitter and receiver shall be made up exclusively from equipment that has been approved according to the present document.

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

4.2 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. The bandwidth requirement of professional in ear monitoring equipment is similar to those of radio microphones.

The radio part of the transmitter and receiver shall be made up exclusively from equipment that has been approved according to the present document.

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

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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.

For radio microphones that may 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 impedance.

The applicant shall state the channel bandwidth(s) within which the equipment is designed to operate chosen from table 1.

Table 1: Channel bandwidth

Declared channel Bandwidth (B)	Designation
50 kHz	L
75 kHz	M
100 kHz	P
150 kHz	Q
200 kHz	R

The applicant shall state the audio input limiting threshold, (see subclause 5.2.2).