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Radio Equipment and Systems (RES); Technical characteristics and test methods for wireless microphones in the 25 MHz to 3 GHz frequency range

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**Technical characteristics and test methods for wireless
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Contents

Foreword	7
Introduction	7
1 Scope	9
2 Normative references	10
3 Definitions, abbreviations and symbols	10
3.1 Definitions	10
3.2 Abbreviations	10
3.3 Symbols	11
4 Functional characteristics	11
4.1 Radio microphone descriptions	11
5 General	12
5.1 Presentation of equipment for testing purposes	12
5.1.1 Choice of model for type testing	12
5.1.2 Definitions of alignment and switching ranges	13
5.1.3 Definition of the categories of the Alignment Range (AR1 and AR2)	13
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	14
5.1.8 Testing of two channel equipment of category AR2	14
5.1.9 Testing of multi-channel equipment (more than two channels) of category AR1	14
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)	15
5.1.12 Testing of equipment without a permanent external RF port	15
5.1.12.1 Equipment with a permanent internal RF port	15
5.1.12.2 Equipment with a temporary RF port	15
5.2 Mechanical and electrical design	15
5.2.1 General	15
5.2.2 Limiting threshold	15
5.2.3 Controls	16
5.2.4 Integral antenna	16
5.2.5 Marking (equipment identification)	16
5.3 Interpretation of the measurement results	17
6 Test conditions, power sources and ambient conditions	17
6.1 Normal and extreme test-conditions	17
6.2 Test power source	17
6.3 Normal test conditions	17
6.3.1 Normal temperature and humidity	17
6.3.2 Normal test power source voltage	18
6.3.2.1 Mains voltage	18
6.3.2.2 Nickel-cadmium cells	18
6.3.2.3 Other power sources	18
6.4 Extreme test conditions	18
6.4.1 Extreme temperatures	18
6.4.1.1 Procedures for tests at extreme temperatures	18
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	19
	6.4.2.4	Other power sources.....	19
7	General conditions.....		19
	7.1	Normal test modulation	19
	7.2	Artificial antenna.....	20
	7.3	Test fixture	21
	7.4	Test site and general arrangements for radiated measurements	21
	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.....	22
		8.1.1 Definition.....	22
		8.1.2 Method of measurement.....	22
		8.1.3 Limit	22
	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	23
		8.2.3.1 Method of measurement under normal test conditions.....	23
		8.2.3.2 Method of measurement under extreme test conditions.....	23
		8.2.4 Limit	23
	8.3	Channel bandwidth.....	24
		8.3.1 Definition.....	24
		8.3.2 Measurement of Necessary Bandwidth (BN).....	24
		8.3.3 Limits	25
	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	26
		8.4.4 Measuring receiver.....	26
	8.5	Transient frequency behaviour of the transmitter.....	26
		8.5.1 Definitions.....	26
		8.5.2 Method of measurement.....	27
		8.5.3 Method of measurement (frequency changing).....	28
		8.5.4 Limits	28
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.....	29
		9.1.3 Method of measuring the effective radiated power of the enclosure.....	29
		9.1.4 Method of measuring the effective radiated power.....	30
		9.1.5 Limits	30
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
Annex D (informative):	Bibliography	41
History.....		42

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Foreword

This Interim European Telecommunication Standard (I-ETS) has been produced by the Radio Equipment and Systems (RES) Technical Committee of the European Telecommunications Standards Institute (ETSI).

Every I-ETS prepared by ETSI is a voluntary standard. This I-ETS 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 this I-ETS 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.

Annex D provides a Bibliography.

Proposed announcement date	
Date of adoption of this I-ETS:	27 October 1995
Date of latest announcement of this I-ETS (doa):	31 March 1996

Introduction

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This I-ETS 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 this I-ETS, 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.

This I-ETS 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.

This I-ETS is a type testing standard based on spectrum utilisation parameters and does not include performance characteristics that may be required by the user or requirements for interfacing equipment.

This I-ETS is intended to specify the minimum performance and the methods of measurement of Wireless Microphones as specified in the scope.

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 this I-ETS.

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1 Scope

This I-ETS 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.

This I-ETS 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 wireless microphones, 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.

This I-ETS does not apply to wireless microphones employing Time Division Multiple Access (TDMA), frequency hopping and spread spectrum or similar forms of modulation.

EMC requirements are covered by draft prETS 300 445.

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.

This I-ETS 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.

This I-ETS contains instructions for the presentation of equipment for type testing purposes.

Power limits recommended in this I-ETS 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: If higher power limits are required reference should be made to I-ETS 300 454 Wide band audio links, which is currently under preparation.

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

The types of equipment covered by this I-ETS are as follows:

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

The classes of equipment given in this I-ETS 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 Normative references

This I-ETS incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this I-ETS only when incorporated in it by amendment or revision. For undated references the latest edition or the publication referred to applies.

- [1] CEPT Recommendation T/R 20-06 (1977): "Transmitters and receivers for low power cordless microphone systems".
- [2] CEPT Recommendation T/R 71-03: "Procedures for type testing and approval for radio equipment intended for non-public systems".
- [3] ITU-R Recommendation 559-2: "Objective measurement of radio-frequency protection ratios in LF, MF and HF broadcasting".
- [4] IEC 244: "Methods of measurement for radio transmitters".
- [5] ETR 028: "Radio Equipment and Systems (RES); Uncertainties in the measurement of mobile radio equipment characteristics".

3 Definitions, abbreviations and symbols

3.1 Definitions

For the purposes of this I-ETS, the following definitions apply:

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

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

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

limiter threshold: The 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 electro-magnetic 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: A 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 Abbreviations

For the purposes of this I-ETS, 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
Rx	Receiver
SINAD	Signal to Noise and Distortion ratio
TDMA	Time Division Multiple Access
Tx	Transmitter
VBW	Video BandWidth

3.3 Symbols

For the purposes of this I-ETS, the following symbols apply:

λ	wavelength in metres
μF	microFarad
μW	microWatt
dBc	dB relative to the carrier level
dBm	dB relative to 1 mW
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)

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 this I-ETS.

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