

**Recommendation T/R 20-06 (Puerto de la Cruz 1974,
revised at Malaga-Torremolinos 1975, Stockholm 1976 and 1977)**

TRANSMITTERS AND RECEIVERS FOR LOW POWER CORDLESS MICROPHONE SYSTEMS

Recommendation proposed by the "Radiocommunications" Working Group T/WG 3 (R)

Text of the Recommendation adopted by the "Telecommunications" Commission:

"The European Conference of Postal and Telecommunications Administrations,

considering

- (a) that as a result of technical progress, low power radio transmitter-receivers for cordless microphone systems are available to the public which enable sound to be transmitted and received without the restrictions which arise from the use of a microphone cable,
- (b) that the use of such equipment can cause technical, regulatory and legal problems for the Administrations,
- (c) that it is desirable that the Administrations should establish common technical specifications in order to simplify such problems,
- (d) that it would be advantageous both for the Administrations and for the users and manufacturers of cordless microphone systems for those Administrations who so desired to exchange type approval test reports,
- (e) that the aim should be the mutual recognition by the member Administrations of the CEPT of test reports and type approval certificates,

recommends

1. that, to the extent that their national regulations permit, the member Administrations of the CEPT should plan to adopt rules for the authorisation of low power cordless microphone systems, in accordance with the conditions contained in Annex I to the present Recommendation,
2. that the technical characteristics of low power cordless microphone systems should be those set out in Annex II of the present Recommendation,
3. that the use of "ISM" bands and frequency bands used for radio broadcasting should be excluded,
4. that, for type approval tests, the methods of measurement described in Annex III to the present Recommendation should be used,
5. that the test report should contain what is needed for the precise identification of the equipment and for the performance of the tests; to this end the applicant should supply at least the information described in Annex IV to the present Recommendation, which must be communicated at the same time as the test reports are exchanged,
6. that, in preparing test reports, the Administrations should, as far as possible, follow the order of the tests and numbering of the paragraphs used in Annex II, and adopt the nomenclatures of Annexes II and III of the present Recommendation."

Left blank

Annex I

CONDITIONS FOR THE USE OF LOW POWER CORDLESS MICROPHONE SYSTEMS

1. The use of low power cordless microphone systems should be authorised as of right (general authorisation); if national legislation or regulations do not so permit, individual licences should be granted subject to the least possible restriction.
2. If an individual licence is required, it should be granted without regard to the applicant's nationality.
3. A person of a minimum age, determined by the Administrations in accordance with their national regulations must be responsible for the operation of low power cordless microphone systems.
4. The equipment used in such cordless microphone systems must be type-approved.
5. The equipment must bear the type-approval number and, where physically possible, the following information:
 - (a) the manufacturer;
 - (b) the type;
 - (c) the serial number;
 - (d) the frequency(cies).
6. All items of equipment supplied in parts and assembled by the purchaser must be type-approved and approved individually.
7. The above-mentioned conditions shall not affect in any manner such national legal provisions as apply to the use of this kind of equipment.

Annex II

TECHNICAL SPECIFICATIONS FOR LOW POWER CORDLESS MICROPHONE SYSTEMS

1. *Frequency bands*

The appropriate frequency bands shall be situated between 26.1 and 47 MHz.

2. *Multi-channel equipment*

Multi-channel equipment may be used in accordance with the conditions indicated in the licence.

3. *Class of emission*

A3E, F3E or G3E

4. *Maximum authorised power*

1 mW effective radiated power, or
10 mW output power, without modulation.

5. *Maximum necessary bandwidth*

180 kHz

6. *Transmitter frequency error*

± 10 kHz

7. *Transmitter spurious emissions*

The power of spurious emissions from the transmitter shall not exceed 4 nW at any frequency.

8. *Receiver spurious emissions*

The power of spurious emissions from the receiver shall not exceed 2 nW at any frequency.

Annex III

METHODS OF MEASUREMENT FOR LOW POWER CORDLESS MICROPHONE SYSTEMS

1. EFFECTIVE RADIATED POWER

1.1. Definition

For the purpose of this specification, and for equipment with an integral antenna, the effective radiated power is the power radiated in the direction of maximum field intensity under the specified environmental conditions.

1.2. Test site and general arrangements

1.2.1. Test site

The test site shall be located on a surface or ground which is reasonably level.

At one point on the site, a ground plane of at least 5 metres diameter shall be provided. In the middle of this ground plane, a support, capable of rotation through 360° in the horizontal plane, shall be used to support the test sample at a height of 1.5 metres above the ground. This support shall consist of a plastic tube, filled with salt water (9 grammes NaCl per litre), which shall have a length of 1.5 metres and an internal diameter of 10 ± 0.5 centimetres. The upper end of the tube shall be closed by a metal plate with a diameter of 15 centimetres, which is in contact with the water.

The test site shall be large enough to allow the erection of a measuring or transmitting antenna at a distance from the test sample of $\lambda/2$ or 3 metres, whichever is the greater. The distance actually used shall be recorded with the results of the test carried out on the site.

Sufficient precautions shall be taken to ensure that reflections from extraneous objects adjacent to the site and ground reflections do not degrade the measurements.

1.2.2. Test antenna and receiver

The test antenna is used to detect radiation from both the test sample and the substitution antenna. It shall be mounted on a support capable of allowing the antenna to be used either horizontally or vertically polarised and the height of its centre above ground to be varied over the range 1-5 metres.

The receiver shall be capable of being tuned to any frequency under investigation and able to measure the relative levels of signals at its input.

1.2.3. Substitution antenna

The substitution antenna shall be a $\lambda/2$ dipole, resonant at the frequency under consideration, or an antenna calibrated against the $\lambda/2$ dipole. The centre of this antenna shall coincide with a reference point which shall be the volume centre of the sample when its antenna is mounted inside the cabinet or the point at which an external antenna is connected to the cabinet.

The distance between the lower extremity of the antenna and the ground shall in any case be at least 30 cm.

This antenna shall be connected to a calibrated signal generator, operating at the frequencies under investigation, through matching and balancing networks.

1.3. **Method of measurement**

The transmitter being measured shall be placed on a non-conducting support at a height of 1.5 metres above the ground on the measurement site, which fulfils the requirements of Clause 1.2.1., and positioned as follows:

- (a) equipment with internal antennae, standing vertically with the axis which is closest to the vertical in normal use perpendicular to the ground;
- (b) equipment with rigid external antennae, standing with the antenna vertical;
- (c) equipment with non-rigid external antennae, standing with the antenna extended vertically upwards by a non-conducting support.

The transmitter shall be switched on, without modulation, and the test receiver tuned to the operating frequency of the transmitter.

The test antenna shall be orientated for vertical polarisation and shall be raised or lowered through the specified height range and the combination of "transmitter/transmitting antenna" rotated through 360° until the maximum signal is received⁽¹⁾.

The combination of "transmitter/transmitting antenna" is replaced by the substitution antenna, as defined in Clause 1.2.3., and the input signal of this antenna is adjusted in level until a preceding or known related level to that detected from the transmitter is obtained in the test receiver.

The effective radiated power shall be equal to the power supplied to the antenna, increased to take account of the substitution antenna gain with respect to the dipole.

2. **TRANSMITTER CARRIER POWER**

2.1. **Definition**

For the purpose of this specification, and for equipment provided with output terminals, the carrier output power of the transmitter shall be the maximum output power, without modulation, which fulfils the conditions of these specifications.

2.2. **Method of measurement**

The transmitter shall be connected to a non-reactive, non-radiating load with an impedance equal to that for which the transmitter has been specified and which has been indicated by the manufacturer. If necessary, an impedance-matching device may be used for testing. The transmitter shall be switched on, without modulation, and the power delivered to the load measured.

3. **FREQUENCY ERROR**

3.1. **Definition**

The frequency error is the maximum permissible difference between the central frequency of the frequency band occupied and the assigned frequency. For testing, the assigned frequency shall be the transmitter's nominal carrier frequency.

3.2. **Method of measurement**

The carrier frequency shall be measured without modulation, with the transmitter connected to a non-reactive, non-radiating load. A part of the output power shall be coupled to the frequency counter. In the case of equipment with integral antennae, a device for coupling the transmitter output to the frequency counter shall be used.

⁽¹⁾ This maximum may be a lower value than the signal value obtainable at heights outside the specified range.

The measurements shall be made taking account of simultaneous variation in the ambient temperature over one of the following ranges (free choice):

- 25° C to +55° C;
- 20° C to +55° C;
- 10° C to +55° C;
- + 5° C to +40° C;

and of variation in the supply voltage of $\pm 10\%$ with respect to the nominal value indicated by the manufacturer.

The test reports shall specify the range of temperatures chosen.

4. **NECESSARY BANDWIDTH**

The most favoured frequency, that is, the frequency of the signal which at a given level gives the greatest frequency deviation, shall be declared by the manufacturer, together with the value of the highest audio frequency transmitted.

Two audio signals at the above frequencies shall be applied successively to the microphone, with a sound level of $104 \text{ dB}/2 \cdot 10^{-5}$ Pascal at the microphone diaphragm.

The frequency deviation shall be measured for the two cases and the bandwidth (equal to twice the value of the sum of the transmitted audio frequency and the measured frequency deviation) shall not exceed the necessary bandwidth of 180 kHz.

5. **TRANSMITTER SPURIOUS EMISSIONS**

5.1. **Definition**

Spurious emissions are emissions at frequencies other than those of the carrier and side bands associated with normal modulation, radiated by the cabinet and chassis of the equipment. For equipment with integral antennae, such emissions include emissions from the antenna.

5.2. **Method of measurement**

On a test site fulfilling the requirements of Clause 1.2.1. the test sample shall be placed on a non-conducting support at a height of 1.5 metres above the ground. The high frequency power output of the transmitter, where the equipment is fitted with terminals, shall be applied to an appropriately adjusted non-reactive load.

Using a wide-band test antenna and a method similar to that of Clause 1.3., the frequencies up to 2,000 MHz at which the responses to be considered are detected by the measuring receiver shall be recorded.

The maximum effective radiated power at each of these frequencies shall be measured using the substitution antenna.

The test antenna shall be rotated through 90° to receive signals with horizontal polarisation and the measurement repeated. The higher of the two values shall be the cabinet radiation value for the frequency in question.

6. CONDUCTED SPURIOUS EMISSIONS

6.1. Definition

Conducted spurious emissions are emissions whose power is provided by conduction to the antenna, or to the artificial antenna, at frequencies other than those of the carrier and side bands associated with normal modulation.

6.2. Method of measurement

Conducted spurious emissions shall be measured by connecting the output of the transmitter, working with an unmodulated carrier, to an appropriately adjusted non-reactive, non-radiating load.

The measurements shall be made over the range 100 kHz to 2,000 MHz excluding the channel in which the transmitter is intended to operate and the adjacent channels.

Measurements of each spurious emission shall be made using a tuned radiation measuring device or a spectrum analyser. The measurements shall be repeated for successive modulation of the transmitter with the audio signals specified in paragraph 4.

7. RECEIVER SPURIOUS EMISSIONS INCLUDING CONDUCTED SPURIOUS EMISSIONS

7.1. Definition

Spurious emissions from the receiver are emissions arising on the one hand from emissions supplied to the antenna line and on the other from emissions radiated by the cabinet and chassis of the equipment.

For equipment with integral antennae, receiver spurious emissions include both emissions from the antenna and those produced by the cabinet and chassis of the equipment.

7.2. Method of measurement

The methods of measurement shall be as described in Clauses 5. and 6., substituting the receiver for the transmitter.

8. ACCURACY OF MEASUREMENT

The tolerances for the measurement of the following parameters shall be as given below:

- | | |
|---|-------------|
| 1. DC voltage | $\pm 3\%$ |
| 2. AC voltage | $\pm 3\%$ |
| 3. Radio frequency | ± 50 Hz |
| 4. Radio-frequency voltage | ± 2 dB |
| 5. Radio-frequency field strength | ± 3 dB |
| 6. Radio-frequency carrier power | ± 10 % |
| 7. Impedance of artificial loads, combining units, cables, plugs, attenuators, etc. | ± 5 % |
| 8. Source impedance of generators and input impedance of measuring receivers | ± 10 % |
| 9. Attenuation of attenuators | $\pm 1\%$ |

10. Temperature

$\pm 1^{\circ}\text{C}$

Annex IV

INFORMATION TO BE PROVIDED BY AN APPLICANT FOR THE TYPE APPROVAL OF A CORDLESS MICROPHONE SYSTEM

General

- Applicant: name, address, telephone number and telex.
- Responsible person supporting the application: name and telephone number.
- Manufacturer: name and address.
- Type designation and commercial designation (if shown on the equipment).
- Countries in which the equipment or a component from which it has been assembled has(ve) already been submitted for type approval and results obtained.
- Type of equipment: transmitter or receiver.
- Power supply: integral or externally supplied to the equipment; using cells, accumulator, mains supply.
- Antennae: nature of antenna terminals;
impedance at antenna terminals;
integral antenna: type, length.
- Class of emission: type of modulation.
- Operational frequency band of the equipment.
- Maximum number of radio channels for which the equipment is designed.
- List of carrier frequencies available to the equipment at the time of testing.

Transmitter

- Nominal effective radiated power or
- Nominal output power, without modulation.
- Necessary bandwidth.
- Relationship of transmitting frequency to oscillator frequency.

Receiver

- Frequency changing formula(e).
- Number and value of intermediate frequencies.

Test conditions

- Extreme low temperature.
- Extreme high temperature.
- Nominal supply voltage(s)

Left blank

Appendix to Recommendation T/R 20-06

This Appendix contains additional information concerning national derogations and options elected for the implementation of Recommendation T/R 20-06. It has been drawn up by the T/GT 3 Working Group on "Radiocommunications" and distributed by the CEPT liaison office. Since the information has been supplied by the Administrations, the content is not subject to the approval of the "Telecommunications" Commission.

T/R 20-06

Appendix to Annex II (revised version, Stockholm, 1977)

Paragraph	Administration	Description of variation or choice	Grounds
1.	Germany (Fed. Rep.)	Depends on the revision of Annexes II and III	
	France	Frequencies assigned: 32.8 MHz, 36.4 MHz and 39.2 MHz (when there is no risk of this last frequency causing interference to reception of television transmissions)	
5.	Austria Netherlands	Bandwidth: 150 kHz or 36 kHz Frequency error: ± 15 kHz	
7. and 8.	Germany (Fed. Rep.)	Further restrictions in the band above 2,000 MHz: 30 nW Additionally, over the range of frequencies 10 kHz to 30 MHz, restrictions are imposed: <ol style="list-style-type: none"> 1. by the magnetic component of the interfering field radiated by the equipment and, where applicable, by its leads 2. where relevant, for the voltage produced by conduction in the power supply leads (of particular importance in the case of base stations) 	The substitution method poses problems with frequencies below 30 MHz

T/R 20-06

Appendix to Annex II (revised version, Stockholm, 1977)

Paragraph	Administration	Description of variation or choice	Grounds
3.2	Germany (Fed. Rep.) Austria Belgium Denmark Finland France Netherlands Norway Switzerland	Extreme temperatures: + 5° C and +40° C Extreme temperatures: -10° C and +55° C Extreme temperatures: -10° C and +55° C Extreme temperatures: + 5° C and +40° C Only measurement made at normal temperatures Extreme temperatures: -10° C and +55° C Extreme temperatures: -10° C and +40° C Extreme temperatures: -10° C and +55° C Extreme temperatures: -10° C and +55° C	Choice allowed Choice allowed Choice allowed Choice allowed Choice allowed Choice allowed Choice allowed Choice allowed
4.	Netherlands	Measurement of the necessary bandwidth is not used; the method used is as follows: <i>Frequency or phase modulation</i> The total deviation shall be restricted to 75 kHz for a modulating signal at a frequency below 15 kHz and shall be reduced by 14 dB/octave to a value of 1,000 Hz for a modulating signal at a frequency above 15 kHz	