Recommendation T/R 20-02 (The Hague 1972, revised at Málaga-Torremolinos 1975), Stockholm 1976 and 1977, Ostend 1979, Cannes 1983, and Odense 1986)

LOW-POWER RADIO TRANSMITTER-RECEIVERS INTENDED TO PROVIDE VOICE RADIOCOMMUNICATION IN THE 27 MHz BAND (PR 27 RADIO EQUIPMENT)

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

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

"The European Conference of Postal and Telecommunications Administrations,

considering

(a) that, tanks to technical progress, low-power transmitter-receivers, operated on collective frequencies, are available to the public,

(b) that the use of such equipment can cause problems to Administrations, in the technical field as well as with respect to regulation,

(c) that it would be desirable for Administrations to have common regulations at their disposal in order to simplify such problems,

(d) that harmonization of the parameters for PR 27 equipment to the greatest extent possible is highly desirable,

(e) that it would be advatageous to Administrations and the users and manufacturers of PR 27 radio equipment for test reports to be exchanged between Administrations in accordance with Recommendation T/R 71-02,

(f) that the object should be the mutual recognition by CEPT members of such test reports,

(g) that technical regulations with a common basis and the clear identification of PR 27 radio equipment would facilitate frontier crossings for this type of equipment,

recommends

1. that, to the extent that their national regulations permit, CEPT members allow such equipment to be used for any purpose and by any person, subject to the common technical and administrative conditions specified below,

2. that, to the extent that their national regulations permit, Administrations adopt rules for the authorization of PR 27 radio equipment in conformity with the conditions set out in Annex I of this Recommendation,

3. that the technical characteristics of PR 27 radio equipment be in conformity with those mentioned in Annex II of this Recommendation,

4. that for type approval tests the methods of measurement described in Annex III of this Recommendation be used,

5. that test reports shall be in conformity with Recommendation T/R 71-02,

6. that in drawing up test reports Administrations follow, as far as possible, the order of tests and numbering of clauses used in Annex III and adopt the terminology of Annexes II and III of this Recommendation."

Table of contents

Annex I

CONDITIONS FOR THE USE OF PR 27 RADIO EQUIPMENT

1. The use of PR 27 radio equipment either shall be granted by means of a general permission (general authorization), or shall be subject to the least possible restrictive conditions.
2. A minimum age, determined by the Administrations in accordance with their national regulations, can be required for the operations of PR 27 radio equipment.
3. If a licence is required, it shall be granted without regards to the applicant's nationality.
4. PR 27 radio equipment may be used either as base station, or as mobile station.
5. PR 27 radio equipment shall not be used either on board aircrafts of any kind, or as aeronautical station.
6. Transmission and reception shall take place on the same channel (single frequency, simplex traffic).
7. PR 27 radio equipment shall not be operated in conjunction with satellites.
8. Connection of PR 27 radio equipment to the switched public telecommunications network shall be prohibited.
9. PR 27 radio equipment shall be type approved.
10. With the exception of directional antennae with gain in the horizontal plane, all types of external antennae may be allowed.
11. Concerning the marking and the free circulation from one country to another of PR 27 radio equipment a reference is made to Recommendation T/R 20-02.

Annex II

TECHNICAL SPECIFICATIONS FOR PR 27 RADIO EQUIPMENT

1. FREQUENCY BAND

The frequency band for PR 27 equipment shall be 26.960 MHz-27.410 MHz.

2. CARRIER FREQUENCIES AND CHANNEL NUMBERS

For PR 27 equipment the following carrier frequencies are available.

Carrier frequencies	Chan. No.	Carrier frequencies	Chan. No.
26.965 MHz	1	27.105 MHz	12
26.975 MHz	2	27.115 MHz	13
26.985 MHz	3	27.125 MHz	14
27.005 MHz	4	27.135 MHz	15
27.015 MHz	5	27.155 MHz	16
27.025 MHz	6	27.165 MHz	17
27.035 MHz	7	27.175 MHz	18
27.055 MHz	8	27.185 MHz	19
27.065 MHz	9	27.205 MHz	20
27.075 MHz	10	27.215 MHz	21
27.085 MHz	11	27.225 MHz	22

If an Administration wishes to grant authorization for the use of supplementary frequencies, a choice should be made from the frequencies mentioned in the list below.

Carrier frequencies	Chan. No.	Carrier frequencies	Chan. No.
27.235 MHz	24	27.325 MHz	32
27.245 MHz	25	27.335 MHz	33
27.255 MHz	23	27.345 MHz	34
27.265 MHz	26	27.355 MHz	35
27.275 MHz	27	27.365 MHz	36
27.285 MHz	28	27.375 MHz	37
27.295 MHz	29	27.385 MHz	38
27.305 MHz	30	27.395 MHz	39
27.315 MHz	31	27.405 MHz	40

3. CHANNEL SEPARATION

The channel separation for PR 27 equipment shall be 10 kHz.

4. MULTI-CHANNEL EQUIPMENT

Multi-channel equipment may be used, provided that such equipment is only designed for the authorized channels.

Precautions should be taken against extension of the usable frequency range by the user. For instance the physical and electrical design of the channel switching system shall permit operation in not more than the authorized channels (22 or 40 channels).

If for the determining of the transmitter frequency use is made of a synthesizer and/or of a PLL system, arbitrary input codes may only lead to the authorized channels.

For the determination of the transmitter frequency only 1 crystal may be used. In the case of PLL systems or synthesizers this crystal is also the reference crystal.

5. TYPE OF MODULATION

Only frequency or phase modulation shall be allowed (F3E/G3E).

6. FREQUENCY ERROR

The frequency error of the transmitter shall not exceed 0.6 kHz.

7. POWER

Both the transmitter carrier power, and the effective radiated power of an equipment with an integral antenna, shall not exceed 4 watts. The equipment shall be constructed in such a way that an increase of output power cannot easily be achieved by actions, undertaken by the user of the equipment.

8. ADJACENT CHANNEL POWER

The adjacent channel power shall not exceed a value of 20 microwatt.

9. SYNTHESIZERS AND PLL SYSTEMS

If—for determining the transmitter frequency—use is made of a synthesizer and/or a phase locked loop system, the transmitter shall be inhibited when synchronisation is absent.

10. SPURIOUS EMISSIONS OF THE TRANSMITTER

(a) *With the transmitter operating*

the power of spurious emissions shall not exceed 4 nanowatts in the following frequency bands:

41 MHz- 68 MHz
87.5 MHz-118 MHz
162 MHz-230 MHz
470 MHz-862 MHz

The power of spurious emissions in other frequencies of the specified ranges (see Annex III) shall not exceed 0.25 microwatt on any arbitrary frequency below 1,000 MHz and 1 microwatt on any arbitrary frequency above 1,000 MHz.

(b) *With the transmitter in stand-by*

the power of any spurious emission in the specified range of frequencies (see Annex III) shall not exceed 2 nanowatts for frequencies below 1,000 MHz and 20 nanowatts for frequencies above 1,000 MHz.

11. MAXIMUM USABLE SENSITIVITY

The maximum usable sensitivity shall not exceed 6 dB (μV) relative to e.m.f. Equipment which is not equipped with a terminal that can be used for the connection of an external antenna is not submitted to this requirement.

12. ADJACENT CHANNEL SELECTIVITY

The adjacent channel selectivity shall not be less than 60 dB relative to an e.m.f. of one microvolt.

Equipment which is not equipped with a terminal that can be used for the connection of an external antenna is not submitted to this requirement.

13. SPURIOUS RESPONSE REJECTION

At any frequency separated from the nominal frequency of the receiver by more than one channel spacing, the spurious response rejection shall not be less than 60 dB relative to an e.m.f. of one microvolt. Equipment which is not equipped with a terminal that can be used for the connection of an external antenna is not submitted to this requirement.

14. INTERMODULATION RESPONSE

The intermodulation response rejection shall not be less than 60 dB relative to an e.m.f. of one microvolt. Equipment which is not equipped with a terminal that can be used for the connection of an external antenna is not submitted to this requirement.

15. SPURIOUS EMISSIONS OF THE RECEIVER

The power of any spurious emission in the specified ranges of frequencies (see Annex III) shall not exceed 2 nanowatt on any discrete frequency below 1,000 MHz and 20 nanowatt above 1,000 MHz.

Annex III

METHODS OF MEASUREMENT FOR PR 27 RADIO EQUIPMENT

1. SCOPE OF SPECIFICATIONS

This Annex describes the methods of measurement of the parameters, specified in Annex II of this Recommendation.

It applies to equipment with a socket for an external antenna as well as to equipment with an integral antenna.

In this specification, an integral antenna is defined as one which is designed to be connected permanently to the transmitter/receiver without the use of a connector and/or the use of a feeder.

In the case of equipment which is intended for use with a integral antenna as well as for equipment with an socket for an external antenna, the equipment shall be measured as equipment intended for use with an external antenna and shall meet the appropriate limits. In addition to this, the transmitter characteristics:
— transmitter carrier power,
— spurious emissions of the transmitter,
and the receiver characteristic:
— spurious emissions of the receiver,
shall be measured as for equipment for use with an integral antenna and the appropriate limits shall be met.

2. TEST CONDITIONS, POWER SOURCES, AND AMBIENT TEMPERATURES

2.1. Normal and extreme test conditions

Type approval tests shall be made under normal test conditions, and also, where stated, under extreme test conditions.

The test conditions and procedures shall be as specified in 2.2. to 2.5.

2.2. Test power source

During type approval tests the power source of the equipment shall be replaced by a test power source, capable of producing normal and extreme test voltages as specified in 2.3.2. and 2.4.2. The internal impedance of the test power source shall be low enough for its effect on the test results to be negligible. For the purpose of tests, the voltage of the power source shall be measured at the input terminals of the equipment.

If the equipment is provided with a permanently connected power cable, the test voltage shall be that measured at the point of connection of the power cable to the equipment.

In equipment with incorporated batteries the test power source shall be applied as close to the battery terminals as practicable.

During tests the power source voltages shall be maintained within a tolerance of $\pm 3\%$ relative to the voltage at the beginning of each test.

2.3. Normal test conditions

2.3.1. *Normal temperature and humidity*

The normal temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges:
Temperature $+15^{\circ}$C to $+35^{\circ}$C
Relative humidity 20% to 75%

Note. When it is impracticable to carry out the tests under the conditions stated above, a note to this effect, stating the actual temperature and relative humidity during the tests, shall be added to the test report.

2.3.2. *Normal test power source*

2.3.2.1. Mains voltage and frequency

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of these specifications, the nominal voltage shall be the declared voltage or any of the declared voltages for which the equipment was designed.

The frequency of the mains voltage shall be within the range 49 to 51 Hz.

2.3.2.2. Regulated lead-acid battery power sources on vehicles

When the radio equipment is intended for operation from the usual types of regulated lead-acid battery power sources on vehicles, the normal test voltage shall be 1.1 times the nominal voltage of the battery (6 volts, 12 volts, etc.).

2.3.2.3. Other power sources

For operation from other power sources or types of battery (primary or secondary), the normal test voltage shall be that declared by the equipment manufacturer and accepted by the testing authorities.

2.4. **Extreme test conditions**

2.4.1. *Extreme temperatures*

For tests at extreme temperatures, measurements shall be made in accordance with the procedures specified in Clause 2.5., at the upper and lower temperatures of
$-10°$ C and $+55°$ C

2.4.2. *Extreme test voltages*

2.4.2.1. Mains voltage and frequency

The extreme test voltage for equipment to be connected to an AC mains source shall be the nominal mains voltage $\pm 10\%$.

The frequency of the mains voltage shall be within the range 49 to 51 Hz.

2.4.2.2. Regulated lead-acid battery power sources on vehicles

When the equipment is intended for operation from the usual types of regulated lead-acid battery power sources on vehicles, the extreme test voltages shall be 1.3 and 0.9 times the nominal voltage of the battery (6 volts, 12 volts, etc.).

2.4.2.3. Other power sources

The lower extreme test voltage for equipment with power sources using primary batteries shall be as follows:

1. For the Leclanché type of battery:
   0.85 times the nominal voltage of the battery;
2. For the mercury type of battery:
   0.9 times the nominal voltage of the battery;
3. For other types of primary batteries:
   end point voltage declared by the equipment manufacturer.

For equipment using other power sources, or capable of being operated from a variety of power sources, the extreme test voltages shall be those agreed between the equipment manufacturer and the testing authority and shall be recorded with the results.

2.5. **Procedure for tests at extreme temperatures**

2.5.1. *Procedure for tests*

Before measurements are made the equipment shall have reached thermal balance in the test chamber. The equipment shall be switched off during the temperature stabilizing period. If the thermal balance is not checked by measurements, a temperature stabilizing period of at least one hour, or such period as may be decided by the testing authority, shall be allowed. The sequence of measurements shall be chosen, and the humidity content in the test chamber shall be controlled so that excessive condensation does not occur.

Prior to tests at high temperatures, the equipment shall be placed in the test chamber and shall be left there until thermal balance is attained. Then the equipment shall be switched on. For tests at high temperatures the equipment shall be switched on for one minute in the transmit condition, followed by four minutes in the receive condition, after which the equipment shall meet the specified requirements.

For tests at the lower temperatures the equipment shall be left in the test chamber until thermal balance is attained, then switched to the stand-by or receive condition for one minute after which the equipment shall meet the specified requirements.

3. GENERAL CONDITIONS

3.1. **Arrangements for test signals applied to the receiver input**

Sources of test signals for application to the receiver input shall be connected in such a way that the impedance presented to the receiver input is 50 ohms.

This requirement shall be met irrespective of whether one or more signals are applied to the receiver simultaneously.

The levels of the test signals shall be expressed in terms of the e.m.f. at the receiver input terminals.

The effects of any intermodulation products and noise produced in the signal generators should be negligible. The test generators shall be substantially free from static amplitude modulation.

3.2. **Receiver mute or squelch facility**

If the receiver is equipped with a mute or squelch circuit, this shall be made inoperative for the duration of the type approval tests.

3.3. **Receiver rated audio output power**

The rated audio output power shall be the maximum power, declared by the manufacturer, for which all the requirements of these specifications are met. With normal test modulation (Clause 3.4.), the audio power shall be measured in a resistive load, simulating the load with which the receiver normally operates. The value of this load shall be declared by the manufacturer.

3.4. **Normal test modulation**

For normal test modulation, the modulation frequency shall be 1 kHz and the resulting frequency deviation shall be ± 1 kHz.

3.5. **Artificial antenna**

Tests on the transmitter shall be carried out with a non-reactive non-radiating load of 50 ohm connected to the antenna terminals. Tests on the transmitter requiring the use of the test fixture shall be carried out with a 50 ohm non-reactive non-radiating load connected to the test fixture terminal.

3.6. **Test fixture**

In the case of equipment intended for use with an integral antenna, the manufacturer may be required to supply a test fixture suitable to allow relative measurements to be made on the submitted sample.

The test fixture shall provide a 50 ohm radio frequency terminal at the working frequencies of the equipment.

The test fixture shall provide means of making external connection to the audio frequency input and radio frequency output and of replacing the power source by external power supplies.

The performance characteristics of this test fixture under normal and extreme conditions are subject to the approval of the testing authority.

The characteristics of interest to the testing authority will be that:

(a) the coupling loss shall not be excessive, that is not greater than 30 dB;
(b) the variation of coupling loss with frequency shall not cause errors exceeding 2 dB in measurements using the test fixture;
(c) the coupling device shall not include any non-linear elements.

The testing authority may provide its own test fixture. A description of a test fixture of this type is given below.

3.7. **Test site and general arrangements for measurements involving the use of radiated fields**

(For general guidance see also Appendix A.)

3.7.1. *Test site*

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

The test site shall be large enough to allow the erection of a measuring or transmitting antenna at a distance of at least 6 metres. The distance actually used shall be recorded with the results of the test carried out on the site.

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 1.5 metres above the ground plane. This support consists of a plastic tube, which is filled with salt water (9 grammes NaCl per litre). The tube shall have a length of 1.5 metres and an internal diameter of 10 + 0.5 centimetres. The upper end of the tube is closed by a metal plate with a diameter of 15 centimetres, which is in contact with the water.

The sample shall be placed with its side of largest area on the metal plate. To meet the requirement that the antenna is vertical while maintaining contact with the metal plate, it may be necessary to use a second metal plate, attached to the first. This metal plate shall be 10 × 15 cm in size and shall be hinged to the first plate by its 10 cm edge in such a way that the angle between the plates can be adjusted between 0° and 90°. The hinge point shall be adjustable so that the centre of the sample can be placed above the centre of the circular plate. In the case of samples whose length along the antenna axis is less than 15 cm, the sample shall be arranged so that the base of the antenna is at the edge of the hinged plate.

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

3.7.2. *Test antenna*

The test antenna is used to detect the radiation from both the test sample and the substitution antenna, when the site is used for radiation measurements; where necessary, it is used as a transmitting antenna, when the site is used for the measurement of receiver characteristics. This antenna is mounted on a support such as to allow the antenna to be used in either horizontal or vertical polarization and for the height of its centre above ground to be varied over the range 1-4 metres. Preferably test antennae with pronounced directivity should be used. The size of the test antenna along the measurement axis shall not exceed 20% of the measuring distance.

For radiation measurements, the test antenna is connected to a test receiver, capable of being tuned to any frequency under investigation and of measuring accurately the relative levels of signals at its input.

3.7.3. *Substitution antenna*

The substitution antenna shall be a $\lambda/2$ dipole, resonant at the frequency under consideration, or a shortened dipole, calibrated to the $\lambda/2$ dipole or a horn radiator calibrated to the half wave dipole. The centre of this antenna shall coincide with the reference point of the test sample it has replaced. This reference point shall be the volume centre of the sample when its antenna is mounted inside the cabinet, or the point where an outside antenna is connected to the cabinet.

The distance between the lower extremity of the dipole and the ground shall be at least 30 cm.

The substitution antenna shall be connected to a calibrated signal generator when the site is used for radiation measurements. The signal generator shall be operating at the frequencies under investigation and shall be connected to the antenna through suitable matching and balancing networks.

3.7.4. *Alternative indoor site*

When the frequency of the signals measured is greater than 80 MHz, use may be made of an indoor site. If this alternative site is used, this shall be recorded in the test report.

The measurement site may be a laboratory room with a minimum area of 6 metres by 7 metres and at least 2.7 metres in height.

Apart from the measuring apparatus and the operator, the room shall be as free as possible from reflecting objects other than the walls, floor and ceiling.

The site arrangement is in principle shown in Figure 1 (T/R 20-02).

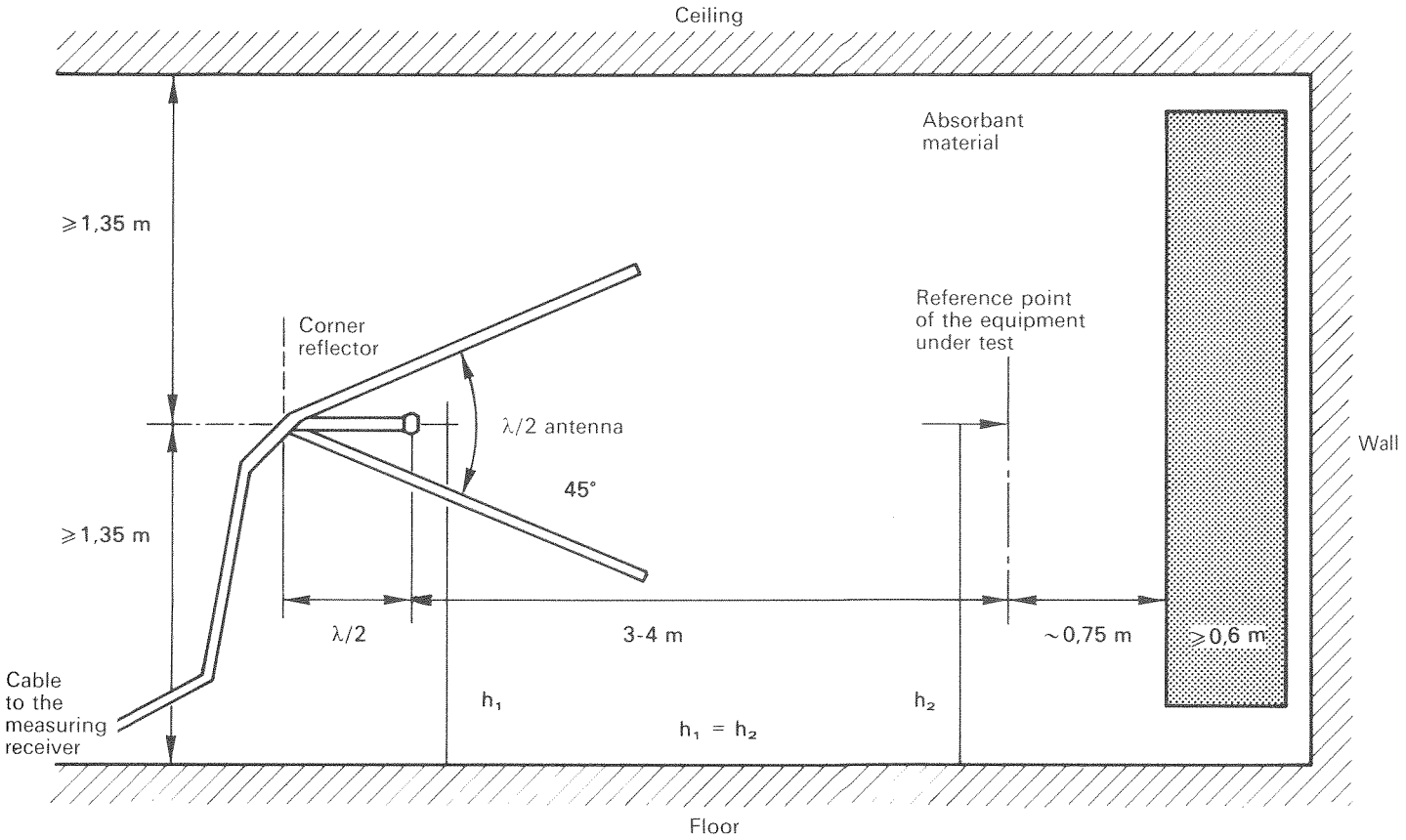

Figure 1 (T/R 20-02). Indoor site arrangement (shown for horizontal polarization).

The potential reflections from the wall behind the equipment under test are reduced by placing a barrier of absorbent material in front of it. The corner reflector around the test antenna is used to reduce the effect of reflections from the opposite wall and from the floor and ceiling in the case of horizontally polarized measurements.

Similarly, the corner reflector reduces the effects of reflections from the side walls for vertically polarized measurements.

For measurements in the lower part of the frequency range (below approx. 175 MHz) no corner reflector or absorbent barrier is needed. For practical reasons, the $\lambda/2$ antenna in Figure 1 (T/R 20-02) may be replaced by an antenna of constant length, provided that this length is between $\lambda/4$ and λ, allowing it to be used at the frequency of measurements and the sensitivity of the measuring system is sufficient. In the same way the distance of $\lambda/2$ to the apex may be varied.

The test antenna, test receiver, substitution antenna and calibrated signal generator are used in a way similar to the general method. To ensure that errors are not caused by the propagation path approaching the point at which phase cancellation between direct and the remaining reflected signals occurs, the substitution antenna shall be moved through a distance of + 10 cm in the direction of the test antenna as well as in the two directions perpendicular to this first direction. If these changes of distance cause a signal change of greater than 2 dB, the test sample should be resited until a change of less than 2 dB is obtained.

3.8. **Arrangement for test signals at the input of the transmitter**

For the purpose of this Recommendation, the transmitter audio frequency modulation signal shall be supplied by a generator applied at the connections of the microphone insert, unless otherwise stated.

4. TRANSMITTER

4.1. Frequency error

4.1.1. *Definition*

The frequency error of the transmitter is the difference between the measured carrier frequency and its nominal value.

4.1.2. *Method of measurement*

The carrier frequency shall be measured in the absence of modulation, with the transmitter connected to an artificial antenna (Clause 3.5.). Equipment with an integral antenna shall be placed in the test fixture (Clause 3.6.) connected to the artificial antenna (Clause 3.5.). The measurement shall be made under normal test conditions (Clause 2.3.) and extreme test conditions (Clauses 2.4.1. and 2.4.2. applied simultaneously). The measurements may be repeated for any intermediate set of conditions.

4.2. Transmitter carrier power

4.2.1. *Definition*

The transmitter carrier power is the mean power delivered to the artificial antenna during a radio-frequency cycle, or in the case of equipment with integral antennae the effective radiated power in the direction of maximum field strength under the specified conditions of measurement (Clause 3.7.) in the absence of modulation.

The rated output power shall be the transmitter carrier power declared by the manufacturer.

4.2.2. *Method of measurement (for equipment other than equipment with integral antenna only)*

The transmitter shall be connected to an artificial antenna (Clause 3.5.) and the power delivered to this artificial antenna measured.

The measurements shall be made under normal test conditions (Clause 2.3.) and extreme test conditions (Clauses 2.4.1. and 2.4.2. applied simultaneously).

4.2.3. *Method of measurement for equipment with integral antenna*

On the test site, which fulfils the requirements of Clause 3.7., the test sample shall be placed on the support in the following position:

(a) equipment with internal antennae,
— in a position similar to the normal position when in use;
(b) equipment with rigid external antennae,
— with that antenna vertical;
(c) equipment with non-rigid external antennae,
— with that antenna extended vertically upwards by a non-conducting support.

The transmitter shall be switched on, without modulation, and the test receiver tuned to the frequency of the signal to be measured. The test antenna shall be orientated for vertical polarization and shall be raised or lowered through the specified height range until a maximum signal level is detected by the test receiver.

The transmitter shall be rotated through 360° until the maximum signal is received.

N.B. This maximum may be a lower value than that obtainable at heights outside the specified limits.

The transmitter shall then be replaced by the substitution antenna, as defined in Clause 3.7., and the test antenna raised or lowered as necessary to ensure that the maximum signal is still received. The input signal applied to the substitution antenna shall be adjusted in level until an equal or a known related level to that detected from the transmitter is obtained in the test receiver.

The transmitter carrier power shall be equal to the power supplied to the substitution antenna, increased in the known relationship if necessary.

A check shall be made at other planes of polarization to ensure that the value obtained above is indeed the maximum. If higher values are obtained, this fact must be recorded in the test report.

4.3. Adjacent channel power

4.3.1. *Definition*

The adjacent channel power is that part of the total output power of a transmitter, modulated under defined conditions, which falls within a specified bandwidth centred on the nominal frequency of either of the adjacent channels. This power is the sum of the mean power produced by the modulation process and by residual modulation caused by hum and noise of the transmitter.

4.3.2. *Methods of measurement*

4.3.2.1. General observations

Two methods are proposed which give equivalent results. CEPT member Administrations are invited to use one or both of these methods. The method used shall be stated in the test reports.

4.3.2.2. Method of measurement using a power measuring receiver

4.3.2.2.1. General

The adjacent channel power may be measured with a power measuring receiver which fulfils the requirements of Clause 4.3.2.2.2. (this equipment is referred to in Clauses 4.3.2.2.1. and 4.3.2.2.2. as the "receiver").

(a) the transmitter shall be operated at the carrier power measured in Clause 4.2. under normal test conditions (Clause 2.3.). The output of the transmitter shall be linked to the input of the "receiver" by a connecting device such that the impedance presented to the transmitter is 50 ohms and the level at the "receiver" input is appropriate;

(b) with the transmitter unmodulated[1]), the "receiver" shall be tuned to the frequency which gives a maximum response. This shall be the 0 dB point. The "receiver"'s attenuation and the reading of the meter shall be recorded;

(c) the "receiver" shall be tuned to give the "receiver"'s -6 dB response, corresponding to the frequency nearest to the transmitter carrier frequency, at a displacement of 5.75 kHz from the nominal carrier frequency;

(d) the transmitter shall be modulated with 1,250 Hz at a level which is 20 dB higher than that required to produce a deviation of ± 1 kHz[2]);

(e) the variable attenuator of the "receiver" shall be adjusted so as to obtain the same meter reading as in (b) or a known relation to it;

(f) the ratio of the adjacent channel power to the carrier power is given by the difference between the attenuator readings recorded in (b) and (e) corrected for the difference in the values read on the meter;

(g) the measurement shall be repeated for the other adjacent channel.

[1]) The measurement may be made with the transmitter modulated with normal test modulation (Clause 3.4.), in which case this fact must be recorded with the test results.

[2]) The resulting frequency deviation must be measured and recorded in the test report for guidance in the maintenance of the equipment.

4.3.2.2.2. Power measuring receiver specification

The power measuring receiver consists of a mixer, an IF-filter, an oscillator, an amplifier, a variable attenuator and an r.m.s. value indicator.

Instead of the variable attenuator with the r.m.s. value indicator it is also possible to use a dB-calibrated r.m.s. voltmeter. The technical characteristics of the power measuring receiver are given below.

4.3.2.2.2.1. IF-filter

The IF-filter shall be within the limits of the following selectivity characteristic given in Figure 2 (T/R 20-02).

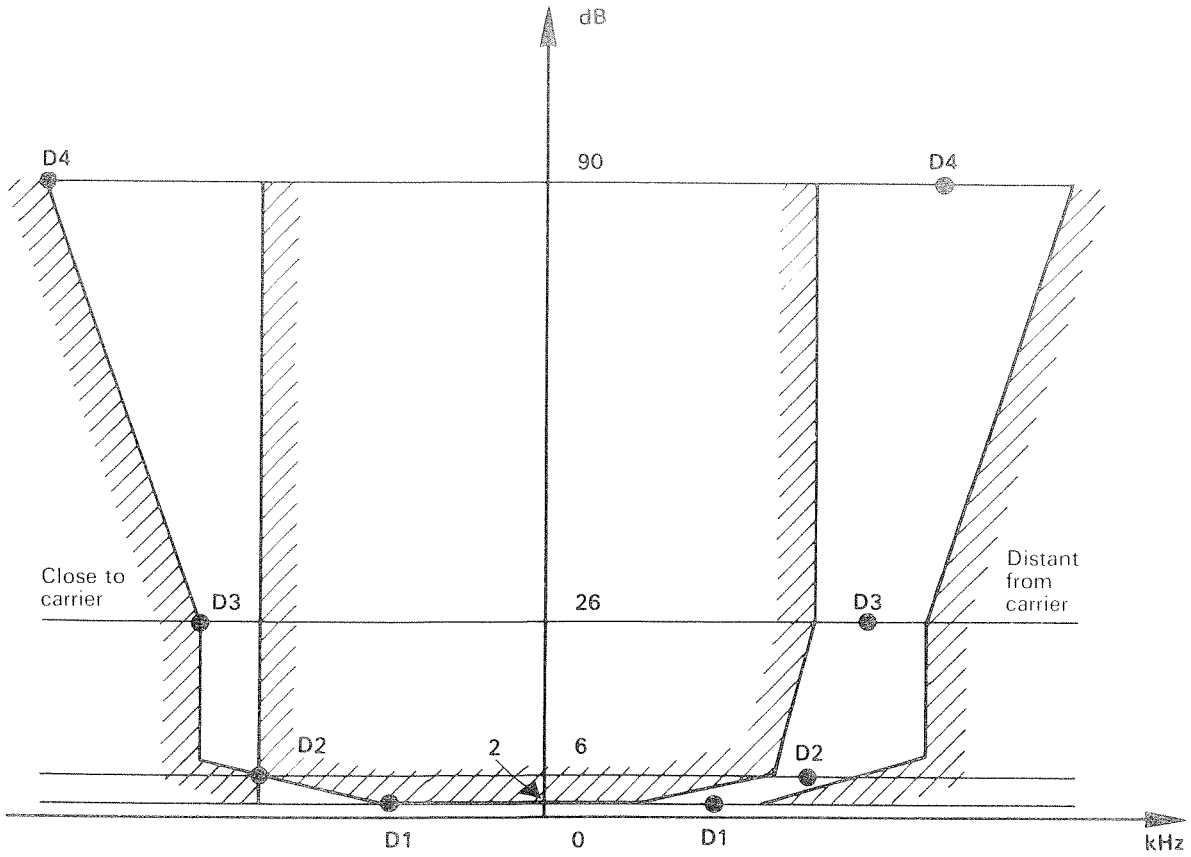

Figure 2 (T/R 20-02). Selectivity characteristic of the "receiver".

The selectivity characteristic shall keep the frequency separations from the nominal centre frequency of the adjacent channel, as mentioned in column 2 of Table II (T/R 20-02).

The attenuation points on the slope towards the carrier shall not exceed the tolerances, as mentioned in column 3 of Table II (T/R 20-02).

The attenuation points on the slope, distant from the carrier, shall not exceed the tolerances, as mentioned in column 4 of Table II (T/R 20-02).

1 Attenuation points	2 Frequency separations	3 Tolerance towards C	4 Tolerance distant from C
D1 (2 dB)	3 kHz	+ 1.35 kHz	± 2 kHz
D2 (6 dB)	4.25 kHz	± 0.1 kHz	± 2 kHz
D3 (26 dB)	5.5 kHz	− 1.35 kHz	± 2 kHz
D4 (90 dB)	9.5 kHz	− 5.35 kHz	+ 2 kHz and − 6 kHz

Table II (T/R 20-02). Selectivity characteristic of the "receiver".

The minimum attenuation of the filter outside the 90 dB attenuation points must be equal to or greater than 90 dB.

4.3.2.2.2.2. Attenuation indicator

The attenuation indicator shall have a minimum range of 80 dB and a reading accuracy of 1 dB.

4.3.2.2.2.3. R.m.s. value indicator

The instrument shall accurately indicate non-sinusoidal signals in a ratio of up to 10 : 1 between peak value and r.m.s. value.

4.3.2.2.2.4. Oscillator and amplifier

The oscillator and the amplifier shall be designed in such a way that the measurement of the adjacent channel power of a low-noise unmodulated transmitter, whose self-noise has a negligible influence on the measurement result, yields a measured value of 80 dB referred to the carrier of the oscillator.

4.3.2.3. Method of measurement using a spectrum analyser

4.3.2.3.1. General

The adjacent channel power may be measured with a spectrum analyser which conforms to Clause 4.3.2.3.2. The transmitter shall be operated at the carrier power determined in Clause 4.2. under normal test conditions (Clause 2.3.). The output of the transmitter shall be linked to the input of a spectrum analyser by a connecting device such that the impedance presented to the transmitter is 50 ohms and the level at the spectrum analyser input is appropriate. The transmitter shall be modulated by a test modulation signal having a frequency of 1,250 Hz and a level which is 20 dB higher than that required to produce a deviation of ± 1 kHz[3]).

The spectrum analyser shall be so adjusted that the spectrum of the transmitter output, including that part which lies within the adjacent channels, is displayed.

For the purpose of this test, the bandwidth of a receiver of the type normally used in the system shall be taken to be 8.5 kHz with a tolerance of $\pm 10\%$.

The centre frequency of the bandwidth within which measurements are to be made shall have a separation from the nominal carrier frequency of the transmitter equal to 10 kHz.

The adjacent channel power is the sum of the power levels of each of the discrete components and the noise in the appropriate bandwidth.

This sum may be calculated or an automatic power level integrating device may be used to obtain it (see Clause 4.3.2.3.3.).

In the latter case, the relative power level of the carrier and its sidebands is initially measured by integration in the appropriate bandwidth, centred on the nominal frequency. The integration is repeated at this bandwidth centred on the nominal frequency of the adjacent channel and the input level of the carrier signal increased until the same power level at the output of the device is obtained.

The difference in the input levels, in dB, is the ratio of the adjacent channel power to the carrier output power.

The adjacent channel power is determined by applying this ratio to the carrier output power as measured in Clause 4.2. or by a direct substitution measurement using a calibrated source.

The measurement shall be repeated for the other adjacent channel.

4.3.2.3.2. Spectrum analyser specification

The specification shall include the following requirements:

It shall be possible, using a resolution bandwidth of 1 kHz, to measure the amplitude of a signal or noise at a level 3 dB or more above the noise level of the spectrum analyser, as displayed on the screen, to an accuracy of ± 2 dB in the presence of a signal separated in frequency by 6.25 kHz, at a level 80 dB above that of the signal to be measured.

The reading accuracy of the frequency marker shall be within $\pm 2\%$ of the channel separation.

The accuracy of relative amplitude measurements shall be within ± 1 dB.

It shall be possible to adjust the spectrum analyser so that two components with a frequency difference of 1 kHz are displayed separately.

4.3.2.3.3. Integrating and power summing device

The integrating and power device is connected to the video output of the spectrum analyser, described in Clause 4.3.2.3.2.

It shall be possible to summate the effective power of all discrete components and the noise power in the selected bandwidth and to measure this as a ratio to the carrier power.

The position and the width of the integration range selected can be indicated on the spectrum analyser by brightening the trace.

[3]) The resulting frequency deviation shall be measured and noted in the test report.

When power levels as low as 50 nanowatts are measured, the output of the device should exceed the internal noise level by 10 dB. The dynamic range shall permit measurement of the required values with a margin of at least 10 dB.

4.4. **Spurious emissions of the transmitter**

4.4.1. *Definition*

Spurious emissions are emissions at frequencies other than those of the carrier and sidebands associated with normal modulation.

The level of spurious emissions shall be measured as:
(a) their power level in a transmission line or antenna and;
(b) their effective radiated power when radiated by the cabinet and structure of the equipment;
(b) is also known as "cabinet radiation".

For equipment which can only be used with an integral antenna, only the measurements mentioned under (b) apply.

4.4.2. *Method of measuring the power level (a)*

Spurious emissions shall be measured as the power level of any discrete signal delivered into a 50 ohms load. This may be done by connecting the transmitter output through an attenuator and if necessary an appropriate filter, to a spectrum analyser or selective voltmeter, or by monitoring the relative levels of the spurious signals delivered to an artificial antenna (Clause 3.5.).

The transmitter shall be unmodulated and the measurements made over the frequency range 100 kHz to 2 GHz, except for the channel on which the transmitter is intended to operate and its adjacent channels.

The measurements shall be repeated with the transmitter modulated with normal test modulation (Clause 3.4.).

The measurements shall be repeated with the transmitter in stand-by.

4.4.3. *Method of measuring the effective radiated power (b)*

On a test site, fulfilling the requirements of Clause 3.7., the sample shall be placed at the specified height on the support as described in Clause 3.7.1. The transmitter shall be operated with the carrier power delivered to an artificial antenna (Clause 3.5.) without modulation, except in the case of testing equipment with an integral antenna.

Radiation of any spurious components shall be detected by the test antenna and receiver, over the frequency range 25 MHz to 2 GHz, except for the channel on which the transmitter is intended to operate and its adjacent channels.

At each frequency at which a component is detected, the sample shall be rotated to obtain maximum response and the effective radiated power of that component determined by a substitution measurement.

The measurements shall be repeated with the test antenna in the orthogonal polarization plane.

The measurements shall be repeated with the transmitter modulated by normal test modulation (Clause 3.4.).

The measurements shall be made under normal test conditions (Clause 2.3.).

The measurements shall be repeated with the transmitter in stand-by.

5. RECEIVER

5.1. **Maximum usable sensitivity**

5.1.1. *Definition*

The maximum usable sensitivity of the receiver is the minimum level of signal (e.m.f.) at the receiver input, at the nominal frequency of the receiver, with normal test modulation (Clause 3.4.), which will produce:

5.1.1.1. in all cases, an audio frequency output power of at least 50% of the rated power output (Clause 3.3.), and

5.1.1.2. either a SND/ND ratio[4]) of 20 dB, measured at the receiver output through a telephone psophometric weighting network as described in CCITT Recommendation P.53A, or

[4]) S = Signal.
N = Noise.
D = Distortion.

5.1.1.3. a SND/N ratio of 20 dB, measured with the psophometric network mentioned in Clause 5.1.1.2.

Note 1. It is considered that these alternatives will give closely similar results. Administrations are requested to state, in their type approval test reports, which method or methods have been used.

Note 2. It is recognized that the results of measurements based on the definitions given above may differ from those which would be obtained for a SND/ND ratio of 12 dB in the absence of a psophometric weighting network. However, evidence points to the conclusion that the differences will be small.

Note 3. The characteristics of the 1 kHz band-stop filter used in SND/ND measurements shall be such that at the output the attenuation at 1 kHz will be at least 40 dB and at 2 kHz will not exceed 0.6 dB. The filter characteristic shall be flat within 0.6 dB over the ranges of 20 Hz to 500 Hz and 2 kHz to 4 kHz. In the absence of modulation, the filter must not cause more than 1 dB attenuation of the total noise power at the audio frequency output of the receiver under test.

5.1.2. *Method of measuring the SND/ND ratio*

A signal of carrier frequency equal to the nominal frequency of the receiver and with normal test modulation according to Clause 3.4. shall be applied to the receiver input terminals. An audio frequency output load and a distortion factor meter, incorporating a 1 kHz band-stop filter and a psophometric telephone weighting network as mentioned in Clause 5.1.1.2., shall be connected to the receiver output terminals. Where possible, the receiver volume control shall be adjusted to give at least 50% of the rated output power (Clause 3.3.) and, in the case of stepped volume controls, to the first step that provides an output power of at least 50% of the rated output power.

The test signal input level shall be reduced until a SND/ND ratio of 20 dB is obtained. The test signal input level under these conditions is the value of the maximum usable sensitivity.

5.1.3. *Method of measuring the SND/N ratio*

A signal of carrier frequency equal to the nominal frequency of the receiver and with normal test modulation according to Clause 3.4. shall be applied to the receiver input terminals. An audio frequency output load and a psophometric telephone weighting network as mentioned in Clause 5.1.1.2. shall be connected to the receiver output terminals. Where possible, the receiver volume control shall be adjusted to give at least 50% of the rated output power (Clause 3.3.) and, in the case of stepped volume controls, to the first step that provides an output power of at least 50% of the rated output power.

The test signal input level shall be reduced until a SND/N ratio of 20 dB is obtained (for this measurement the modulation is switched on and off).

The test signal input level under these conditions is the value of the maximum usable sensitivity.

5.2. Adjacent channel selectivity

5.2.1. *Definition*

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal which differs in frequency from the wanted signal by an amount equal to the adjacent channel separation for which the equipment is intended.

5.2.2. *Method of measurement*

The two input signals shall be applied to the receiver input via a combining network (see also Clause 3.1.).

The wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation (Clause 3.4.). The unwanted signal shall be modulated by a frequency of 400 Hz with a deviation of ± 1 kHz and shall be at the frequency of the channel immediately above that of the wanted signal.

Initially the unwanted signal shall be switched off and the wanted input signal adjusted to the level of +6 dB relative to an e.m.f. of 1 microvolt.

The unwanted signal shall be switched on and the level adjusted until either the SND/ND ratio or the SND/N ratio at the receiver output (psophometrically weighted) is reduced from 20 dB to 14 dB. The measurement shall be repeated with an unwanted signal at the frequency of the channel below that of the wanted signal. The adjacent channel selectivity shall be expressed as the lower value for the upper and lower adjacent channels of the level of the unwanted signal.

5.3. Spurious response rejection

5.3.1. *Definition*

The spurious response rejection is a measure of the capability of the receiver to discriminate between the wanted modulated signal at the nominal frequency and an unwanted signal at any other frequency at which a response is obtained.

5.3.2. *Method of measurement*

Two input signals shall be applied to the receiver input via a combining network (see also Clause 3.1.). The wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation (Clause 3.4.). Initially the unwanted signal shall be switched off and the wanted input signal adjusted to the value of +6 dB to an e.m.f. of 1 microvolt.

The unwanted signal shall be switched on and modulated by a frequency of 400 Hz with a deviation of +1 kHz.

The input level shall be 76 dB relative to an e.m.f. of 1 microvolt.

The frequency shall than be varied over the frequency range from 100 kHz to 2 GHz.

At any frequency at which a response is obtained, the input level shall be adjusted until the SND/ND ratio or SND/N ratio (psophometrically weighted) is reduced from 20 dB to 14 dB.

The spurious response rejection shall be expressed as the level of the unwanted signal at the receiver input when the above-mentioned reduction in the SND/ND ratio or SND/N ratio is obtained.

The spurious response rejection shall be measured at any frequency, separated from the nominal frequency of the receiver by an amount exceeding one channel.

5.4. **Intermodulation response**

5.4.1. *Definition*

The intermodulation response is a measure of the capability of a receiver to inhibit the generation of in-band signals caused by the presence of two or more signals at unwanted frequencies.

5.4.2. *Method of measurement*

Two signal generators A and B shall be connected to the receiver via a combining network (see Clause 3.1.).

The signal from signal generator A shall have normal test modulation (Clause 3.4.) and shall be adjusted to a frequency separated by twice the channel separation above (or below) the nominal frequency. Signal generator B shall then be switched on. It shall be unmodulated and adjusted to the frequency separated by one channel separation above (or below) the nominal frequency. The output levels of the two signal generators shall be kept equal and increased in level until a SND/ND ratio or a SND/N ratio of 20 dB (psophometrically weighted) is produced at the output of the receiver.

The frequency of signal generator A shall be adjusted slightly if necessary, to produce the maximum SND/ND ratio or SND/N ratio. The levels of the two test signals shall be readjusted to restore the ratio of 20 dB.

The intermodulation response is equal to the level (e.m.f.) of the two signal generators.

5.5. **Spurious emissions of the receiver**

5.5.1. *Definition*

Spurious emissions are any emissions from the receiver.

The level of spurious emissions shall be measured by:
(a) their power level in a transmission line or antenna, and
(b) their effective radiated power when radiated by the cabinet and structure of the equipment;
(b) is also known as "cabinet radiation".

For equipment, which can only be used with an integral antenna, only (b) applies.

5.5.2. *Method of measuring the power level (a)*

Spurious emissions shall be measured as the power level of any discrete signal at the input terminals of the receiver. The receiver input terminals are connected to a spectrum analyser or selective voltmeter having an input impedance of 50 ohms and the receiver is switched on.

If the detecting device is not calibrated in terms of power input, the level of any detected component shall be determined by a substitution method using a signal generator.

The measurements shall extend over a frequency range of 100 kHz to 2 GHz.

5.5.3. *Method of measuring the effective radiated power (b)*

On a test site fulfilling the requirements of Clause 3.7., the sample shall be placed at the specified height on the support as described in Clause 3.7.1.

The receiver shall be operated from a power source via a radio frequency filter to avoid radiation from the power leads. The antenna connector shall be terminated with a non-reactive, non-radiating load of 50 ohms (the measurements may be repeated with the antenna connector terminated with a real antenna).

Radiation of any spurious components shall be detected by the test antenna and receiver over the frequency range 25 MHz to 2 GHz.

At each frequency at which a component is detected, the sample shall be rotated to obtain maximum response and the effective radiated power of that component determined by a substitution measurement.

The measurements shall be repeated with the test antenna in the orthogonal polarization plane.

6. PRESENTATION OF SINGLE- AND MULTI-CHANNEL EQUIPMENT FOR TYPE APPROVAL

6.1. Choice of model for type approval

The manufacturer shall provide a production model of the equipment, for type approval testing.

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

6.2. Single-channel equipment

Any channel within the specified frequency range may be selected for type approval testing. The choice shall be approved by the testing authority.

6.3. Multi-channel equipment

Type approval tests need to be carried out only on the highest and lowest channels within the switching range of the equipment and on a channel near the middle of the switching range, except in special circumstances. The switching range shall be declared by the manufacturer. The choice of channels for type approval testing shall be approved by the testing authority.

7. ACCURACY OF MEASUREMENTS

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

7.1.1.	D.C. voltage	±3%
7.1.2.	A.C. mains voltage	±3%
7.1.3.	A.C. mains frequency	±0.5%
7.2.1.	Audio frequency voltage, power, etc.	±0.5 dB
7.2.2.	Audio frequency	±1%
7.2.3.	Distortion and noise, etc., of audio frequency generators	1%
7.3.1.	Radio frequency	±50 Hz
7.3.2.	Radio frequency voltage	±2 dB
7.3.3.	Radio frequency fieldstrength	±3 dB
7.3.4.	Radio frequency carrier power	±10%
7.3.5.	Adjacent channel power	±3 dB
7.4.1.	Impedance of artificial loads, combining units, cables, plugs, attenuators, etc.	±5%
7.4.2.	Source impedance of generators and input impedance of measuring receivers	±10%
7.4.3.	Attenuation by attenuators	±0.5 dB
7.5.1.	Temperature	±1°C
7.5.2.	Humidity	±5%

Appendix A

GUIDANCE ON THE USE OF RADIATION TEST SITES

For measurements involving the use of radiated fields, use may be made of a test site in conformity with the requirements of paragraph 3.7. of this Annex. When using such a test site, the following conditions should be observed to ensure consistency of measuring results.

A.1. MEASURING DISTANCE

Evidence indicates that the measuring distance is not critical and does not significantly affect the measuring results, provided that the distance is not less than $\lambda/2$ at the frequency of measurement and the precautions described in this Annex are observed.

Measuring distances of 3 m, 5 m, 10 m and 30 m are in common use in the CEPT countries.

A.2. TEST ANTENNA

Different types of test antennae may be used, since in performing substitution measurements, calibration errors of the test antennae do not affect the measuring results.

Height variation of the test antenna over a range of 1-4 metres is essential in order to find the point at which the radiation is a maximum.

Height variation of the test antenna may not be necessary at the lower frequencies below about 100 MHz.

A.3. SUBSTITUTION ANTENNA

Variations in the measuring results may occur with the use of different types of substitution antennae at the lower frequencies below about 80 MHz. Where a shortened dipole antennae is used at these frequencies, details of the type of antenna used should be included with the results of the tests carried out on the site.

A.4. ARTIFICIAL ANTENNA

The dimensions of the artificial antenna used during case radiation measurements should be small in relation to the sample under test.

In this latter case, a direct connection should be used between the artificial antenna and the test sample.

In cases where it is necessary to use a connecting cable, means should be taken to reduce the radiation from this cable by, for example, the use of ferrite cores.

A.5. AUXILIARY CABLES

The position of auxiliary cables which are not adequately decoupled may cause variations in the measuring results. In order to get reproducible results, cables and wires of auxiliaries are mounted vertically downwards (through a hole in the isolating table or in the base plate of the salt water column) and should be fitted in the upper section with a radiofrequency stopfilter (employing ferrite tubes for example).

Appendix B

This Appendix contains additional information concerning national derogations and options elected for the implementation of Recommendation T/R 20-02. It has been drawn up by the T/WG 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 20-02

Appendix B to Annex I (revised at Cannes 1983)

Paragraph	Administration	Description of variation or choice	Grounds
General	Denmark	Individual licence not required	
	Finland	Recommendation not applied	
	Ireland	Recommendation not applied	
	Spain	Revision planned in near future	
	United Kingdom	Recommendation not applied	
1.	Spain	Utilisation restricted to professional applications	
	Greece	Individual licence	
2.	Spain	Minimum age of 18	
	Greece	Minimum age of 18	
	Norway	Minimum age of 16	
3.	Greece	Recommendation not applied	
4.	Spain	Portable equipment only, with integral antenna	
	Greece	Base stations not authorised for individual use. Portables not authorised	
5.	Greece	Communication between ship and land station not authorised	
5., 6. and 7.	Spain	Communication authorised only between equipment specified in the same licence	
9.	Spain	Provision for type approval only in case of equipment supplied ready-assembled	
	Greece	Provision for type approval in case of radiotelephones following assembly	

T/R 20-02

Appendix B to Annex II (revised at Cannes 1983)

Paragraph	Administration	Description of variation or choice	Grounds
1.	Greece	26.965-27.405 MHz frequency band	
2.	Denmark	Channels from Appendix A and channel 11A (27.095 MHz) to be added. Total: 23 channels Measurements taken at usual temperatures only Amplitude and frequency modulation only	
	Spain	Utilisation of channel Nos. 7, 8, 10, 11, 12, 13, 15, 16, 17 and 20 only	
	Greece	23 channels to be added between 27.155 and 27.395 MHz	
	Norway	Channels from Appendix A and channel 11A (27.095 MHz) to be added. Total: 23 channels	
	Sweden	Channels from Appendix A and channel 11A (27.095 MHz) and 23 (27.255 MHz) to be added. Total: 24 channels	
	Switzerland	12 channels to be added for professional use between 27.425 and 27.905 MHz	
4.	Denmark	Power measuring receiver	
5.	France	AM, FM or SSB	
	Greece	Amplitude modulation authorised, double sideband with full carrier	
	Sweden	SSB authorised on channel 24 (27.235 MHz)	
6.	France	4 W peak for all modulation	
	Spain	Power consumption restricted in all cases to 2 W	
	Greece	(b) Output power of 5 W	
	Norway	(c) Power (c.c.) supplied at transmitter power stage restricted to 2 W	
	Sweden	(a) Maximum apparent radiated power: 0.7 W (b) Maximum output power: 3.5 W (c) Input power (c.c.) not specified	
7.	Spain	Antennae other than integral not authorised	
	Sweden	Gain below 3 dB in relation to $\lambda/2$ dipole	
8.	Spain	Maximum bandwidth restricted to 6 kHz	
9.	Federal Republic of Germany	Temperature extremes: -10° C and $+55^{\circ}$ C	
	Austria	Temperature extremes: -10° C and $+55^{\circ}$ C	Option available
	Belgium	Temperature extremes: -10° C and $+55^{\circ}$ C	Option available
	Denmark	Temperature extremes: -5° C and $+40^{\circ}$ C	Option available
	Spain	Temperature range and power supply voltages not specified	
	France	Temperature extremes: -10° C and $+55^{\circ}$ C (on request: -20° C or -25° C)	Option available
	Greece	Temperature extremes: -10° C and $+55^{\circ}$ C	
	Netherlands	Temperature extremes: -10° C and $+55^{\circ}$ C Power supply voltages: test values: for equipment connected to the mains: $\pm 10\%$ for equipment powered by lead-acid batteries: 1.3 and 0.9 times the nominal value for equipment powered by Leclanché batteries: 0.6 times the nominal value for equipment powered by mercury batteries: 0.9 times the nominal value for equipment powered by other batteries: as indicated by the manufacturer	Option available
	Norway	Temperature extremes: -10° C and $+55^{\circ}$ C	Option available

T/R 20-02

Appendix B to Annex II (revised at Cannes 1983)

Paragraph	Administration	Description of variation or choice	Grounds
9.	Sweden	Temperature extremes: −25°C and +55°C (except in the case of equipment utilised exclusively in locations with controlled temperature: +5°C and +40°C)	Option available
	Switzerland	Temperature extremes: −10°C and +55°C	
10.a	France	Spurious radiation from transmitter specified in 87.5-118 MHz band instead of 87.5-104 MHz band	To protect radionavigation bands in the aeronautical service
10.a/b	Federal Republic of Germany	In addition, restrictions are imposed on the 10 kHz-30 MHz frequency range: 1. by the magnetic component of the interfering field radiated by the equipment and, where relevant, by its wires 2. where relevant, for the voltage produced by conduction in power supply lines (of particular importance for base stations)	Substitution method for frequencies below 30 MHz poses problems
10.a	Spain	0.25 μW for all frequency bands	
	Switzerland	For non-essential transmitter radiation: single limit of 20 nW	

T/R 20-02

Appendix B to Annex III (revised at Cannes 1983)

Paragraph	Administration	Description of variation or choice	Grounds
2.2.1.	Sweden	Distance of at least $\lambda/2$	
2.2.2.	Sweden	Height: 1-4 m above ground	
3.	Norway	Transmitter power measured at extreme power supply values	
4.		Method of adjacent channel power measurement	
	Federal Republic of Germany	Both methods utilised	Option available
	Austria	Both methods possible; power measurement receiver generally utilised	Option available
	Belgium	Spectrum analyser	Option available
	Denmark	Power measurement receiver	Option available
	France	Spectrum analyser	Option available
	Netherlands	Power measurement receiver (tighter filter similar to Rohde and Schwartz NKS receiver also authorised)	
	Sweden	Power measurement receiver (filter specification as proposed by the FTZ)	
	Switzerland	Power measurement receiver	Option available
5.2.	Netherlands	Failure of module component determining transmitter frequency should result in automatic cutoff of the latter. With phase-locked loop systems, transmitter will be inhibited until synchronisation is achieved	
	Switzerland	Temperature extremes: -10 °C and $+55$ °C	
6.2.	Sweden	Measurement range: 30 MHz to 1,000 MHz	
7.2.	Sweden	Measurement range: 100 kHz to 1,000 MHz	
8.1.	Sweden	Also covers transmitters on stand-by	
9.2.4.	Sweden	$\pm$ 1dB	
9.3.1.	Sweden	$\pm$ 20%	
9.3.2.	Sweden	$\pm$ 40%	
9.3.3.	Sweden	$\pm$ 2dB	