INTERIM EUROPEAN TELECOMMUNICATION STANDARD

I-ETS 300 235

March 1994

Source: ETSI TC-RES

Reference: DI/RES-00002

ICS: 33.020

Key words: Radio, testing, CT1

Radio Equipment and Systems (RES); Technical characteristics, test conditions and methods of measurement for radio aspects of cordless telephones CT1

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE
Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE
X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

Tel.: +33 92 94 42 00 - Fax: +33 93 65 47 16

Copyright Notification: No part may be reproduced except as authorized by written permission. The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 1994. All rights reserved.

Whilst every care has been taken in the preparation and publication of this document, errors in content, typographical or otherwise, may occur. If you have comments concerning its accuracy, please write to "ETSI Editing and Committee Support Dept." at the address shown on the title page.

Contents

Blank page

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).

An ETSI standard may be given I-ETS status when it is regarded either as a provisional solution ahead of a more advanced standard, or because it is immature and requires a trial period. The life of an I-ETS is limited, at first, to three years after which it may be converted into a European Telecommunication Standard (ETS), have its life extended for a further two years, be replaced by a new version of the I-ETS or, finally, be withdrawn.

This I-ETS contains text concerning the conformance testing of the equipment to which it relates. This text should be considered solely as guidance, and does not make the I-ETS mandatory.

Blank page

1 Scope

Cordless Telephones (CT1) according to the CEPT Recommendation T/R 24-03 [5] "Radio Characteristics of Cordless Telephones" are widely used throughout Europe. This I-ETS is produced in order to maintain the CEPT T/R 24-03 [5] with respect to the development which has taken place since the introduction of the CEPT Recommendation in 1984.

Equipment according to this I-ETS is in the following designated CT1. CT1 uses the frequency band 914 - 915 MHz paired with 959 - 960 MHz providing 40 duplex channels. This frequency band forms part of the allocation for GSM.

Therefore, in some countries the frequency band 885 - 887 MHz paired with 930 - 932 MHz providing 80 channels has been made available. This equipment is in the following designated CT1+.

Either of these frequency bands is available in many, but not all European countries.

This I-ETS specifies CT1 equipment only. Deviating requirements for CT1+ equipment are contained in Annex B.

The I-ETS provides:

- harmonization on the broadest possible basis, of the radio technical parameters or cordless telephones;

- a basis for the mutual recognition of test reports;

- harmonized test procedures and test conditions for cordless telephones.

Where the fixed part of a cordless telephone is connected to the switched telephone network, requirements have to be met in specifying the network access. These requirements are not part of this I-ETS. Annex C of this I-ETS describes which parameters require different consideration than applied for a wired telephone.

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 of the publication referred to applies.

[1] CCITT Recommendation G.162: "Characteristic of compandors for telephony".

[2] ETS 300 086: "Radio Equipment and Systems (RES); Land Mobile Service".

[3] CCITT Recommendation O.41: "Psophometer for use on telephone type circuits".

[4] CEPT Recommendation T/R 24-01: "Specifications of equipment for use in the Land Mobile Service".

[5] CEPT Recommendation T/R 24-03: "Radio characteristics of cordless telephones".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this I-ETS the following definition applies:

Cordless Telephone (CT1): a telephone terminal connected to an exchange line or an extension line. It consists of at least two parts, fixed and portable respectively, which are connected by a radio link.

3.2 Abbreviations

For the purposes of this I-ETS the following abbreviations apply:

CT	Cordless Telephone
CFP	Cordless Fixed Part
CPP	Cordless Portable Part
PSTN	Public Switched Telephone Network
RF	Radio Frequency

"Manufacturer" in this I-ETS is meant as the party submitting equipment for testing.

4 Principles of operation and general requirements

4.1 Procedure to set up the RF connection between fixed and portable part

Both fixed and portable part comprises a transmitter and a receiver which will perform full duplex operation. When the need for a radio frequency channel arises in any of the parts of a cordless telephone, this part will act in general as follows:

a) the initiating part searches for an idle duplex channel. A channel is considered to be idle if the initiating part of the cordless telephone senses that the radio frequency field strength on that specific channel is below a specified limit;

b) on the idle (duplex) channel, found under a), the initiating part starts transmitting signals to the desired part of the same cordless telephone. These signals contain an identification code which offers at least 999999 different combinations;

c) the receiver of each part of a cordless telephone is constantly scanning, searching for a signal which contains its matching identification code. Upon detection of this code, the receiver stops scanning and initiates its transmitter to return its identification code to the initiating part on this duplex channel;

d) as the receiver of the initiating part detects its matching identification code on the return frequency of the selected duplex channel, the duplex channel becomes available.

4.2 Operating frequencies

Cordless telephones shall be constructed to use all of the following channels of the frequency set CT1.

CT1: Channel number and Transmitting frequencies

	Portable part	Fixed part
1	914,0125 MHz	959,0125 MHz
2	914,0375 MHz	959,0375 MHz
3	914,0625 MHz	959,0625 MHz
	. . .	
	. . .	
	. . .	
38	914,9375 MHz	959,9375 MHz
39	914,9625 MHz	959,9625 MHz
40	914,9875 MHz	959,9875 MHz

The CT1 operating frequency set is not available in all countries (see Annex B).

4.3 General requirements

The performance of a CT shall be such that its interaction with the PSTN shall be as near as possible to that of a wired analog telephone.

4.3.1 Modulation

Only constant envelope analogue angle modulation shall be used.

4.3.2 Antenna

Only the use of a non-directional antenna shall be allowed.

The antenna of the Cordless Fixed Part (CFP) and the antenna of the Cordless Portable Part (CPP), shall be an integral antenna. The CFP and the CPP may be fitted with a permanent internal or a temporary internal 50 Ω RF connector which allows access to the transmitter output and the receiver input for measurement purposes.

The use of an external antenna connector is not allowed.

4.3.3 Companding

To improve the signal to noise ratio and the subjective quality it is suggested that syllabic compression and expanding of the audio signal in accordance with CCITT Recommendation G.162 [1] be incorporated.

4.3.4 Threshold level for field strength and minimum observation time

To determine the availability of a channel during the scanning procedure the parts of a cordless telephone shall be equipped with a detector which provides a sensing facility corresponding to the field strength. A channel shall be considered as not in use if the median level of the field strength is lower than 20 dB relative to 1 microvolt per metre. The minimum observation time before a channel is considered to be available shall be 100 milliseconds.

4.3.5 Scanning time

When a call is initiated, the scanning procedure shall start immediately.

In case the call is initiated by an incoming ringing signal from the telephone line, the scanning procedure shall start within one second after detection of the ringing signal.

When a channel is available, the time between initiating a connection, after the set has been idle for at least 10 seconds, and seizure of the channel shall be no more than 5 seconds. When a free channel is located the initiating part shall transmit identification signals for not longer than 3 seconds. If a matching response has not been received by the initiating part after 3 seconds, it recommences searching for another free channel. In the case of an incoming call this procedure continues as long as there is an incoming ringing signal.

4.3.6 Use of the identification code

4.3.6.1 General

In the procedure to set up the RF connection between the fixed and the portable parts, the initiating part shall transmit a unique identification code until an answer from the desired part containing the same unique identification code is received (see subclauses 4.1 and 4.3.5). The exchange of identification codes shall ensure that only associated parts will lock to each other.

4.3.6.2 The exchange of the code

The identification code shall also be transmitted with every signalling information transmitted over the radio channel from a CPP, which is intended for the telephone line.

Signalling information shall only be forwarded to the telephone line if the identification code, which was received, matches to the identification code of the CFP.

As an alternative to the above, the identification code shall be used to ensure that only the associated fixed and portable parts will lock to each other.

To ensure continued locking during a call this identification procedure shall be exchanged between CFP and CPP and be repeated at intervals not longer than 45 seconds. This may be achieved by in-band signalling or by out-of-band signalling during the conversation.

4.3.6.3 The number of codes and their protection

The number of code combinations shall be at least 999 999. Protection against unauthorized changes of the code shall be incorporated.

4.3.6.4 Wrong identification codes

If wrong identification codes are received twice, the RF connection shall be terminated (see subclause 4.3.8).

4.3.7 Answering incoming calls

When an incoming call is answered by means of a CPP, it shall transmit a coded answer signal, including the identification code. On receipt of this signal the fixed part shall create the appropriate line condition.

4.3.8 Termination of the RF connection and line connection

After termination of the RF connection in accordance with subclauses 4.3.8.1 to 4.3.8.3 the telephone line loop connection should be immediately released, unless the conversation has been taken over by another part.

4.3.8.1 Termination of the RF connection

When the RF connection is to be terminated, the part of the cordless telephone which initiates the termination shall transmit 4 times a coded termination message, including the identification code which would be used for initiating a RF connection. The RF circuit shall then be disconnected and the cordless telephone shall return to the idle condition.

4.3.8.2 Interruption of a connection due to low field strength

A CPP is considered to be "out of range" if the median level of the field strength at a receiving part is at a level less than 5 dB above the stated message acceptance level tested under subclause 8.2. The line connection and RF connection in use by the cordless telephone shall be terminated automatically if the CPP has remained "out of range" for more than 10 ± 1 seconds. Termination shall be preceded by a warning signal.

4.3.9 Communication between CFP and CPP

The equipment may provide means of voice communication and/or signalling between CPPs and CFP in order to perform telephone related functions other than making calls such as intercom, call transfer or control of an answering machine.

If the equipment is used for a purpose other than to set up a connection, the CPP shall be able to signal and receive an incoming call.

4.3.10 Power supply for CPP

The supply voltage is considered to be insufficient if it is lower than the lowest voltage which is mentioned under "extreme test voltages" for the applicable type of power source. If the supply voltage is insufficient it shall not be possible to establish a RF connection. Means shall be provided to indicate the supply voltage situation on a CPP.

4.3.11 Power supply for CFP

The power supply for the fixed part shall not be taken from the PSTN.

5 Test conditions, power sources and ambient temperatures

5.1 Normal and extreme test conditions

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 subclauses 5.2 to 5.5.

5.2 Test power source

During 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 subclauses 5.3.2 and 5.4.2. 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 ± 3 % relative to the voltage at the beginning of each test.

5.3 Normal test conditions

5.3.1 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°Cto +35°C
Relative humidity	20 % to 75 %

5.3.2 Normal test power source

5.3.2.1 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 testing according to this I-ETS, the nominal voltage shall be the declared voltage or any of the declared voltages for which the equipment was designed. The frequency of the test power source shall be the nominal ac frequency.

5.3.2.2 Other power sources

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

5.4 Extreme test conditions

5.4.1 Extreme temperatures

For tests at extreme temperatures, measurements shall be made in accordance with the procedures specified in subclause 5.5, at the following upper and lower temperatures:

0°C to +55°C

5.4.2 Extreme test voltages

5.4.2.1 Mains voltage and frequency

The extreme test voltage for equipment to be connected to an ac mains source shall be the nominal mains voltage ± 10 %. The frequency shall be an ac frequency between 49 and 51 Hz.

5.4.2.2 Other power sources

The lower extreme test voltages for equipment with power sources using the following batteries shall be:

- for the Leclanché or the lithium type of battery: 0,85 times the nominal voltage of the battery;

- for the mercury or nickel-cadmium type of battery: 0,9 times the nominal voltage of the battery.

No upper extreme test voltages apply.

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 test laboratory and shall be recorded with the results.

5.5 Procedure for test at extreme temperatures

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.

In the case of equipment containing temperature stabilization circuits designed to operate continuously, the temperature stabilization circuits may be switched on for 15 minutes after thermal balance has been obtained, and the equipment shall then meet the specified requirements. For such equipment the manufacturer shall provide for the power source circuit feeding the crystal oven to be independent of the power source of the rest of the equipment.

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 test laboratory, 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.

5.5.1 Procedure for equipment designed for continuous operation

As a CT is being used for continuous operation, the test procedure shall be as follows.

Before tests at the upper extreme temperature the equipment shall be placed in the test chamber and left until thermal balance is attained. The equipment shall then be switched on in the transmit condition for a period of half an hour after which the equipment shall meet the specified requirements.

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

6 General conditions

6.1 Arrangements for test signals applied to the receiver

Sources of test signals are applied to the receiver via an internal antenna connector or a test antenna (subclause 6.8).

If no temporary or permanent internal antenna connector is available, then the test fixture (subclause 6.7) shall be used instead.

The signal sources shall in all cases present an impedance of 50 Ω.

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

The effects of any intermodulation products and noise produced in the signal generators should be negligible.

6.2 Receiver circuitry

6.2.1 Receiver mute or squelch circuit

The receiver mute or squelch circuit shall be made inoperative for the duration of the tests.

6.3 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 this I-ETS are met. With normal test modulation (subclause 6.4) the audio output power shall be measured in a resistive load, simulating the load with which the receiver normally operates.

The value of this load shall be:

- in the case of receiver measurements on the CPP: as declared by the manufacturer;

- in the case of receiver measurements on the CFP: 600 Ω.

6.4 Normal test modulation

For normal test modulation, the modulation frequency shall be 1 kHz and the resulting frequency deviation shall be ± 3 kHz.

6.5 Encoder for receiver measurements

To facilitate measurements on the receiver, an encoder for the signalling system should accompany the model submitted, complete with details of the normal modulation process. The encoder will be used to modulate a signal generator for use as a test signal source.

If possible, the encoder should be capable of operation in a repetitive mode, with intervals between each code that are not less than the reset time of the receiver.

Complete details of all codes and code format(s) shall be given.

6.6 Normal coded test signal

The normal coded test signals shall be trains of correctly coded signals, separated from each other by a time of not less than the reset time of the receiver. This signal shall be that, as agreed between the manufacturer and test laboratory, which requires the greatest radio frequency occupied bandwidth. Details of this test signal shall be included in the test report.

The encoder, which is associated with the transmitter, shall be capable of supplying the normal coded test signal. If possible this should be continuous modulation for the duration of the measurements.

6.7 Test fixture

The manufacturer may be required to supply a test fixture suitable to allow relative measurements to be made on the submitted sample.

The test laboratory may provide its own test fixture.

A test fixture shall provide a 50 Ω radio frequency terminal at the working frequencies of the equipment to the measuring instruments.

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

The characteristics of interest to the test laboratory will be that:

a) the coupling loss shall not be excessive, that is, not greater than 20 dB;

b) the variation of coupling loss with frequency shall not cause errors exceeding 2 dB in the operating frequency band in measurements using the test fixture;

c) the coupling device shall not include any non-linear elements.

6.8 Test site and general arrangement for measurements involving the use of radiated fields

6.8.1 Test site

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

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 non-conducting 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.

The test site shall be large enough to allow the erection of a measuring or transmitting antenna at a distance of at least 3 metres.

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 measurement results.

A guidance on the use of radiation test sites is given in ETS 300 086 [2], Annex A.

6.8.2 Optional indoor test site

When the frequency of the signals being measured is greater than 80 MHz, use may be made of an indoor site. If this alternative is used, this shall be recorded in the test report. The measurement site may be a laboratory room with a minimum area of 6 m by 7 m and at least 2,7 m 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 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 the reflections from the opposite wall and from the floor and ceiling in case of horizontally polarized measurements. Similarly, the corner reflector reduces the effects of reflections from the side walls for vertically polarized measurements. For the lower part of the frequency range (below approximately 175 MHz) no corner reflector or absorbent barrier is needed. For practical reasons, the lambda/2 antenna in ETS 300 086 [2], Annex A, figure A.2 may be replaced by an antenna of constant length, provided that the length is between lambda/4 and lambda at the frequency of measurement 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, measuring receiver, substitution antenna and calibrated generator are used in a way similar to that of the general method.

To ensure that the 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 ± 0,1 m in the direction of the 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 re-positioned until a change of less than 2 dB is obtained.

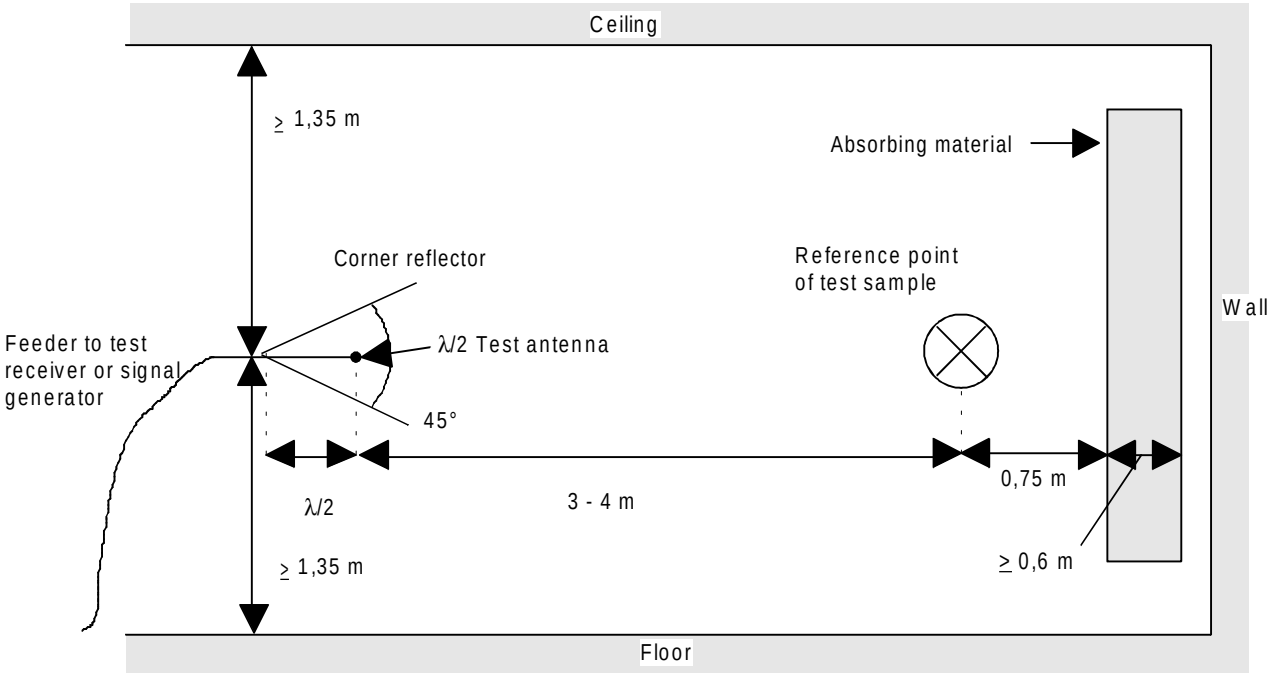

Figure 1: Indoor site arrangement (shown for horizontal polarization)

6.8.3 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 the horizontal or vertical polarization and for the height of its center above ground to be varied over the range 1 - 4 metres. Preferably a test antenna 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. When necessary (for receiver measurements) the test receiver is replaced by a signal source.

6.8.4 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. The center of this antenna shall coincide with the reference point of the test sample it has replaced. This reference point shall be the volume center of the sample when its antenna is mounted inside the cabinet, or the point where an external 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 measurement and to a calibrated measuring receiver when the site is used for measurement of receiver characteristics.

The signal generator and the receiver shall be operating at the frequencies under investigation and shall be connected to the antenna through suitable matching and balancing networks.

6.8.5 Auxiliary cables

The position of auxiliary cables (power supply and microphone cables etc.) 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), and shall be fitted at the upper part with a radio frequency stop filter (for instance using ferrite cores).

6.9 Interpretation of measurement results

The interpretation of the results recorded in a test report for the measurements described in this I-ETS shall be as follows:

- the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of this I-ETS;

- the measurement uncertainty value for the measurement of each parameter shall be included in the test report;

- the recorded value of the measurement uncertainty shall be, for each measurement, equal to or lower than the figures given in Clause 11;

- the test report shall include references to methods used for determination of the measurement uncertainties.

7 Transmitter

7.1 Frequency error

7.1.1 Definition

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

7.1.2 Method of measurement

Either of the following two arrangements may be used:

- the equipment shall be placed in a test fixture (subclause 6.7) connected to a non-reactive non-radiating load of 50 Ω; or

- the transmitter is connected to a non-reactive non radiating load of 50 Ω through the internal antenna connector.

The carrier frequency shall be measured in the absence of modulation. The measurement shall be made under normal test conditions (subclause 5.3) and extreme test conditions (subclause 5.4).

If the equipment is constructed so that during the procedure to setup the RF connection, the frequency is determined by a separate technique, the measurements shall be repeated while the frequency is determined by that technique.

7.1.3 Limits

The frequency error measured at least one second after a channel has been selected shall not exceed a value of ± 2,5 kHz.

7.2 Carrier power

7.2.1 Definition

For the purpose of this I-ETS, the carrier power is the effective radiated power in the direction of maximum field strength under specified conditions of measurement (subclause 6.8) in the absence of modulation.

The rated carrier power is the effective radiated power declared by the manufacturer.

7.2.2 Method of measurement under normal test conditions

On a test site, fulfilling the requirements of subclause 6.8, the sample shall be placed on the support in a position:

a) for equipment with internal antenna, it shall stand vertically, with that axis vertical which is closest to vertical in normal use;

b) for equipment with rigid external antenna, the antenna shall be vertical;

c) for equipment with non-rigid external antenna, with the antenna extended vertically upwards by a non-conducting support.

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

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

NOTE: This maximum may be a lower value than the value obtainable at heights outside the specified limits.

The transmitter shall be replaced by the substitution antenna, as defined in subclause 6.8 and the test antenna raised or lowered as necessary to ensure that the maximum signal is still received. The input signal 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 carrier power is equal to the power supplied to the substitution antenna, increased by the known relationship if necessary.

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

7.2.3 Limits

The effective radiated power of the equipment shall not exceed 10 mW.

7.3 Adjacent channel power

7.3.1 Definition

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

7.3.2 Method of measurement

7.3.2.1 General remarks

When using the test fixture for this measurement, it is important to ensure that direct radiation from the transmitter to the power measuring receiver or spectrum analyzer does not affect the results of the measurements.

7.3.2.2 Method of measurement using a power measuring receiver

The adjacent channel power shall be measured with a power measuring receiver which conforms to subclause 7.3.2.3 (referred to in subclauses 7.3.2.2 and 7.3.2.3 as the "receiver").

a) Either of the following two arrangements may be used:

   - the equipment shall be placed in a test fixture (subclause 6.7) connected to the input of the "receiver"; or

   - the transmitter is connected to the input of the "receiver" through the internal antenna connector.

   The transmitter shall be operated at the carrier power determined in subclause 7.2 under normal test conditions (subclause 5.3). The radio frequency output shall be applied to the input of the "receiver" at a level that is appropriate.

b) With the transmitter unmodulated the tuning of the "receiver" shall be adjusted so that a maximum response is obtained. This is the 0 dB response point. The receiver attenuator setting and the reading of the meter shall be recorded.

   NOTE: The measurement may be made with the transmitter modulated with normal test modulation (subclause 6.4), in which case this fact shall be recorded with test results.

c) The tuning of the receiver shall be adjusted away from the carrier so that the "receiver" - 6 dB response nearest to the transmitter carrier frequency is located at a displacement from the nominal carrier frequency of 17 kHz.

d) The transmitter shall be modulated at 1 250 Hz at a level which is 20 dB greater than that required to produce a frequency deviation of ± 3 kHz.

e) The "receiver" variable attenuator shall be adjusted to obtain the same meter reading as in step b) or a known relation to it.

f) The ratio adjacent channel power to carrier power is the difference between the attenuator settings in steps b) and e), corrected for any differences in the reading of the meter.

g) The measurement shall be repeated with the "receiver" tuned to the other side of the carrier.

h) The measurements shall be repeated while the transmitter is modulated with the normal coded test signal (subclause 6.6). If possible this should be continuous modulation for the duration of the measurement.

7.3.2.3 Power measuring receiver specification

The power measuring receiver consists of a mixer, an IF filter, an oscillator, an amplifier, a variable attenuator and an rms value indicator. Instead of the variable attenuator with the rms value indicator it is also possible to use an rms voltmeter calibrated in dB as the rms value indicator. The technical characteristics of the power measuring receiver are given below.

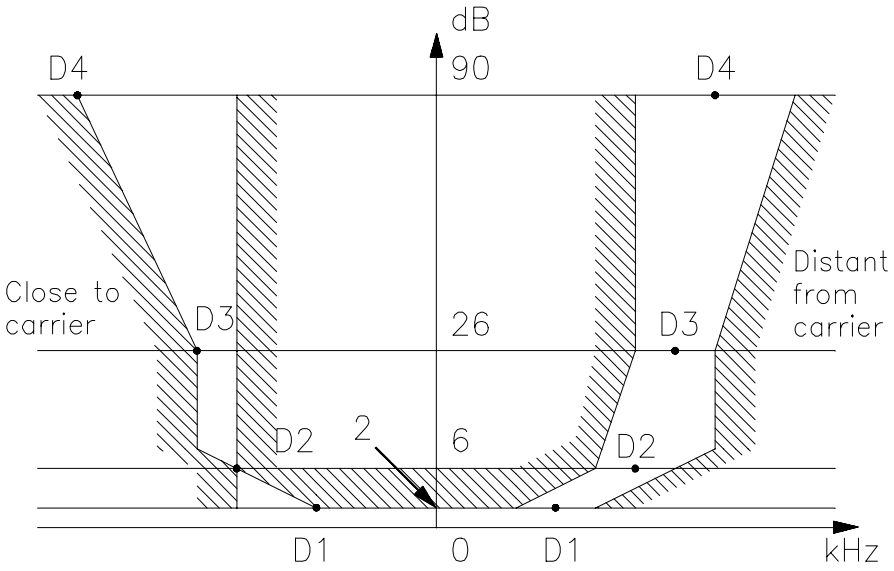

Figure 2: IF filter selectivity characteristic

The selectivity characteristic shall keep the following frequency separations from the nominal center frequency of the adjacent channel.

The attenuation characteristic shall show the frequency separations from the nominal center frequency of the adjacent channel, as given in column 2 of table 1.

The attenuation points on the slope towards the carrier shall not exceed the tolerances, as given in column 3 of table 1.

The attenuation points on the slope, distant from the carrier, shall not exceed the tolerances, as given in column 4 of table 1.

Table 1

1	2	3	4
attenuation points	frequency separation	tolerance towards carrier	tolerance distant from carrier
D1 (2dB)	5 kHz	+ 3,1 kHz	± 3,5 kHz
D2 (6dB)	8 kHz	± 0,1 kHz	± 3,5 kHz
D3 (26dB)	9,25 kHz	- 1,35 kHz	± 3,5 kHz
D4 (90dB)	13,25 kHz	- 5,35 kHz	+ 3,5 kHz and - 7,5 kHz

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

The variable attenuator shall have a minimum range of 80 dB and a resolution of 1 dB.

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

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 ≤ - 90 dB referred to the carrier of the oscillator.

7.3.4 Limits

The adjacent channel power shall not exceed a value of 10 nW.

7.3A Frequency deviation

The frequency deviation is the maximum difference between the instantaneous frequency of the modulated radio frequency signal and the carrier frequency in the absence of modulation.

7.3A.1 Maximum permissible frequency deviation

7.3A.1.1 Definition

The maximum permissible frequency deviation is the maximum value of frequency deviation given in this I-ETS.

7.3A.1.2 Method of measurement

Either of the following two arrangements may be used:

- the equipment shall be placed in a test fixture (subclause 6.7) connected to a non-reactive non-radiating load of 50 Ω; or

- the transmitter is connected to a non-reactive non radiating load of 50 Ω through the internal antenna connector.

The frequency deviation shall be measured by sampling the signal fed to a non-reactive non-radiating load of 50 Ω by means of a deviation meter suitable for the measurement of the maximum deviation including that due to any harmonics and intermodulation products which may be produced in the transmitter. The modulation frequency shall be varied between the lowest frequency considered to be appropriate, and 3 kHz. The level of this test signal shall be 20 dB above the level of the normal test modulation (subclause 6.4).

7.3A.1.3 Limits

The maximum permissible frequency deviation shall be ± 5 kHz.

7.3A.2 Response of the transmitter at modulation frequencies above 3 kHz

7.3A.2.1 Definition

The response of the transmitter at modulation frequencies above 3 kHz is the frequency deviation expressed as a function of modulation frequencies above 3 kHz.

7.3A.2.2 Method of measurement

Either of the following two arrangements may be used:

- the equipment shall be placed in a test fixture (subclause 6.7) connected to a non-reactive non-radiating load of 50 Ω; or

- the transmitter is connected to a non-reactive non radiating load of 50 Ω through the internal antenna connector.

The transmitter shall be operated under normal test conditions (subclause 5.3). The transmitter shall be modulated with normal test modulation (subclause 6.4). With a constant input level of the modulation signal, the modulation frequency shall be varied from 3 kHz to a frequency of 25 kHz and the frequency deviation shall be measured by means of a deviation meter as described in subclause 7.4.1.2.

7.3A.2.3 Limits

The frequency deviation at modulation frequencies between 3 kHz and 6 kHz shall not exceed the frequency deviation at a modulation frequency of 3 kHz. At 6 kHz the deviation shall be less than ± 2,5 kHz. The frequency deviation at modulation frequencies between 6 kHz and 25 kHz shall not exceed that given by a linear response of frequency deviation (in decibels) against modulation frequency, starting at a point where the modulation frequency is 6 kHz and where the deviation is equal to ± 2,5 kHz and having a slope of 14 dB per octave, the frequency deviation is diminishing as the modulation frequency is increased.

7.4 Intermodulation attenuation

This requirement applies only to transmitters to be used in the fixed part of the Cordless Telephone.

7.4.1 Definition

For the purpose of this I-ETS the intermodulation attenuation is a measure of the capability of the transmitter to inhibit the generation of signals in its non-linear elements caused by the presence of the carrier and an interfering signal reaching the transmitter via its antenna or by irradiation.

7.4.2 Methods of measurement

Either of the following two arrangements may be used:

- the equipment shall be placed in a test fixture (subclause 6.7) connected to a non-reactive non-radiating load of 50 Ω; or

- the transmitter is connected to a non-reactive non-radiating load of 50 Ω through the internal antenna connector.

Initially, the fixed part of the CT shall be operated as the source in a measuring arrangement as explained in figure 3. The power of the transmitter shall be measured with a selective measuring device.

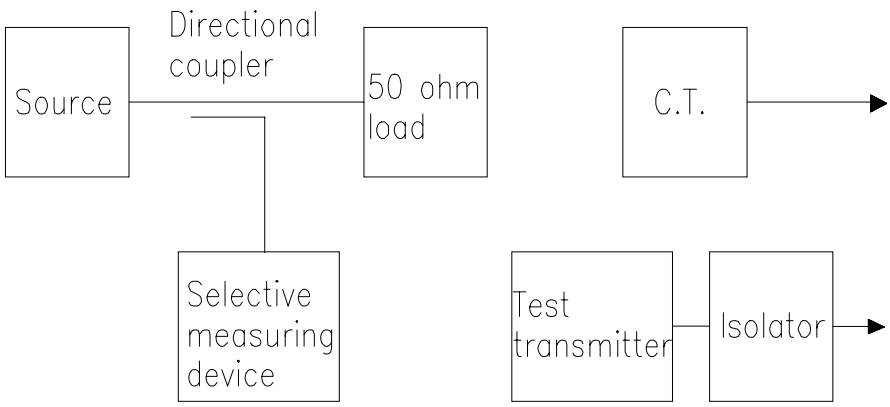

Figure 3

Then, the source shall be replaced by a test transmitter with an isolator at its outlet. The frequency of this test transmitter shall be set within 1 to 4 neighboring channels above and below the frequency of the fixed part of the cordless telephone. The power of the test transmitter shall be adjusted to yield a reading of 30 dB below the power of the fixed part of the CT.

Subsequently the 50 Ω load shall be replaced by the test transmitter and isolator without changing its frequency and power settings. The fixed part of the CT shall be connected in place of the source.

The intermodulation attenuation shall be measured as the difference between the CT carrier power and the strongest intermodulation product.

7.4.3 Limits

The ratio of transmitter power and intermodulation power shall be at least 45 dB.

7.5 Spurious emissions

7.5.1 Definition

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

7.5.2 Method of measurement

On a test site, fulfilling the requirements of subclause 6.8, the sample shall be placed at the specified height on the support. The transmitter shall be operated without modulation at the carrier power as specified under subclause 7.2. Radiation of any spurious components shall be detected by the test antenna and receiver, over the frequency range 25 MHz - 4 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 the normal coded test signal. If possible this should be continuous modulation for the duration of the measurement.

The measurements shall be repeated with the transmitter modulated with normal test modulation (subclause 6.4).

The measurement shall be repeated with the transmitter in the "stand-by" position.

7.5.3 Limit

The power of any spurious emission shall, on any frequency and in all polarization planes, not exceed 4 nW in the frequency range up to 1 GHz and shall not exceed 250 nW in the frequency range 1 GHz - 4 GHz. In the case of measurements made in the "stand-by" position the limit is 2 nW in the frequency range up to 1 GHz and 20 nW in the frequency range 1 GHz - 4 GHz. The power of any spurious emission in the frequency ranges 65,9 - 74,0 MHz and 87,5 - 108 MHz which may be modulated by understandable voice communication, shall not exceed a value of 20 pW.

8 Receiver

During receiver measurements the transmitter of the cordless telephone shall be in operation except during the measurement of spurious radiations.

During the receiver measurements a possible compressor and/or expander in the equipment is allowed to be operating.

For the receiver measurements, test fixture or internal connector measurements are specified, except for measurements of:

- receiver sensitivity (subclause 8.1);

- spurious response rejection (subclause 8.5).

For test fixture or connector measurements, the RF input level is obtained from field strength values using a measured antenna factor. The antenna factor is measured during receiver sensitivity measurements subclause 8.1.

8.1 Receiver sensitivity

8.1.1 Definition

The sensitivity of the receiver is the minimum field strength of a signal, at the nominal frequency of the receiver, with normal test modulation (subclause 6.4) which will produce:

- an audio frequency output power of at least 50 % of the rated output power (subclause 6.3);

- a SINAD ratio of 20 dB measured at the output of the receiver through a telephone psophometric weighting network; in accordance with CCITT Recommendation O.41 [3].

  NOTE: SINAD ratio: SINAD = (S+N+D)/(N+D),
  where: S - Signal power
  N - Noise power
  D - Distortion power.

The SINAD meter needed for the receiver measurements is specified in CEPT Recommendation TR 24-01 [4].

8.1.2 Method of measurement

On a test site, fulfilling the requirements of subclause 6.8, the sample shall be placed on the support in the following position:

a) for equipment with internal antenna, it shall stand vertically, with that axis vertical which is closest to vertical in normal use;

b) for equipment with rigid external antenna, the antenna shall be vertical;

c) for equipment with non-rigid external antenna, with the antenna extended vertically upwards by a non-conducting support.

The test antenna (subclause 6.8.2) shall be at a similar distance from the receiver under test as was used between the transmitter and the test antenna in the carrier power measurement in subclause 7.2.2. The test signal fed to the test antenna from the signal source shall have a frequency equal to the nominal frequency of the receiver and shall be modulated with the normal test modulation.

An audio frequency output load, a SINAD meter and a psophometric telephone weighting network in accordance with CCITT Recommendation O.41 [3], shall be coupled to the receiver loudspeaker/transducer via an audio test line.

Where possible, the receiver volume control shall be adjusted to give at least 50 % of the rated output power, subclause 6.3, or 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 output level shall be reduced until the SINAD ratio of 20 dB is obtained.

For verification purposes an acoustic coupler, as described in Annex A, shall be used to make certain that the audio test line does not affect the measurement.

The test antenna shall be raised and lowered through the specified range of height to find the lowest level of the test signal, that produces a SINAD ratio of 20 dB. The operation shall be repeated while the equipment under test is rotated through 360 degrees.

The input signal level to the test antenna shall be maintained.

The receiver shall be replaced by a substitution antenna as defined in subclause 6.8.3.

The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the receiver.

The substitution antenna shall be connected to a calibrated measuring receiver.

The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.

The signal level measured with the calibrated measuring receiver shall be recorded as the field strength in dBμV/m.

The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

The measure of the receiver sensitivity expressed as field strength is the minimum of the two signal levels recorded as the input to the calibrated measuring receiver, corrected for the gain of the antenna if necessary.

The measurement shall be made under normal test conditions (subclause 5.3) and extreme test voltages (subclause 5.4.2 only).

With extreme test voltages, a variation of the receiver output power of ± 3 dB relative to the value obtained under normal test conditions may be allowed.

8.1.3 Limits

The receiver sensitivity expressed as field strength shall not exceed 30 dB relative to 1 microvolt per metre under normal test conditions and 36 dB relative to 1 microvolt per metre with extreme test voltages.

8.2 Message acceptance

8.2.1 Definition

Message acceptance is the capability of the receiver and the decoder to decode the normal coded test signal at a signal level specified by the manufacturer.

8.2.2 Method of measurement

Either of the two following arrangements are possible:

- the receiver shall be placed in a test fixture. A signal generator shall be connected to the fixture;

- the receiver is connected to a signal generator through the internal antenna connector.

The generator shall be set to the nominal frequency and modulated with the normal coded test signal. The output level of the generator shall be adjusted to the level at the receiver input stated by the manufacturer, which shall not be higher than an equivalent of 25 dBμV/m. The normal coded test signal shall be transmitted 40 times whilst observing in each case whether or not a successful response is obtained.

8.2.3 Limit

At least 80 % of the transmitted messages shall be decoded successfully.

8.3 Co-channel rejection

8.3.1 Definition

The co-channel rejection 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, both signals being at the nominal frequency of the receiver.

8.3.2 Method of measurement

Either of the two following arrangements are possible:

- the receiver shall be placed in a test fixture; or

- the receiver is connected through the internal antenna connector.

The two input signals shall be connected to the test fixture or receiver input via a combining network.

The wanted signal shall have normal test modulation (subclause 6.4). The unwanted signal shall be modulated with a frequency of 400 Hz at a deviation of ± 3 kHz.

Both input signals shall be at the nominal frequency of the receiver under test and the measurement repeated for displacements of the unwanted signal of up to 3 kHz.

Initially the unwanted input signal shall be switched off and the wanted input signal shall be adjusted to a level of 33 dBμV/m at the receiver input. The unwanted signal shall then be switched on and the input level shall be adjusted until the SINAD ratio (psophometrically weighted) at the output of the receiver is reduced to 20 dB.

The co-channel rejection ratio shall be expressed as the ratio in dB, of the level of the unwanted signal to the level of the wanted signal at the test fixture input, resp. the internal receiver input connector, for which the above-mentioned reduction of the SINAD ratio occurs.

8.3.3 Limit

The co-channel rejection ratio at any signal displacement within the specified range shall be greater than - 14 dB.

8.4 Adjacent channel selectivity

8.4.1 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 that spacing between adjacent channels for which the equipment is intended.

8.4.2 Method of measurement

Either of the two following arrangements are possible:

- the receiver shall be placed in a test fixture; or

- the receiver is connected through the internal antenna connector.

The two input signals shall be connected to the test fixture or receiver input via a combining network.

The wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation (subclause 6.4). The unwanted signal shall be modulated with a frequency of 400 Hz at a deviation of ± 3 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 shall be adjusted to a level of 33 dBµV/m at the receiver input. The unwanted signal shall be switched on and the level adjusted until the SINAD ratio at the output of the receiver, psophometrically weighted, is reduced to 20 dB.

This measurement shall be repeated with the 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 of the ratios in dB for the upper and lower adjacent channels of the level of the unwanted signal to the level of the wanted signal.

8.4.3 Limit

The ratio obtained in the measurement for adjacent channel selectivity shall be greater than 51 dB.

8.5 Spurious response rejection

8.5.1 Definition

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

8.5.2 Method of measurement

On a test site fulfilling the requirements of subclause 6.8., the receiver shall be placed in the position used for the tests under subclause 8.1.2. The test signal, fed to the test antenna from the signal source, shall be modulated with normal test modulation. A second antenna, supplying the unwanted signal to the receiver, is placed at a distance of at least 5 metres from the test antenna with the wanted signal. The second antenna shall initially be orientated for vertical polarization. The unwanted signal, modulated with a 400 Hz tone resulting in 3 kHz deviation, is initially switched off.

Maintaining the test antenna and the Equipment Under Test (EUT) in the position where the maximum SINAD ratio was found, subclause 8.1.2, the output level of the wanted signal is adjusted to create a field strength of 33 dBμV per metre around the integral antenna of the receiver. The SINAD ratio produced is recorded as X dB.

The output level of the unwanted signal is adjusted to create a field strength equal to 80 dB above the receiver sensitivity, subclause 8.1, around the integral antenna. The height of the second antenna is adjusted until the SINAD ratio is decreased to a minimum. The EUT is rotated through 360 degrees, in the horizontal plane, and the angle corresponding to the minimum SINAD ratio is recorded as Y degrees.

The unwanted signal is switched off and the wanted signal is adjusted to produce a SINAD ratio of the previously recorded X dB. The unwanted signal is then adjusted until the SINAD ratio is decreased to 20 dB. The field strength at the EUT of the unwanted signal is determined by replacing the EUT by a calibrated antenna of a field strength meter. The field strength is recorded as Z dBμV per metre.

Changing the second antenna as necessary for each frequency band, adjust the frequency of the unwanted signal generator over the range 30 MHz - 2 GHz. The measurement is repeated for the second antenna orientated for horizontal polarization.

For verification purposes an acoustic coupler, as described in Annex A, shall be used to make certain that the audio test line does not affect the measurement.

The difference between the recorded Z dBμV per metre field strength and a field strength of 33 dBμV per metre is a measure of the spurious response rejection. It is expressed as a ratio in dB.

8.5.3 Limit

At any frequency separated from the nominal frequency of the receiver by more than one channel spacing, the spurious response rejection shall be greater than 56 dB.

8.6 Intermodulation rejection

8.6.1 Definition

The intermodulation rejection is a measure of the capability of a receiver to inhibit the generation of inband signals caused by the presence of two or more signals at unwanted frequencies.

8.6.2 Method of measurement

Either of the two following arrangements are possible:

- the receiver shall be placed in a test fixture; or

- the receiver is connected through the internal antenna connector.

Three signal generators A, B and C shall be connected to the test fixture resp. receiver input via a combining network.

Initially signal generators B and C shall be switched off. The signal from signal generator A shall be at the nominal frequency of the receiver and shall have normal test modulation (subclause 6.4). The input to the test fixture from signal generator A shall be adjusted to a level of 33 dBμV/m at the receiver input. Where possible the receiver volume control shall be adjusted to give 50 % of the rated output as defined in subclause 6.3 and in the case of stepped volume controls, to the first step that provides an output power of at least 50 % of the rated power output.

The signal generator B shall be unmodulated. Signal generator B shall be adjusted to the frequency separated by the channel separation (25 kHz) above (or below) the nominal frequency of the receiver. Signal generator C shall be modulated with a frequency of 400 Hz with a deviation of ± 3 kHz. Signal generator C shall be adjusted to the frequency separated by two times the channel separation above (or below) the nominal frequency of the receiver. The level of the output signals of generators B and C shall be kept equal and increased until the unwanted signals (generators B and C) cause a reduction to 20 dB SINAD ratio at the receiver output measured through a telephone psophometric weighting network [3]. The frequency of generator C shall be adjusted carefully to maximize the degradation. The amplitude of generators B and C shall be readjusted to reobtain the 20 dB SINAD ratio at the receiver output. The intermodulation rejection ratio is the ratio in dB of the output level of the two generators B and C to the level of generator A.

The measurements may be repeated for frequency separations of up to 4 and 8 times the channel separation.

8.6.3 Limit

The intermodulation rejection ratio shall not be less than 56 dB. For the frequency separation of 1 (generator B) and 2 (generator C) times the channel separation the intermodulation rejection ratio shall not be less than 51 dB.

8.7 Spurious radiations

8.7.1 Definition

Spurious radiations from receivers are radiations at any frequency, radiated by the equipment and its antenna.

8.7.2 Method of measurement

On a test site, fulfilling the requirements of subclause 6.8, the sample shall be placed at the specified height on the support. The receiver shall be operated from the normal power source. Radiation of any spurious components shall be detected by the test antenna and receiver.

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.

At each spurious radiation in the frequency range and 87,5 - 108 MHz it shall be investigated whether or not this spurious emission may be modulated with understandable voice communication. The measurement shall be repeated with the test antenna in the orthogonal polarization plane. The measurement shall extend over a frequency range of 25 MHz to 4 GHz.

8.7.3 Limit

The power of any spurious radiation of the receivers shall not exceed 2 nW in the frequency range up to 1 GHz and 20 nW in the frequency range 1 GHz - 4 GHz.

The power of any spurious radiation in the frequency range 87,5 - 108 MHz which may be modulated by understandable voice communication, shall not exceed a value of 20 pW.

9 Presentation of equipment for testing purposes

9.1 Choice of model for testing

The manufacturer shall provide a production model of the equipment for testing. If type approval is given on the basis of tests on a preliminary model, then the corresponding production models must be identical in all respects with the preliminary model tested.

9.2 Channel selection

Any channel within the specified frequencies given in this I-ETS may be selected for testing. Tests shall be carried out on all the channels which the test laboratory judges necessary.

9.3 Equipment with internal temporary or internal permanent antenna connector

The means to access and/or implement the internal permanent or internal temporary antenna connector shall be stated by the manufacturer with the aid of a diagram.

The fact that use has been made of an internal antenna connection to facilitate measurements shall be recorded in the test report.

The manufacturer, or an authorized representative, may submit one set of equipment with the normal antenna connected, to enable the radiated measurements to be made.

The manufacturer, or an authorized representative, shall attend the test laboratory at conclusion of the radiated measurements, to disconnect the antenna and fit the temporary internal connector.

The test laboratory staff shall not connect or disconnect any temporary internal antenna connector.

Alternatively the manufacturer, or an authorized representative, may submit two sets of equipment to the test laboratory, one fitted with a internal temporary antenna connector with the antenna disconnected and the other with the antenna connected.

It shall be agreed between the test laboratory and the manufacturer, or an authorized representative, which of the alternatives shall be used.

Each equipment shall be used for the appropriate tests.

9.4 Audio and power supply connections

The manufacturer shall provide means of replacing the power source by external power supplies.

The manufacturer shall also provide means of making external connections to the audio frequency input and output on the CPP. This may be done either by a connector or by a temporary audio connection as described in subclause 9.4.1. The test laboratory and the manufacturer shall agree on the method to be used.

9.4.1 Temporary audio connections

This subclause applies to the CPP only.

If the equipment is not provided with a means to externally connect the transmitter and receiver audio circuitry, the equipment submitted for test shall be temporarily fitted with such connection. The connection shall be made such that it has the least possible influence on the field strength measurements. The connection shall be made in parallel so that the transducers stay in place.

If two sets are submitted for test according subclause 10.3, then both sets shall be fitted with the connection.

10 Measurement uncertainties

Absolute measurement uncertainties: maximum values

Valid up to 1 GHz for RF parameters unless otherwise stated.

RF frequency $< \pm 1*10^{-7}$

RF power $< \pm 0,75$ dB

Maximum frequency deviation:

- within 300 Hz to 6 kHz of audio frequency $< \pm 5$ %
- within 6 kHz to 25 kHz of audio frequency $< \pm 3$ dB

Deviation limitation $< \pm 5$ %

Adjacent channel power $< \pm 5$ dB

Audio output power $< \pm 0,5$ dB

Sensitivity at 20 dB SINAD $< \pm 3$ dB

Two-signal measurement, valid to 4 GHz $< \pm 4$ dB

Three-signal measurement $< \pm 3$ dB

Radiated emission of transmitter, valid to 4 GHz $< \pm 6$ dB

Radiated emission of receiver, valid to 4 GHz $< \pm 6$ dB

Transmitter intermodulation $< \pm 3$ dB

Annex A (normative): Acoustic coupler

When carrying out measurements of receiver sensitivity and receiver spurious response rejection for the requested verification the audio output shall be monitored by acoustically coupling the audio signal from the receiver loudspeaker/transducer to the test microphone. On the radiation test site all conducting materials shall be placed below the ground surface and the acoustic signal is conveyed from the receiver to the test microphone in a non-conducting acoustic pipe.

The following description suggests an example of such an acoustic pipe.

The acoustic pipe shall have an appropriate length. The acoustic pipe shall have an inner diameter of 6 mm and a wall thickness of 1,5 mm. A plastic funnel of a diameter corresponding to the receiver loudspeaker/transducer shall be attached to the receiver surface centered in front of the receiver loudspeaker/transducer. The plastic funnel shall be very soft at the attachment point to the receiver in order to avoid mechanical resonance. The narrow end of the plastic funnel shall be connected to the one end of the acoustic pipe and the test microphone to the other.

Annex B (informative): Technical characteristics, test conditions and methods of measurement for radio aspects of cordless telephones CT1+

This informative annex applies to cordless telephones providing 80 channels in the frequency band 885 - 887 MHz and 930 - 932 MHz, also designated CT1+.

The following deviations from CT1 cordless telephones apply:

Channel number and Transmitting frequencies

	Portable part	Fixed part
1	885,0125 MHz	930,0125 MHz
2	885,0375 MHz	930,0375 MHz
3	885,0625 MHz	930,0625 MHz
	...	
	...	
	...	
78	886,9375 MHz	931,9375 MHz
79	886,9625 MHz	931,9625 MHz
80	886,9875 MHz	931,9875 MHz

For the frequency band of CT1+ the equipment may work with fixed blocks of more than 39 channels, if the equal use of all channels is maintained.

Apart from the different frequencies, all other clauses of the CT1 standard apply for CT1+ equipment, too.

Due to the fact, that the operating frequencies of CT1 are not available in all countries, the above frequency set may be used.

The situation may change due to the introduction of GSM. Therefore the manufacturer should seek information about the actual operating frequencies from the national authorities.

Annex C (informative): Additional requirements

Test methods for audio frequency response and harmonic distortion, linearity and overall S/N ratio of the cordless telephone are given in the following subclause.

C.1 Definitions

The definitions of the audio frequency response, linearity and of the harmonic distortion are the same as those applicable to a normal telephone set.

Instead of the S/N ratio measurement, the noise level at the telephone line and at the CPP speaker should be measured.

C.2 Method of measurement

The method of measurement which is used for a normal telephone set should also be applied for the two parts of the cordless telephone. These should be placed on isolating supports on a test site with a distance of 1 metre between CFP and CPP. Measurements of the frequency response and linearity should be carried out within the audio frequency range 300 - 3 000 Hz. Distortion only needs to be measured with an audio frequency of 1 kHz. Noise level measurements should be carried out with no signal applied. These measurements should be carried out at a level where the limiter is not in effect.

C.3 Limits

The limits which apply for a normal telephone set apply to a cordless telephone set with a relaxation for the audio frequency response of ± 3 dB in the frequency ranges below 0,5 kHz and above 2,2 kHz for the audio frequency response.

The limits for linearity, if applicable in the respective telephone specification, should be relaxed to allow for ± 2 dB tracking deviation between input and output level.

Only the distortion figure at a frequency of 1 kHz should be considered for a cordless telephone.

The noise level should not exceed:

- 45 dBA at the speaker of the CPP;

- - 60 dBm at the CFP line terminal with psophometric weighting in accordance with CCITT Recommendation O.41 [3].

History

Document history	
March 1994	First Edition
March 1996	Converted into Adobe Acrobat Portable Document Format (PDF)