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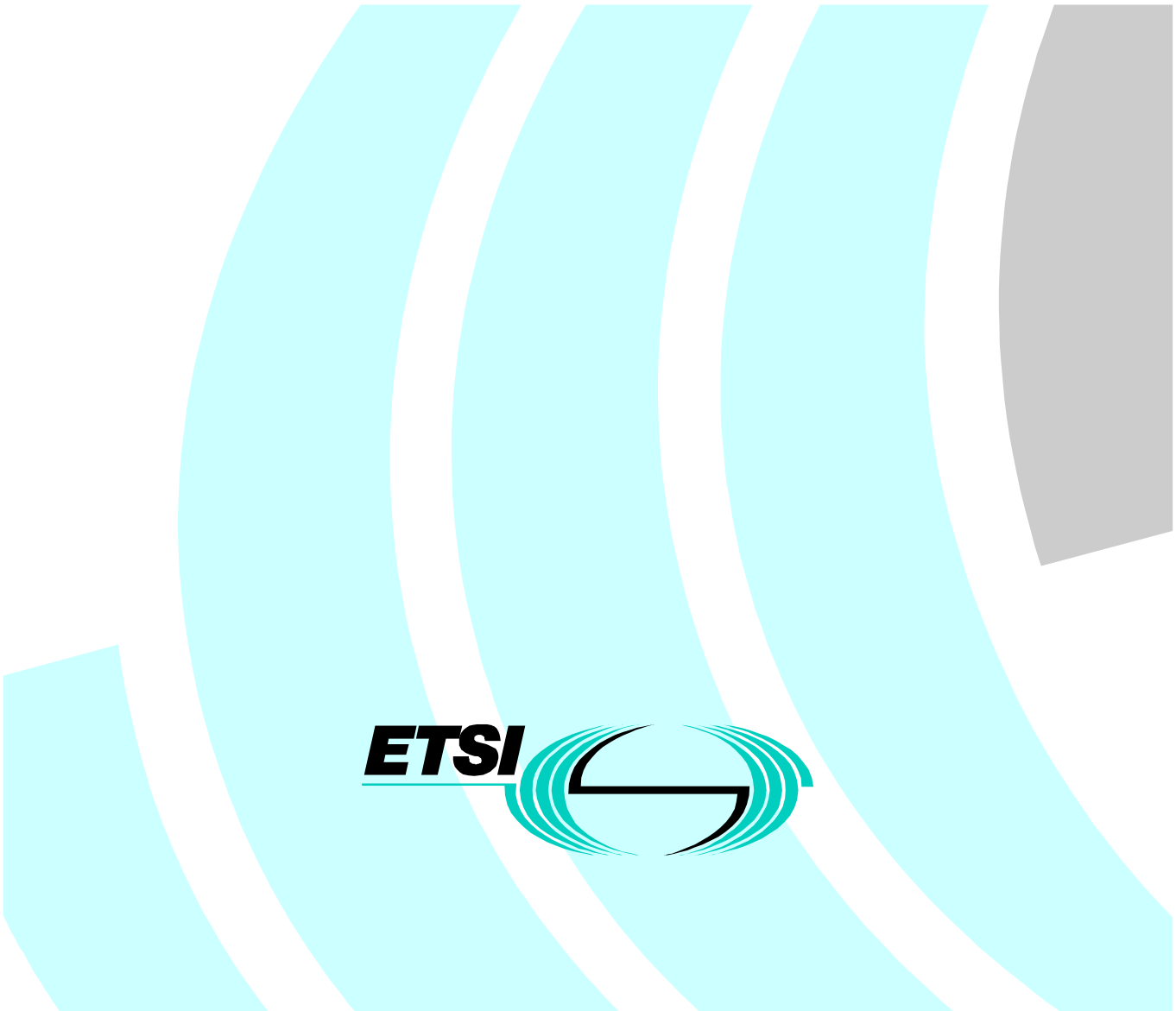
Candidate Harmonized European Standard (Telecommunications series)

Electromagnetic compatibility and Radio Spectrum Matters (ERM); Harmonized EN for CT2 cordless telephone equipment covering essential requirements under article 3.2 of the R&TTE directive



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Contents

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Foreword

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

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [7] laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Directive 1999/5/EC [1] of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity ("the R&TTE Directive").

National transposition dates	
Date of adoption of this EN:	21 July 2000
Date of latest announcement of this EN (doa):	31 October 2000
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 April 2001
Date of withdrawal of any conflicting National Standard (dow):	30 April 2001

Introduction

The present document is part of a set of standards designed to fit in a modular structure to cover all radio and telecommunications terminal equipment under the R&TTE Directive [1]. Each standard is a module in the structure. The modular structure is shown in figure 1.

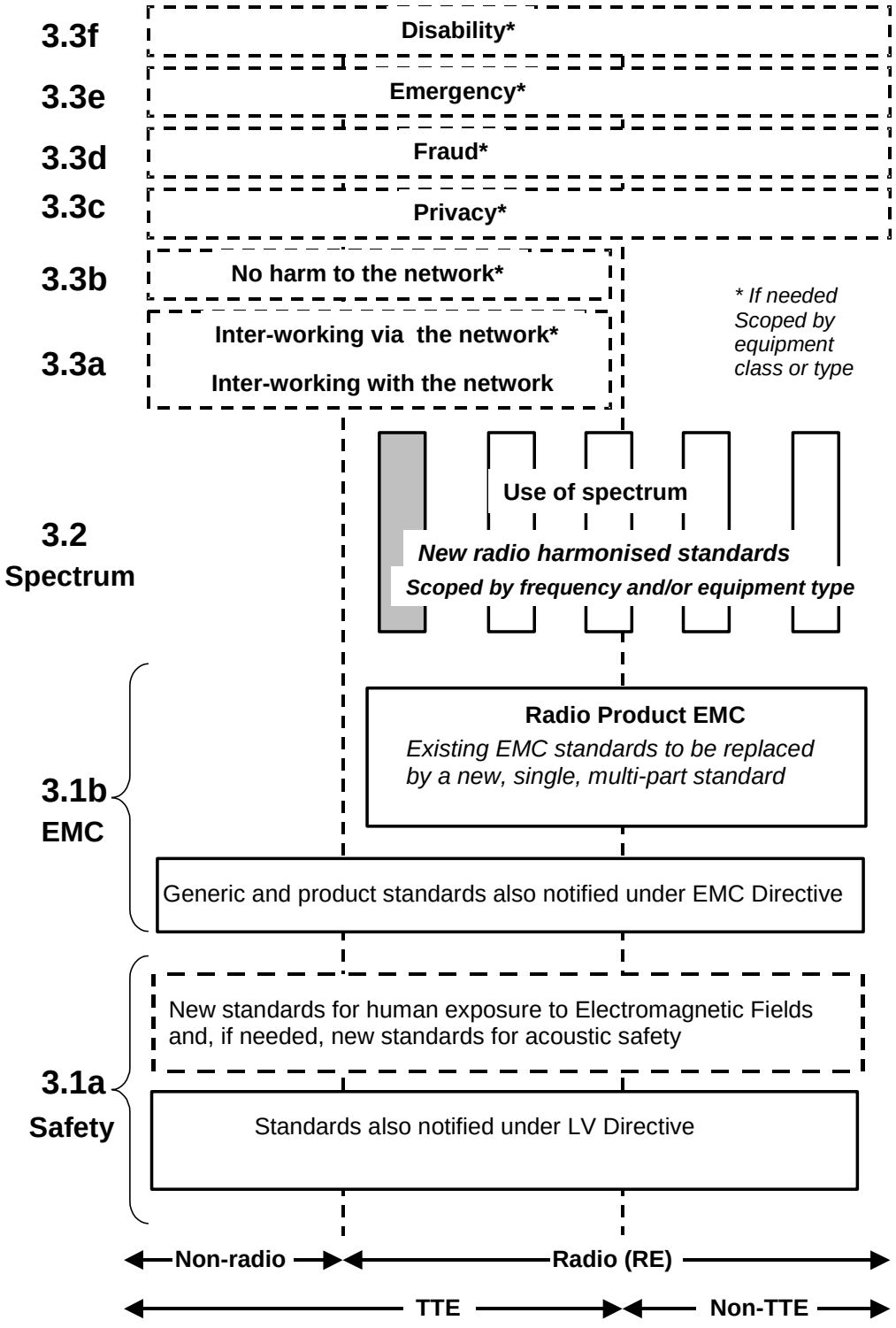


Figure 1: Modular structure for the various standards used under the R&TTE Directive [1]

The left hand edge of the figure 1 shows the different subclauses of Article 3 of the R&TTE Directive [1].

For article 3.3 various horizontal boxes are shown. Dotted lines indicate that at the time of publication of the present document essential requirements in these areas have to be adopted by the Commission. If such essential requirements are adopted, and as far and as long as they are applicable, they will justify individual standards whose scope is likely to be specified by function or interface type.

The vertical boxes show the standards under article 3.2 for the use of the radio spectrum by radio equipment. The scopes of these standards are specified either by frequency (normally in the case where frequency bands are harmonized) or by radio equipment type.

For article 3.1b the diagram shows the new single multi-part product EMC standard for radio, and the existing collection of generic and product standards currently used under the EMC Directive [2]. The parts of this new standard will become available in the second half of 2000, and the existing separate product EMC standards will be used until it is available.

For article 3.1a the diagram shows the existing safety standards currently used under the LV Directive [3] and new standards covering human exposure to electromagnetic fields. New standards covering acoustic safety may also be required.

The bottom of the figure shows the relationship of the standards to radio equipment and telecommunications terminal equipment. A particular equipment may be radio equipment, telecommunications terminal equipment or both. A radio spectrum standard will apply if it is radio equipment. An article 3.3 standard will apply as well only if the relevant essential requirement under the R&TTE Directive [1] is adopted by the Commission and if the equipment in question is covered by the scope of the corresponding standard. Thus, depending on the nature of the equipment, the essential requirements under the R&TTE Directive [1] may be covered in a set of standards.

The modularity principle has been taken because:

- it minimizes the number of standards needed. Because equipment may, in fact, have multiple interfaces and functions it is not practicable to produce a single standard for each possible combination of functions that may occur in an equipment;
- it provides scope for standards to be added:
  - under article 3.2 when new frequency bands are agreed; or
  - under article 3.3 should the Commission take the necessary decisions;

  without requiring alteration of standards that are already published;
- it clarifies, simplifies and promotes the usage of Harmonized Standards as the relevant means of conformity assessment.

1 Scope

The present document applies to CT2 cordless telephone terminal equipment.

CT2 telephone terminal equipment is capable of operating in all or any part of the frequency bands given below:

Table 1: Cordless Telephone service frequency bands

	Cordless Telephone service frequency bands
Transmit CT2	864,1 MHz to 868,1 MHz
Receive CT2	864,1 MHz to 868,1 MHz

It shall be noted that the above frequency bands are not harmonized throughout the community.

The existence of this Harmonized Standard does not imply the availability of the above frequency spectrum for the particular types of equipment covered by the present document.

The present document is intended to cover the provisions of Directive 1999/5/EC [1] (R&TTE Directive) Article 3.2, which states that "….. radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communications and orbital resources so as to avoid harmful interference."

In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of Article 3 of the R&TTE Directive [1] will apply to equipment within the scope of the present document.

NOTE: A list of such ENs is included on the web site http://www.newapproach.org.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, Version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest Version applies.
- A non-specific reference to an ETS shall also be taken to refer to later Versions published as an EN with the same number.

[1] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).

[2] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive).

[3] Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits (LV Directive).

[4] ETSI I-ETS 300 131 (1994): "Radio Equipment and Systems (RES); Common air interface specification to be used for the interworking between cordless telephone apparatus in the frequency band 864,1 MHz to 868,1 MHz, including public access services".

[5] ETSI ETS 300 086 (1991): "Radio Equipment and Systems (RES); Land mobile group; Technical characteristics and test conditions for radio equipment with an internal or external RF connector intended primarily for analogue speech".

[6] ETSI ETR 028 (1994): "Radio Equipment and Systems (RES); Uncertainties in the measurement of mobile radio equipment characteristics".

[7] Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions in the R&TTE Directive [1], and the following terms and definitions apply:

active mode: any mode of operation of a CFP or CPP in which the CFP or CPP is transmitting only or transmitting and receiving.

communication state: phase of a call between link set up and link termination.

idle mode: any mode of operation of a CFP or CPP which is not the active mode.

PACKET: layer two entity comprising Address Code Word and any following Data Code Words transmitted as a single unit over which the signalling protocol may operate.

3.2 Abbreviations

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

AFC	Automatic Frequency Control
BER	Bit Error Ratio
CAI	Common Air Interface
CFP	Cordless Fixed Part
CIS	CFP Information and Status codeword
CPP	Cordless Portable Part.
CT2	Second Generation Cordless Telephone
CTA	Cordless Telephone Apparatus
EMC	Electro-Magnetic Compatibility
f_c	Nominal Channel Centre Frequency
FSK	Frequency Shift Keying
LV	Low Voltage
MUX1.2	Signalling Multiplex Mode 1 (two-bit signalling)
MUX1.4	Signalling Multiplex Mode 1 (four-bit signalling)
MUX2	Signalling Multiplex Mode 2
MUX3	Signalling Multiplex Mode 3
NPSS	Normal Power Secondary Service
PCM	Pulse Code Modulation
PSTN	Public Switched Telephone Network
R&TTE	Radio and Telecommunications Terminal Equipment
RE	Radio Equipment
RF	Radio Frequency
RFP	Radio Fixed Part
SABM_ACK	Layer two acknowledgment to SABM. Unless otherwise stated, SABM_ACK refers to either the basic or extended form of the message.
TTE	Telecommunications Terminal Equipment

4 Radio frequency interface

4.1 General

Clause 4 covers the minimum RF performance and RF system requirements for cordless telephone equipment which permit, by radio means, some or all of the functions of a normal telephone apparatus and comprises one or more single PSTN line fixed parts, one or more antenna systems, and one or more cordless portable parts. Test conditions for parameters defined in this clause are specified in clause 5.

NOTE: In clause 4, communication is taken to be the CFP and CPP interchanging either control, or speech, or both.

4.2 Channel frequencies

4.2.1 Channel centre frequencies

In countries where the frequency band is available, the channel centre frequencies for the forty CT2 channels shall be 864,050 MHz + (0,100 x n) MHz, where n is the channel number, lying in the range 1 to 40 inclusive. The first channel (channel number one) lies at 864,150 MHz and the last (channel number forty) at 868,050 MHz.

4.2.2 Channel frequency accuracy

The channel frequency accuracy required of both the CFP and CPP transmitters shall be ±10 kHz maximum difference between the nominal and actual channel centre frequencies over supply voltage and temperature ranges. AFC may be used in the receiver at both CFP and CPP but may only be linked to control the transmitter centre frequency at the CPP.

4.2.3 Rate of change of transmit centre frequency

The maximum rate of change of transmit centre frequency at both CFP and CPP shall not exceed 1 kHz/ms, except for the specific cases of switching of the CPP transmitter from MUX3 to MUX2 and for channel changing.

4.2.4 CTA access

The CTA shall have access to all radio channels defined in subclause 4.2.1.

4.3 Signalling strategy

The supplier shall declare that the signalling strategy complies with each subclause of 4.3.

4.3.1 CTA access

The CTA shall have access to the full number of allocated channels and make use of any free channel when signalling to establish a communication channel.

4.3.2 Signalling whilst in the communication state

Signalling whilst in the communication state shall be limited to the same radio channel as is used for communication.

4.3.3 Signalling outside the communication state

Signalling outside the communication state shall only be allowed for the purposes of subclause 4.4 and limited in duration by the requirements of subclauses 4.9.1.

4.4 Dynamic channel allocation strategy

The supplier shall declare that the signalling strategy complies with each subclause of 4.4.

4.4.1 Incoming calls

When an incoming call is detected by the CFP it shall choose a free channel over which to signal, using its handshake, to the CPP. The CPP upon detection and recognition of this handshake shall respond on this chosen channel with a signal using its handshake. The CFP, upon detection and recognition of this response, shall in conjunction with the CPP establish the communication link.

If the above link establishment is unsuccessful then the CFP may make re-attempts, sequentially, on the subsequent free channels. These re-attempts shall be restricted to using a maximum of five free channels and shall be constrained by the requirements of subclauses 4.4.4 and 4.9.1.2.

4.4.2 Outgoing calls

When a CPP is requested to make an outgoing call it shall choose a free radio channel over which to signal for a maximum period of 5 s, using its handshake, to the CFP. The CFP, upon detection of this matching handshake shall respond on this chosen channel with a signal using its handshake. The CPP, upon detection and recognition of this response, shall in conjunction with the CFP establish the communications link.

If the above channel acquisition is unsuccessful then the CPP may make re-attempts, sequentially, on the subsequent free channels. These re-attempts shall be restricted to using a maximum of five free channels and shall be constrained by the requirements of subclauses 4.4.4 and 4.9.1.1.

4.4.3 Channel selection strategies

Manufacturers shall use such selection strategies as to ensure random utilization of the radio channels defined in subclause 4.2.1.

4.4.4 Free channel

The primary usage of CT2 CAI is for voice telephony. The radio interface may also be used for other purposes. These secondary uses include CIS transmissions (subclause 6.8.2 of I-ETS 300 131 [4]) and data services. Different free channel selection algorithms apply for primary and secondary services. All uses not specified as secondary services in the text of the present document may be considered as primary services.

4.4.4.1 Free channel selection for primary services

The decision as to whether a channel is free shall be made on the basis of intermittent or continuous monitoring for a period of time between 200 ms and 2 s. If intermittent monitoring is used the decision shall be based upon a minimum of five distributed samples which should be taken such that the peak level over a period sufficient to cover both halves of a MUX1 or MUX2 frame is recorded. Monitoring shall be performed to a nominal resolution of 6 dB or better over this period. The decision on whether a channel is free shall be considered valid only during the period of 2 s immediately following the end of the monitoring period.

A free channel is defined as the following:

1) any channel with a local field strength below an absolute maximum of 40 dB relative to 1 μV/m; or

2) where all channels are above 40 dB relative to 1 μV/m, then any channel which has the lowest field strength of all channels defined in subclause 4.2.1 as measured, by intermittent or continuous monitoring, to a nominal resolution of 6 dB or better;

but may exclude any channels on which an unsuccessful attempt has been made to establish communications for that call. If an externally synchronized RFP or nested RFP is able to make a valid free channel assessment in the transmit window then the RFP should exclude from its free channel assessment any channels which on a basis of at least one sample per channel, record a peak level of 79 dBμV/m or greater in its transmit window. Alternatively where the channel usage of all the synchronous RFPs in a network or nest are known then those channels which are reported as locally in use should be excluded.

4.4.4.2 Free channel selection for secondary services

The CFP or CPP shall select a free channel for secondary service in accordance with the channel selection criteria in subclause 4.4.4.1; however, further restrictions for channel selection shall apply:

1) a channel shall not be selected if the local field strength is measured above 56 dB relative to 1 μV/m;

2) a channel may only be selected for transmission at the low power level (see subclause 4.5.1.3 of I-ETS 300 131 [4]) if the measured field strength on both the selected channel and the immediately adjacent channels does not exceed 56 dB relative to 1 μV/m. If a secondary service channel assessment occurs during a communications link, and a SABM_ACK with NPSS = 1 (see subclause 6.5.6.6 of I-ETS 300 131 [4]) has been received by the CPP, the CPP shall not select a channel which is only available for low power use;

3) a channel may only be selected for transmission at the normal power level if the measured field strength on both the selected channel and the immediately adjacent channels does not exceed 50 dB relative to 1 μV/m.

For CFPs only, the above two thresholds may be varied to suit local operating conditions, but the values used shall not exceed those specified above by more than 3 dB.

NOTE: There is only one adjacent channel for channel numbers 1 and 40.

4.5 Radio transmitters

4.5.1 RF power

4.5.1.1 Maximum RF power

The transmitter carrier output power or effective radiated power (see subclause 5.3.1) under normal test conditions and under extreme test conditions shall not exceed 10 mW.

4.5.2 Modulation

The modulation employed shall be 2-level FSK shaped by an approximately Gaussian filter to meet the requirements of subclause 4.5.4. The peak frequency deviation under all possible data patterns shall lie between 14,4 kHz and 25,2 kHz.

A binary 1 shall be encoded as a frequency higher than the carrier frequency (fc+ f); a binary 0 shall be encoded as a frequency lower than the carrier frequency (fc - f). fc is the RF carrier frequency and f is the deviation.

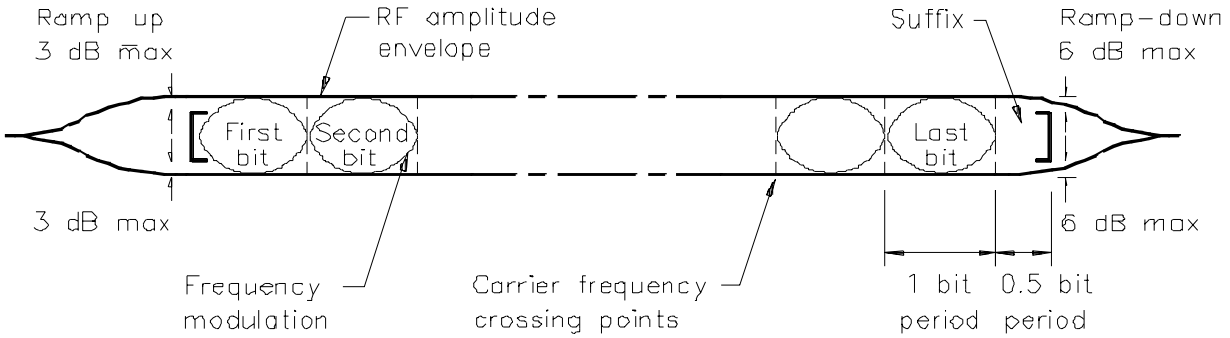
The designation of the specified emission, according to article 4 of the Radio Regulations is 100KF7WCT.

4.5.3 Transmitter burst envelope

4.5.3.1 Amplitude

The amplitude of the RF envelope at the start of the first valid bit to be transmitted shall be within 3 dB of the final amplitude of the burst, as shown in figure 2.

The amplitude of the CPP RF envelope 2 bit periods prior to the start of the first bit to be transmitted shall be less than -60 dB relative to the amplitude of the transmission. The amplitude of the CPP RF envelope 3 bits periods after the end of the final bit to be transmitted shall be less than -60 dB relative to the amplitude of the transmission.



NOTE: The signal frequency during ramp-up, suffix and ramp-down may lie anywhere between the upper deviation limit.

Figure 2: Data packet within RF envelope

4.5.3.2 Synchronization of transmitter burst envelopes

Where external synchronization ports are provided to synchronize the transmitter burst envelopes of a CFP or CT2 system, the transmitter burst envelopes should conform to the specifications given in annex N, subclause N.2.2 of I-ETS 300 131 [4].

4.5.4 Adjacent channel power (narrow band)

The adjacent channel power under either normal or extreme test conditions shall not exceed 10 µW when integrated within a bandwidth of 80 kHz ± 5%.

4.5.5 Out of band power arising from transmitter transients

The power level of any switching transient at a frequency separated by 100 kHz from the nominal frequency shall not exceed 2,5 µW and those by 500 kHz from the nominal frequency shall not exceed 1 nW.

4.5.6 Intermodulation attenuation

This requirement applies to transmitters/receivers to be contained (nested) in a single enclosure or a single unit containing two or more transmitters/receivers which are not separable.

The effective radiated power of the intermodulation products measured in a 10 kHz bandwidth shall not exceed 4 nW.

4.6 Radio receivers

4.6.1 Sensitivity

The receiver sensitivity (see subclause 5.5.6 for test method) shall be defined at a bit error ratio of 1 in 1000 or better in both the B (speech data) and D (signalling data) channels (see subclause 5.2 of I-ETS 300 131 [4]).

4.6.1.1 Receiver sensitivity for CFP or CPP using an integral or supplied antenna

The radio receiver sensitivity shall be at least 40 dBµV/m.

NOTE: It is recommended that this be achieved by ensuring that the radio receiver sensitivity is typically 34 dBµV/m or better.

4.6.1.2 Receiver sensitivity with a 50 ohm connector

The radio receiver sensitivity shall be -100 dBm or better at the antenna connector. A sensitivity of -94 dBm at the antenna connector shall be allowed for a system employing a multi-channel passive combiner/splitter.

4.7 Combined radio transmitter/receivers

4.7.1 Adverse power supply conditions

The adjacent channel power and spurious emission limits specified shall not be exceeded under normal and under adverse power supply condition.

4.7.2 Spurious emissions of the combined transmitter/receiver

The power of any spurious emission in the frequency ranges specified in table 2, when the equipment is in the active mode, shall not exceed the values listed in table 2.

The bandwidth of the measurements are specified in subclause 5.4.1.

Table 2: Spurious emissions

Frequency range	Maximum level (active mode)	Maximum level (idle mode)
100 kHz to 862 MHz	4 nW	2 nW
862 MHz to 864,1 MHz	250 nW	2 nW
864,1 MHz to 868,1 MHz	250 nW	0,2 nW
868,1 MHz to 890 MHz	250 nW	2 nW
890 MHz to 1 000 MHz	4 nW	2 nW
1 000 MHz to 10,7 GHz	1 µW	20 nW
10,7 GHz to 12,75 GHz	20 nW	4 nW

4.8 Termination of the communication state

The supplier shall declare that the signalling strategy complies with each subclause of 4.8.

4.8.1 Clear down signal sequence

Any action for the deliberate termination of the communication state shall initiate an interchange, over the RF link, of a clear down signal sequence.

4.8.2 Cessation of RF activity

Any action for the deliberate termination of the communication state shall, within 1 s, cause the cessation of RF activity in the CPP and that part of the CFP with which it is in communication.

4.8.3 Off-line timing

Where only one CPP is in communication with the PSTN, any action for the deliberate termination of the communication state shall cause that part of the CFP with which it is in communication, and which was on-line to the PSTN, to go off-line to the PSTN within 1 s.

4.9 Channel scanning

The supplier shall declare that the signalling strategy complies with each subclause of 4.9.

4.9.1 Response times

The response times given in subclauses 4.9.1.1 and 4.9.1.2 shall be for the following conditions:

a) full availability of free radio channels to the service;

b) any possible group of three adjacent radio channels, below a field strength of 40 dB relative to 1 µV/m and the remaining channels carrying speech traffic, with the same modulation format as the CTA at field strengths of 50 dB relative to 1 µV/m.

4.9.1.1 Outgoing

The interval between the CPP initiating a communication link, and the establishment of that communication link to the CFP shall not exceed 5 s.

4.9.1.2 Incoming

The interval between a CFP having sufficient information to determine which CPP(s) are to be polled and the poll response from the CPP(s) (if enabled) shall be less than 5 s.

4.10 Controls

Those controls, which if maladjusted might increase the interfering potentialities of the equipment, shall not be easily accessible, in particular any control which may cause the equipment to operate outside the permitted frequency limits specified in the other parts of clause 4.

5 Radio frequency parametric and system tests

5.1 Test conditions, power sources and ambient temperatures

5.1.1 Normal and extreme test conditions

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

5.1.2 Test power source

During the 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 5.1.3.2 and 5.1.4.2. 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 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.

5.1.3 Normal test conditions

5.1.3.1 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°C to +35°C;
- relative humidity 20% to 75%.

It should be noted that when it is impracticable to carry out the tests under these conditions, a statement giving the actual temperature and relative humidity during the tests, shall be added to the test report.

5.1.3.2 Normal test power source

5.1.3.2.1 Mains voltage

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the voltage or voltages for which the equipment was designed as declared by the manufacturer. The frequency of the test power source corresponding to the AC mains shall be between 49 Hz and 51 Hz.

5.1.3.2.2 Regulated lead acid battery power sources

When the radio equipment is intended for operation from the usual type of regulated lead acid battery source, the normal test source voltage shall be 1,1 times the nominal voltage of the battery (6 volts, 12 volts etc.).

5.1.3.2.3 Nickel cadmium battery

When the equipment is intended for operation from the usual type of nickel cadmium battery, the normal test voltage shall be the nominal voltage of the battery (1,2 volt per cell).

5.1.3.2.4 Other power sources

For operation from other power sources or types of battery, either primary or secondary, the normal test source voltage shall be that declared by the equipment manufacturer.

5.1.4 Extreme test conditions

5.1.4.1 Extreme temperatures

For tests at extreme temperatures, measurements shall be made in accordance with the procedures specified in subclause 5.1.5 at an upper value of +40°C and at a lower value of 0°C.

5.1.4.2 Extreme test source voltages

5.1.4.2.1 Mains voltage

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

5.1.4.2.2 Regulated lead acid battery power sources

When the equipment is intended for operation from the usual type of regulated lead acid battery source, the extreme test voltages shall be 1,3 and 0,9 times the nominal voltage of the battery.

5.1.4.2.3 Nickel cadmium battery

When the equipment is intended for operation from the usual type of nickel cadmium battery, the extreme test voltages shall be 1,25 and 0,85 times nominal voltage of the battery.

5.1.4.2.4 Other power sources

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

a) for Leclanché type of battery - 0,85 times the nominal voltage;

b) for other types of primary battery - the 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, or designed for operation within extreme voltage limits not in accordance with those quoted above the extreme test voltages shall be those agreed between the equipment manufacturer and the testing authority and shall be recorded with the test results.

5.1.5 Procedure for tests 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. 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 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.

Before tests at the upper 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 active condition for a period of half an hour after which the equipment shall meet the specified requirements.

5.2 Electrical test conditions

5.2.1 Arrangements for signals to be applied to the fixed and portable receivers

The cordless telephone equipment utilizes radio frequency link control protocols involving the transmission of a handshake code between the fixed and portable parts to maintain the radio frequency communication link. Subclause 5.5.1.6 of I-ETS 300 131 [4] contains a requirement for the radio frequency link to cease operation if a time greater than 10 seconds has elapsed without a successful handshake taking place.

In order to carry out the radio frequency tests contained in the present document it is necessary to arrange for transmission of the relevant handshake code to be maintained for the duration of the tests. This handshake shall be obtained by coupling the fixed or portable part under test to its associated portable or fixed part such that reliable handshaking is established. If the equipment is fitted with a dynamic radio frequency output power control, the equipment should operate at its maximum power.

In the case of equipment with an integral antenna, the required level of coupling shall be achieved by, placing the associated fixed part (with if necessary an antenna connected) or portable part, at a distance such as to produce the signal required for link establishment. In the case of equipment with antenna terminals, or when an equipment with an integral antenna is being tested in the test fixture, a radio frequency coupling network shall apply the correct signal level.

Care should be taken to ensure that the coupling method employed causes the minimum effect on the test results.

5.2.2 Artificial antenna

Tests on the transmitter shall be carried out with a substantially non-reactive non-radiating 50 Ω load connected to the terminals, or in the case of equipments with integral antenna, to the test fixture terminal.

5.2.3 Test fixture for integral antenna

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

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

The test fixture shall provide means of making an external connection to at least the radio frequency input and output and of replacing the power source by an external power supply.

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

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

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

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

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

The testing laboratory may provide its own test fixture.

5.2.4 Test site and general arrangements for measurements involving the use of radiated fields

5.2.4.1 Outdoor test site

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

At one point on the site, a ground plane of at least 5 m 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 lambda/2 or 3 m whichever is the greater. The distance actually used shall be recorded with the results of the tests 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.

5.2.4.2 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 to 4 m. 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 receiver and transmitter radiation measurements, the test antenna is connected to a measuring receiver capable of being tuned to any frequency under investigation and of measuring accurately the relative levels of signals at its input. For receiver radiated sensitivity measurements the test antenna is connected to a reference CTA.

5.2.4.3 Substitution antenna

When measuring in the frequency range up to 1 GHz, 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. When measuring in the frequency range above 4 GHz a horn radiator shall be used. For measurements between 1 GHz and 4 GHz either a lambda/2 dipole or a horn radiator may be used. 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 external antenna is connected to the cabinet.

The distance between the lower extremity of the dipole and the ground shall be at least 0,3 metre.

The substitution antenna shall be connected to a calibrated signal generator when the site is used for spurious radiation measurements and transmitter effective radiated power measurements. The substitution antenna shall be connected to a calibrated measuring receiver when the site is used for the measurement of receiver sensitivity.

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

NOTE: The gain of a horn antenna is generally expressed relative to an isotropic radiator.

5.2.4.4 Optional additional indoor 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 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 shown in principle in figure 3.

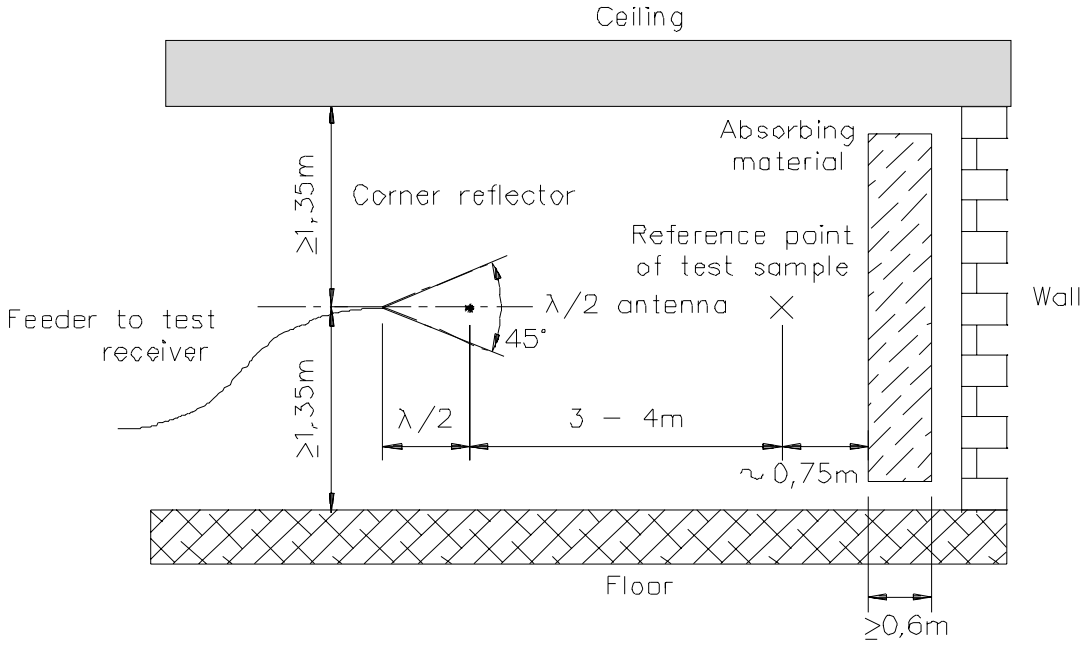


Figure 3: Indoor site arrangement

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 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 figure 3 may be replaced by an antenna of constant length, provided that this 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, test receiver, substitution antenna and calibrated signal generator are used in a way similar to that of 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 ±0,1 m 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.

5.2.5 Combined transmitter/receiver test facility

The manufacturer shall supply facilities to enable control of those functions of the equipment which are associated with the parameters measured in clause 5.

Adequate operating instructions relevant to the equipment submitted for test shall be provided.

Control shall be provided of switching between the normal active mode (at maximum rated transmitter power) and the idle mode.

Connections shall be provided to enable external access to the equipment power supply.

The manufacturer shall ensure that the control and connection facilities provided do not have a significant effect on the measured results.

5.2.6 Guidance on the use of radiation test sites

Guidance on the use of radiation test sites may be found in ETS 300 086 [5] (annex A, clause A.2).

5.2.7 Further optional alternative indoor test site using an anechoic chamber

For radiation measurements where the frequency of the signals being measured is greater than 30 MHz, use may be made of an indoor site being a well-shielded anechoic chamber simulating the free space environment. Guidance on such sites may be found in ETS 300 086 [5] (annex A, clause A.3).

5.2.8 Test frequencies

In band wanted and interfering test signals and channel power measurements shall be on nominal channel centre frequencies unless otherwise stated.

5.3 Transmitter

The tests in this subclause require the testing laboratory to provide a reference part (CPP and CFP), or the manufacturer to supply a complete CTA.

5.3.1 Transmitter carrier power

5.3.1.1 Definition

The transmitter carrier power is the mean power delivered to the artificial antenna during a single cycle of the radio frequency carrier or, in the case of equipment with an integral antenna or antennas, the effective radiated power in the direction of maximum field strength under specified conditions of measurement (subclause 5.2.4) if possible in the absence of modulation.

5.3.1.2 Method of measurement for equipment with an antenna connection

The handshake code between the fixed and portable parts is established as described in subclause 5.2.1.

The transmitter shall be connected to an artificial antenna (subclause 5.2.2), and the power delivered to this artificial antenna shall be measured.

The mean power measured shall be multiplied by 2 to obtain the carrier power.

The measurements shall be made under normal test conditions (subclause 5.1.3) and extreme test conditions (subclauses 5.1.4.1 and 5.1.4.2 applied simultaneously).

5.3.1.3 Method of measurement for equipment with an integral antenna

5.3.1.3.1 Method of measurement under normal test conditions

On a test site, fulfilling the requirements of subclause 5.2.4 the sample shall be placed on the support in the following position:

1) for equipment with an internal antenna it shall stand so that the axis of the equipment, which in its normal use is closest to the vertical, shall be vertical;

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

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

The handshake code between the fixed and portable parts is established as described in subclause 5.2.1. 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 then be rotated through 360° until the maximum signal is received.

It should be noted that the 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 5.2.4.3 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.

The measurement shall be repeated for any alternative antenna supplied by the manufacturer.

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.

5.3.1.3.2 Method of measurement under extreme test conditions

The equipment shall be placed in the test fixture (subclause 5.2.3). The handshake code between the fixed portable parts is established as described in subclause 5.2.1. The power delivered to the artificial antenna shall be measured. The measurements shall be made under normal test conditions (subclause 5.1.3) and extreme test conditions (subclauses 5.1.4.1 and 5.1.4.2 applied simultaneously).

The mean power measured shall be multiplied by 2 to obtain the carrier power.

5.3.1.4 Limits

The limits shall be those specified in subclause 4.5.1.

5.3.2 Adjacent channel power (narrow-band)

5.3.2.1 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 centred 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.

5.3.2.2 Method of measurement

The adjacent channel power shall be measured with a spectrum analyser.

Equipment with an antenna terminal shall have the terminal connected to a spectrum analyser by a coupling device which provides the appropriate input level to the spectrum analyser. Equipment with an integral antenna shall be placed in the test fixture (subclause 5.2.3) and the radio frequency output of the test fixture shall be applied to the spectrum analyser at the appropriate input level. The handshake code between the fixed and portable parts is established as described in subclause 5.2.1. The transmitter shall be operated at the measured carrier power (subclause 5.3.1) under normal test conditions (subclause 5.1.3) such as to produce a modulated output representative of normal active use (subclause 5.6).

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

For the purpose of this test the integration bandwidth used in this measurement shall be 80 kHz with a tolerance of ±5%.

The centre frequency of the bandwidth within which measurements are to be made shall have a 100 kHz separation from the nominal carrier frequency of the transmitter.

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

This sum may be automatically calculated by the spectrum analyser, or an automatic power level integrating device may be used to obtain it.

In the latter case, the relative power level of the modulated transmitter is initially measured by integration over the appropriate bandwidth, centred on the nominal frequency. The measurement is repeated with this bandwidth centred on the nominal frequency of the adjacent channel and the input level to the integrating device is increased until the same power level at the output of the device is obtained.

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

The adjacent channel power, expressed as an effective radiated power, is calculated by applying this ratio to the carrier power as determined in subclause 5.3.1.

The measurement shall be repeated for the other adjacent channel.

The measurement shall be repeated under extreme conditions (subclauses 5.1.4.1 and 5.1.4.2 applied simultaneously).

5.3.2.3 Limits

The limits shall be those specified in subclause 4.5.4.

5.3.3 Out of band power arising from transmitter transients

5.3.3.1 Definition

The out-of-band power arises from transients in the transmitter and is the peak power of the modulation products which result from the rapid on and off switching of the transmitter and which fall within a specified frequency band on either side of the nominal frequency.

5.3.3.2 Method of measurement

If the transmitter is equipped with an antenna terminal it shall be connected to a spectrum analyser by a coupling device which provides the appropriate input level to the spectrum analyser. If the transmitter is equipped with an integral antenna it shall be placed in the test fixture (subclause 5.2.3) and the radio frequency output of the test fixture applied to the spectrum analyser at the appropriate input level.

The handshake code between the fixed and portable parts is established as described in subclause 5.2.1. The transmitter shall be operated at the measured carrier power (subclause 5.3.1) under normal test conditions (subclause 5.1.3) such as to produce a modulated output representative of normal active use (subclause 5.6).

The two multiplex modes MUX1.2 and MUX1.4 (if applicable) shall be tested.

5.3.3.3 Limits

The limits shall be those specified in subclause 4.5.5.

5.3.4 Intermodulation attenuation

This requirement applies to transmitters/receivers to be contained (nested) in a single enclosure or a single unit containing two or more transmitters/receivers which are not separable.

5.3.4.1 Definition

For the purpose of the present document the intermodulation attenuation is a measure of the capability of a transmitter to inhibit the generation of signals in its non-linear elements caused by the presence of the carrier and an interfering signal.

5.3.4.2 Method of measurement

Two transmitters/receivers of the type which will be contained (nested) in a single enclosure shall be operated in the enclosure immediately adjacent to each other. Where the transmitter/receivers are equipped with antenna terminals, these shall be connected to the antenna combining system and the antenna which will be employed with the commercial product.

On a test site, fulfilling the requirements of subclause 5.2.4 the sample shall be placed on the support in the following position:

1) for equipment with an internal antenna, it shall stand so that the axis of the equipment which is in its normal use is closest to vertical shall be vertical;

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

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

The handshake codes for the two systems are established as described in subclause 5.2.1.

The transmitters shall be operated at the power levels measured under subclause 5.3.1.

Radiation of any third order intermodulation products shall be detected by the test antenna and a spectrum analyser with a resolution bandwidth of 10 kHz and a video bandwidth of 30 kHz.

At the frequencies at which products are detected, the equipment under test shall be rotated to obtain the maximum response, and the effective radiated power of that product determined by a substitution measurement.

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

5.3.4.3 Limits

The limits shall be those specified in subclause 4.5.6.

5.3.5 Prevention of mis-operation due to adverse power supply conditions

5.3.5.1 Definition

For the purpose of the present document mis-operation shall be defined as the generation of emissions outside the specified limits due to a reduction of power supply voltages.

5.3.5.2 Method of measurement

a) The transmitter/receiver under test shall be placed in the test fixture or connected to a suitable artificial load. The handshake code between the fixed and portable parts is established as described in subclause 5.2.1. The emission shall be monitored on a spectrum analyser.

b) The radiated spectrum shall be monitored whilst the supply voltage (AC or DC) shall be slowly reduced from the normal value to zero at the rate recommended by the equipment manufacturer.

c) The levels of adjacent channel power and spurious emissions shall be measured and recorded.

5.3.5.3 Limits

The limits shall be those specified in subclause 4.7.1.

NOTE 1: If a back up power supply, i.e. a rechargeable battery, is provided in the fixed part, the test shall be repeated with the battery replaced by a variable DC power supply.

NOTE 2: Any non-repetitive transient condition (of duration less than 50 ms) shall be ignored.

5.4 Spurious emissions

The tests in this subclause require the testing laboratory to provide a reference part (CPP and CFP), or the manufacturer to supply a complete CTA.

5.4.1 Spurious emissions of the combined transmitter/receiver

5.4.1.1 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:

1) their power level in a transmission line or antenna; and

2) their effective radiated power when radiated by the cabinet and structure of the equipment. This is also known as "cabinet radiation".

For equipment which can only be used with an integral antenna, only the measurement mentioned under (2) applies.

5.4.1.2 Method of measuring the power level, subclause 5.4.1.1, (1)

Spurious emissions shall be measured as the peak power level within the measurement bandwidth delivered into a 50 Ω load. This may be done by connecting the transmitter/receiver output through an attenuator to a spectrum analyser or by monitoring the relative levels of the spurious signals delivered to an artificial antenna (subclause 5.2.2). The bandwidth of the measurement shall be as specified in table 3.

The handshake code between the fixed and portable parts is established as described in subclause 5.2.1. The measurements shall be made over the frequency range 100 kHz to 12,75 GHz, except for the channel on which the transmitter/receiver is operating and its adjacent channels.

The measurement shall be repeated with the transmitter/receiver in the idle mode.

Table 3: Bandwidths for measurement of spurious emissions

Frequency range	Active mode		Idle mode	
	Resolution bandwidth	Video bandwidth	Resolution bandwidth	Video bandwidth
up to 864,1 MHz	10 kHz	300 kHz	10 kHz	300 kHz
864,1 MHz to 868,1 MHz	10 kHz	300 kHz	1 kHz	300 kHz
868,1 MHz to 1 000 MHz	10 kHz	300 kHz	10 kHz	300 kHz
above 1 000 MHz	100 kHz	3 MHz	100 kHz	3 MHz

5.4.1.3 Method of measuring the effective radiated power, subclause 5.4.1.1, (2)

On a test site, fulfilling the requirements of subclause 5.2.4, the sample shall be placed at the specified height on a non-conducting support. The handshake code between the fixed and portable parts is established as described in subclause 5.2.1.

The transmitter/receiver shall be operated with the carrier power delivered to an artificial antenna (subclause 5.2.2), except in the case of testing equipment with an integral antenna.

Radiation of any spurious components shall be detected by the test antenna and a spectrum analyser over the frequency range 25 MHz to 12,75 GHz, except for the channel on which the transmitter is intended to operate and its adjacent channels. The bandwidth of the measurement shall be as specified in table 3.

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

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

The measurements shall be repeated with the transmitter in the idle mode.

5.4.1.4 Limits

The limits shall be those specified in subclause 4.7.2.

5.5 Radio frequency system operation

The tests in this subclause require the testing laboratory to provide a reference part (CPP and CFP).

5.5.1 Definitions

Ability to receive: the reference part shall transmit 10 acknowledged (numbered) packets each of 4 code words to the test receiver. The number of acknowledged (numbered) packets that are indicated as having been correctly received (as detected by acknowledgements received at the reference part) shall be counted.

If four or more are correct, then the receiver has the ability to receive. If three or fewer are correct, then the receiver does not have this ability.

5.5.2 Channel frequencies

5.5.2.1 Ability to receive when the carrier frequency is up to ±10 kHz from nominal

The reference part transmitter carrier frequency shall be adjusted over this range at a defined level of sensitivity (20 dB above the minimum sensitivity requirement).

5.5.2.2 Ability to receive when carrier frequency is varying at a rate of up to 1 kHz/ms

The reference part transmitter carrier frequency shall be adjusted at this rate at a defined level of sensitivity (20 dB above the minimum sensitivity requirement).

5.5.3 Dynamic RF channel allocation strategy

5.5.3.1 No channel is occupied

The channel selection is random when no channel is occupied. For both CPP and CFP by manufacturer's declaration supported by details of the implementation of "random".

5.5.3.2 One channel only below the threshold

That with one channel only below the threshold, that it is selected. For both CPP and CFP an interferer shall occupy all channels except, in turn, channels 1 and 40 which shall be subject to a field strength below the threshold value.

5.5.3.3 All channels occupied

That with all channels occupied, the channel with the lowest signal strength is selected. For both CPP and CFP this shall be as in subclause 5.5.3.2 but with the power level raised so that, in turn, channels 1 and 40 have the lowest signal strength, but above the threshold.

5.5.4 RF modulation

5.5.4.1 Peak frequency deviation: transmission

The peak frequency deviation under all possible data patterns shall be in the range 14,4 kHz to 25,2 kHz.

For a CPP, a pure tone acoustic test signal at a frequency between 1004 Hz and 1025 Hz is applied with a sound pressure level of -4,7 dBPa at the mouth reference point.

For a CFP, a pure tone electrical test signal at a frequency between 1004 Hz and 1025 Hz is applied at the CFP so as to produce a level of -10 dBm0 at the uniform PCM interface.

Confirm that for CPP and CFP the peak deviation of the transmitter is greater than 14,4 kHz and is less than 25,2 kHz.

5.5.4.2 Peak frequency deviation: reception

Ability to receive when peak deviation is anywhere in the range 14,4 kHz to 25,2 kHz. The reference part transmitter to be configured to generate peak deviation at 14,4 kHz and 25,2 kHz with the link maintained.

5.5.5 RF envelope

5.5.5.1 Transmitter output: ramp-down

Transmitter to maintain output power within 6 dB of the amplitude obtained during the transmission (figure 2) of normal data, for not less than 0,5 bit periods after the end of the last bit of normal data. By inspection of the envelope using MUX1.2, MUX1.4 (if applicable), MUX2, and MUX3 (if applicable).

5.5.5.2 Transmitter output: ramp-up

Transmitter to attain output power within 3 dB of the amplitude obtained during the transmission (figure 2) of normal data by the start of the first bit of normal data. By inspection of the envelope using MUX1.2, MUX1.4 (if applicable), MUX2, and MUX3 (if applicable).

5.5.5.3 CPP transmit amplitude during off period

The provisions of this subclause apply to CPPs only.

The amplitude of the RF envelope at the times specified in subclause 4.5.4.1 of I-ETS 300 131 [4] shall be <-60 dB relative to the peak amplitude of the transmission. By measurement of the RF envelope. To be tested in MUX1.4 if MUX1.4 is supported. To be tested in MUX1.2 if MUX1.4 is not supported.

5.5.5.4 CFP transmit amplitude during off period

The provisions of this subclause apply only to CFPs with external synchronization ports as defined in annex N of I-ETS 300 131[4].

The amplitude of the RF envelope at the times specified in subclause N.2.2 of I-ETS 300 131[4] shall be <-60 dB relative to the peak amplitude of the transmission. By measurement of the RF envelope. To be tested in MUX1.4 if MUX1.4 is supported. To be tested in MUX1.2 if MUX1.4 is not supported.

The CFP shall synchronize its transmissions as specified in subclause N.2.2 of I-ETS 300 131[4]. This test is to be made under two circumstances:

1) using an internally generated synchronization signal (no external input);

2) using an external synchronization signal applied to the external synchronization input port.

5.5.6 Radio receiver sensitivity

5.5.6.1 Raw bit error rate

The raw bit error rate shall not exceed 1 in 1000 at a field strength which is specified in subclause 4.6.1. The following procedure is to be adopted to distinguish between those receivers with a BER performance worse than $3,2 \times 10^{-3}$ and those with a performance better than 1×10^{-3}:

1) the signal strength at the receiver's antenna shall be set to the field strength specified in subclause 4.6.1;

2) the reference part transmits, with the maximum peak frequency deviation which is specified in subclause 4.5.2, ten acknowledged packets of 4 code words to the test receiver. The number of acknowledged packets that are indicated as having been correctly received (as detected by acknowledgements received at the reference part) are counted:

   a) if 9 or 10 are correct, then accept the receiver;

   b) if 3 or fewer are correct, then reject the receiver;

c) if 4 to 8 packets are correct, go to the next stage;

3) 20 acknowledged packets of 4 code words are sent to the test part:

a) if 15 or more of this 20 are correct, then accept the receiver;

b) if 10 or fewer packets are correct, then reject the receiver;

c) if 11 to 14 packets are correct, go to the next stage;

4) another 20 acknowledged packets of 4 code words are sent to the test part:

a) if 14 or more of this second 20 are correct, then accept the receiver;

b) if 11 or fewer packets are correct, then reject the receiver;

c) if 12 or 13 packets are correct, go to the next stage;

5) another 20 acknowledged packets of 4 code words are sent to the test part:

a) if 13 or more are correct, then accept the receiver;

b) if 12 or fewer packets are correct, then reject the receiver.

The above procedure results in: the probability of rejecting a CPP that gives 1 x 10^{-3} BER is 1,23%; and the probability of accepting a CPP that gives 3 x 10^{-3} BER is 1,21 %.

If the peak frequency deviation of the reference test equipment is not equal to the maximum specified in subclause 4.5.2 a correction factor X shall be applied to the measurements.

$$S(f_{\max}) = S(f_{actual}) - X$$

Where:

$S(f_{max})$ is the sensitivity for the maximum frequency deviation (dBm or dBµV/m);

$S(f_{actual})$ is the measured frequency deviation using a deviation factual (dBm or dBµV/m);

X is the correction factor = $20 \log(f_{max}/f_{actual})$.

5.6 Transmitter modulation

When the radio frequency link between the fixed and portable parts is established, the modulation of the transmitter shall be representative of normal active use.

5.7 Power supply units

The fixed and portable parts shall be operated with their appropriate power supply units which shall be submitted with the equipment at the time of test. Means for connecting an external power supply to portable equipment shall be provided.

5.8 Declarations by the manufacturer

The manufacturer shall supply the following information, which shall be included in the test documentation:

1) transmitters:

   - the oscillator frequencies, intermediate frequencies and carrier generation formula or, the technique of frequency generation;

2) receivers:

   - the oscillator frequencies, intermediate frequencies and local oscillator generation formula;

3) power supply:

   a) the nominal supply voltage;

   b) the type of battery where applicable;

   c) the battery end-point voltage where applicable.

5.9 Identification

The equipment shall be provided with a clear indication of the type number and description under which it is submitted for testing.

Annex A (normative): The EN Requirements Table (EN-RT)

The EN Requirements Table (EN-RT) serves a number of purposes, as follows:

- it provides a tabular summary of all the requirements;
- it shows the status of each EN-R, whether it is essential to implement in all circumstances (Mandatory), or whether the requirement is dependent on the supplier having chosen to support a particular optional service or functionality (Optional). In particular it enables the EN-Rs associated with a particular optional service or functionality to be grouped and identified;
- when completed in respect of a particular equipment it provides a means to undertake the static assessment of conformity with the EN.

Table A.1: EN Requirements Table (EN-RT)

EN Reference		EN 300 797				Comments
No.	**Reference**	**EN-R (note)**	**Status**			
1	4.2.2	Channel frequency accuracy	M			
2	4.2.3	Rate of change of transmit centre frequency	M			
3	4.2.4	CTA Access	M			
4	4.3	Signalling strategy	M			
5	4.5.1	RF power	M			
6	4.5.2	Modulation	M			
7	4.5.3	Transmitter burst envelope	M			
8	4.5.4	Adjacent channel power	M			
9	4.6.1	Sensitivity	M			
10	4.7	Combined radio transmitter / receivers	M			
11	4.8	Termination of the communications state	M			
12	4.9	Channel scanning	M			
NOTE: These EN-R's are justified under Article 3.2 of the R&TTE Directive.						

Key to columns:

No Table entry number;

Reference Subclause reference number of conformance requirement within the present document;

EN-R Title of conformance requirement within the present document;

Status Status of the entry as follows:

- M Mandatory, shall be implemented under all circumstances;
- O Optional, may be provided, but if provided shall be implemented in accordance with the requirements;
- O.n this status is used for mutually exclusive or selectable options among a set. The integer "n" shall refer to a unique group of options within the EN-RT. A footnote to the EN-RT shall explicitly state what the requirement is for each numbered group. For example, "It is mandatory to support at least one of these options", or, "It is mandatory to support exactly one of these options".

Comments To be completed as required.

Annex B (normative): Accuracy of measurement

B.1 Radio frequency parametric and system tests

The interpretation of the results recorded in a test report for the measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of the present document;
- the value of the measurement uncertainty 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 in table B.1.

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with ETR 028 [6] and shall correspond to an expansion factor (coverage factor) k = 1,96 or k = 2 (which provide confidence levels of respectively 95% and 95,45% in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Table B.1 is based on such expansion factors.

Table B.1: Maximum measurement uncertainty

Parameter	Uncertainty
DC voltage	±3 %
AC mains voltage	±3 %
AC mains frequency	±0,5 %
Radio frequency	±0,1ppm
Radio frequency power	±2dB
Radio frequency field strength	±6dB
Adjacent channel power	±5dB

History

Document history		
V1.1.1	March 2000	One-step Approval Procedure OAP 20000721: 2000-03-22 to 2000-07-21
V1.1.1	September 2000	Publication