

EN 300 220-2 V1.2.1 (1997-11)

European Standard (Telecommunications series)

**Electromagnetic compatibility and
Radio spectrum Matters (ERM);
Short range devices;
Technical characteristics and test methods for radio
equipment to be used in the 25 MHz to 1 000 MHz frequency
range with power levels ranging up to 500 mW;
Part 2: Supplementary parameters
not intended for regulatory purposes**



European Telecommunications Standards Institute

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Foreword

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

The technical parameters which are relevant to the EMC Directive are listed in annex B.

The present document consists of two parts as follows:

Part 1: "Parameters intended for regulatory purposes";

Part 2: "Supplementary parameters not intended for regulatory purposes".

This part specifies supplementary parameters for specific applications not related to effective use of the spectrum.

Annex A provides specifications concerning social alarm systems.

National transposition dates	
Date of adoption of this EN:	24 October 1997
Date of latest announcement of this EN (doa):	28 February 1998
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 August 1998
Date of withdrawal of any conflicting National Standard (dow):	31 August 1998

1 Scope

The present document covers the minimum characteristics considered necessary for Short Range Devices (SRD) in order to make the best use of the available frequencies. The term "The present document" refers to EN 300 220-2 only.

These parameters specified in this part are not intended to be measured for regulatory purposes. However, they are provided to give guidance to manufacturers and users regarding reasonable reliability of the radio link and performance of the receiver.

The present document contains the technical characteristics for radio equipment referencing relevant CEPT/ERC Decisions and Recommendation CEPT ERC/Recommendation 70-03 [1].

The present document does not necessarily include all the characteristics which may be required by a user, nor does it necessarily represent the optimum performance achievable. It is a product family standard which may be completely or partially superseded by specific standards covering specific applications.

The present document applies to short range devices:

- either with a Radio Frequency (RF) output connection and/or with an integral antenna;
- for alarms, identification, telecommand, telemetry, etc., applications;
- with or without speech;
- operating on radio frequencies between 25 MHz and 1 000 MHz, with power levels up to 500 mW, radiated or conducted.

The present document covers fixed stations, mobile stations and portable stations. In the present document basic requirements are given for the different frequency bands, channel separation etc., where appropriate.

The present document does not require measurements for radiated emissions below 25 MHz.

Additional standards or specifications may be required for equipment such as that intended for connection to the Public Switched Telephone Network (PSTN).

2 Normative references

References may be made to:

- a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or
- b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or
- c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or
- d) publications without mention of a specific version, in which case 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] Draft CEPT/ERC Recommendation 70-03: "Relating to the use of Short Range Devices (SRD)".
- [2] ETS 300 113: "Radio Equipment and Systems (RES); Land mobile service; Technical characteristics and test conditions for radio equipment intended for the transmission of data (and speech) and having an antenna connector".

- [3] ETS 300 390: "Radio Equipment and Systems (RES); Land mobile service; Technical characteristics and test conditions for radio equipment intended for the transmission of data (and speech) and using an integral antenna".
- [4] ITU-T Recommendation Blue Book 0.41 (1988): "Psophometer for use on telephone-type circuits".
- [5] EN 300 220-1 (1997): "Electromagnetic compatibility and Radio spectrum matters (ERM); Short range devices; Technical characteristics and test methods for radio equipment to be used in the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW; Part 1: Requirements related to spectrum utilization".

3 Definitions, symbol and abbreviations

3.1 Definitions

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

alarm: The use of radio communication for indicating an alarm condition at a distant location.

conducted measurements: Measurements which are made using a direct 50 Ω connection to the equipment under test.

dedicated antenna: A removable antenna supplied and type tested with the radio equipment, designed as an indispensable part of the equipment.

fixed station: Equipment intended for use in a fixed location.

integral antenna: A permanent fixed antenna, which may be built-in, designed as an indispensable part of the equipment.

mobile station: Equipment normally fixed in a vehicle.

portable station: Equipment intended to be carried, attached or implanted.

radiated measurements: Measurements which involve the absolute measurement of a radiated field.

telecommand: The use of radio communication for the transmission of signals to initiate, modify or terminate functions of equipment at a distance.

telemetry: The use of radio communication for indicating or recording data at a distance.

3.2 Symbol

For the purposes of the present document, the following symbol applies:

SND/ND Signal + Noise + Distortion / Noise + Distortion

3.3 Abbreviations

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

emf	electromotive force
EMC	ElectroMagnetic Compatibility
ERP	Effective Radiated Power
PSTN	Public Switched Telephone Network
RF	Radio Frequency
SRD	Short Range Device

4 Receiver parameters

For the method of measurement of the receiver parameters, reference should be made to the appropriate subclauses in ETS 300 113 [2] or ETS 300 390 [3].

4.1 Maximum usable sensitivity (conducted)

4.1.1 Definition

The maximum usable sensitivity is minimum level of signal (electromotive force (emf)) at the receiver input, produced by a carrier at the nominal frequency of the receiver, modulated with the normal test signal modulation, which produces:

- a SND/ND ratio of 20 dB, measured at the receiver output through a telephone psophometric weighting network as described in ITU-T Recommendation 0.41 [4]; or
- after demodulation, a data signal with a bit error ratio of 10^{-2} ; or
- after demodulation, a message acceptance ratio of 80 %.

4.1.2 Limits

The maximum usable sensitivity shall not exceed an emf of +6 dB μ V under normal test conditions.

4.2 Average usable sensitivity (field strength)

This measurement only applies to equipment with an integral or dedicated antenna.

The average, E_{mean} , is calculated from eight measurements of field strength, where the receiver is rotated in 45° increments, starting at an arbitrary orientation.

$$E_{mean} = 20 \log_{10} \sqrt{\frac{8}{\sum_{i=1}^{i=8} \frac{1}{x_i^2}}}$$

Where x_i represents the eight field strengths in μ V/m.

4.2.1 Definition

The average usable sensitivity of the receiver is the average field strength, expressed in dB μ V/m, produced by a carrier at the nominal frequency of the receiver, modulated with the normal test signal which produces:

- a SND/ND ratio of 20 dB, measured at the receiver output through a telephone psophometric weighting network as described in ITU-T Recommendation 0.41 [4]; or
- after demodulation, a data signal with a bit error ratio of 10^{-2} ; or
- after demodulation, a message acceptance ratio of 80 %.

4.2.2 Limits

The average radiated usable sensitivity is given in table 1.

Table 1

Frequency range (MHz)	Average usable sensitivity dB μ V/m
Integral antenna fully within the case	
30 to 400	27,0
> 400 to 750	28,5
> 750 to 1 000	30,0
Integral or dedicated antenna with an external length \leq 20 cm to the case	
30 to 130	18,0
> 130 to 300	19,5
> 300 to 440	21,5
> 440 to 600	23,5
> 600 to 800	25,5
> 800 to 1 000	28,0
Integral or dedicated antenna with an external length > 20 cm to the case	
30 to 130	18,0 - k
> 130 to 300	19,5 - k
> 300 to 375	21,5 - k
> 375 to 440	21,5
> 440 to 600	23,5
> 600 to 800	25,5
> 800 to 1 000	28,0

Where:

$$k = 20 \log_{10} ((l + 20)/40); \text{ and}$$

l is the length of the external part of the antenna in cm.

4.3 Co-channel rejection

4.3.1 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.

4.3.2 Limits

The value of the co-channel rejection ratio, expressed in dB, shall be:

- between -8 and 0 dB, for a channel spacing of 20 or 25 kHz;
- between -12 and 0 dB, for a channel spacing of \leq 12,5 kHz.

4.4 Adjacent channel selectivity

4.4.1 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 signal which differs in frequency from the wanted signal by an amount equal to the adjacent channel separation for which the equipment is intended.

4.4.2 Limits

The adjacent channel selectivity of the equipment under specified conditions shall not exceed the levels of the unwanted signal as stated in table 2.

Table 2

Test conditions	Channel spacing $\leq 12,5$ kHz	Channel spacing 20 kHz or 25 kHz
Normal	60,0 dB	70,0 dB

4.5 Spurious response rejection

4.5.1 Definition

The spurious response 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 at any other frequency, at which a response is obtained.

4.5.2 Limits

At any frequency separated from the nominal frequency of the receiver by more than one channel spacing, the spurious response rejection shall not be less than 70,0 dB.

4.6 Intermodulation response rejection

4.6.1 Definition

The intermodulation response 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 two or more unwanted signals with a specific frequency relationship to the wanted signal frequency.

4.6.2 Limits

The intermodulation response rejection ratio shall not be less than 65 dB.

4.7 Blocking or desensitization

4.7.1 Definition

Blocking 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 input signal at any frequencies other than those of the spurious responses or the adjacent channels.

4.7.2 Limits

The blocking ratio, for any frequency within the specified ranges, shall not be less than 84 dB, except at frequencies on which spurious responses are found.

Annex A (normative): Application: Social alarm systems

A.1 General

This annex covers equipment operating in a domestic or residential environment. It covers fixed, mobile or portable transmitters working into fixed receivers.

This annex assumes a certain path loss if the equipment has to operate with adequate reliability. The minimum power level recommended in this annex takes into account the effects of:

- non uniform radiation patterns of the transmitter and receiver antennas;
- reflections caused by the construction of the building, moveable objects and persons;
- attenuation by commonly used building materials;
- path loss assuming a distance of typically 10 m;
- operating frequency.

A.2 Minimum effective radiated power

The minimum required radiated power is based on the factors stated above and the receiver limits stated in clause 4.

A.2.1 Definition

For the definition of effective radiated power see subclause 8.3.1 of EN 300 220-1 [5]. The minimum level is the maximum value measured in accordance with the method of measurement stated in subclause 8.3.2 of EN 300 220-1 [5].

A.2.2 Method of measurement

For the method of measurement see subclause 8.3.2 of EN 300 220-1 [5].

A.2.3 Classification of effective radiated power levels

There are four classes of Effective Radiated Power (ERP) as detailed in tables A.1.

For frequencies above 500 MHz the effective radiated power range for additional classes are given in table A.1. For frequencies between 137 and 500 MHz, the values given in table A.1 are modified as follows:

$$p \times (f/500)^4,$$

where p is equal to the effective radiated power.

Table A.1

Class	Radiated level ERP
A	$\geq 2 \text{ mW to } 10 \text{ mW}$
B	$\geq 100 \text{ } \mu\text{W to } 2 \text{ mW}$
C	$\geq 10 \text{ } \mu\text{W to } < 100 \text{ } \mu\text{W}$
D	$< 10 \text{ } \mu\text{W}$

A.3 Receiver parameters

The receiver parameters limits are stated in subclauses 4.1 to 4.5 of the present document. For the method of measurement of the receiver parameters, reference shall be made to the appropriate subclauses in ETS 300 113 [2] or ETS 300 390 [3].

History

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