

9`Y_fca U[bYfbUnXfi y`^j cgh]b`nUXYj Yj `nj Yn]`n`fUX]`g_`ja `gdY_fca `fØFAŁĚ
?cdYbg_Ua cV]bUgħcf]ħj `Ě`CXXU`b]`g][bU]`fUX]`g_Y`cdfYa YnUj nVi `Ub`Y
gdYWZ] b] `cX[cj cfcj `j `gdfY`Ya b]_i `Ě`%`XY. `HY b] bY`_UfU_ħf]gh]_Y]b`a Yf]bY
a YħXY

ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Land Mobile Service;
Radio equipment transmitting signals to initiate a specific response in the receiver; Part
1: Technical characteristics and methods of measurement

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European Standard (Telecommunications series)

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
Land Mobile Service;
Radio equipment transmitting signals to initiate
a specific response in the receiver;
Part 1: Technical characteristics and methods of measurement**

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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 present document was submitted to Public Enquiry as EN 300 219. It was divided into two parts during the Public Enquiry resolution phase.

The present document is part 1 of a multi-part deliverable, covering the Land Mobile Service; Radio equipment transmitting signals to initiate a specific response in the receiver, as identified below:

- Part 1:** "Technical characteristics and methods of measurements";
Part 2: "Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive".

National transposition dates

Date of adoption of this EN:	23 February 2001
Date of latest announcement of this EN (doa):	31 May 2001
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 November 2001
Date of withdrawal of any conflicting National Standard (dow):	30 November 2001

Introduction

The present document is intended to specify the minimum performance and the methods of measurement of radio equipment for use in the land mobile service as specified in the scope.

The present document is based upon I-ETS 300 219.

Examples of equipment that may be designed to fulfil the present document are: selective calling devices included in equipment fulfilling EN 300 086-1 [7], remote control equipment and transmitters for paging systems.

Channel separations, maximum transmitter output power / effective radiated power, class of transmitter intermodulation attenuation and the inclusion of automatic transmitter shut-off facility may all be conditions relating to the issue of a licence by the appropriate administration.

Annex A provides additional information concerning radiated measurements.

Annex B contains normative specifications for adjacent channel power measurement arrangements.

Annex C is a graphic representation of clause 4.1, referring to the presentation of equipment for testing purposes.

Clause 5 provides the appropriate limits. These limits have been chosen to ensure an acceptable grade of service and to minimize harmful interference to other equipment and services. They are based on the interpretation of the measurement results described in clause 4.3.

Provision for the placing on the market of radio equipment in EU Member States can be found in the R&TTE Directive (Directive 99/5/EC [1]). It can also be noted that some of the parameters considered as essential under the R&TTE Directive [1] had already been listed as essential under the EMC Directive.

The present document may also be used in Countries that are not EU Member States. For the benefit of these Countries, mechanisms for mutual recognition of type approval have been identified in Decision ERC/DEC/(97)10.

Alternatively, another approach may be used in Countries that have not implemented this Decision: type test measurements performed in an accredited test laboratory in one country would be accepted by the Administration in another country provided that the national regulatory requirements are met (CEPT Recommendation ERC/REC 01-06).

Decision ERC/DEC/(97)10 also addresses issues related to total quality management.

The present document may, in particular, be used by accredited test laboratories for the assessment of the performance of the equipment. The performance of the equipment, in the case of conformity assessment measurements, shall be representative for the performance of the corresponding production model. In order to avoid any ambiguity in that assessment, the present document contains general instructions (clause 4), conditions (clauses 6 and 7) and methods of measurement (clauses 8, 9 and 10).

The present document was drafted on the assumption that if equipment available on the market is required to be checked, it should be tested in accordance with the methods of measurement specified in the present document.

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1 Scope

The present document covers the minimum characteristics considered necessary in order to avoid harmful interference and to make the best use of the available frequencies. It does not necessarily include all the characteristics which may be required by a user, nor does it necessarily represent the optimum performance achievable.

The present document applies to constant envelope angle modulation systems for use in the land mobile service, using the available bandwidth, operating on radio frequencies between 30 MHz and 1 GHz, with channel separations of 12,5 kHz, 20 kHz and 25 kHz intended for transmission and/or reception of signals used to initiate a specific response in the receiver.

The present document applies to non-speech and to the non-speech part of combined speech/non-speech analogue equipment. In the present document, non-speech radio equipment is defined as a radio equipment transmitting a signal to initiate a specific response in the receiver. The equipment shall comprise a transmitter and associated encoder and/or a receiver and associated decoder. The encoder and/or decoder may be a separate piece of equipment, in which case compliance to the present document covers the encoder and/or decoder in connection with the transmitter and/or receiver equipment.

In the present document different requirements are given for the different radio frequency bands, channel separations, environmental conditions and types of equipment, where appropriate.

The types of equipment covered by the present document are as follows:

- Base Station: equipment fitted with an antenna socket;
- Mobile Station: equipment fitted with an antenna socket;
- Handportable stations:
 - a) fitted with an antenna socket; or
 - b) without an external antenna socket (integral antenna equipment) but fitted with a permanent internal or a temporary internal 50 Ω Radio Frequency (RF) connector which allows access to the transmitter output and the receiver input.

Handportable equipment without an external or internal RF connector and without the possibility of having a temporary internal 50 Ω RF connector is not covered by the present document. Integral antenna equipment is covered by EN 300 341-1 [8] (see the corresponding scope).

For combined speech/non-speech equipment the present document is complementary to EN 300 086-1 [7], which covers radio equipment for use in the land mobile service intended primarily for analogue speech.

Radio equipment intended for the transmission of data is covered by EN 300 113-1, EN 300 390-1, and ETS 300 471.

This is a general EN which may be superseded or complemented by specific standards addressing specific applications. It applies to equipment designed to operate within the professional mobile radio service and to the associated frequency planning.

Channel separations, maximum transmitter output/effective radiated power, class of transmitter intermodulation attenuation, temperature ranges and the inclusion of an automatic transmitter shut off facility may be conditions to the issue of a licence by the appropriate Administration.

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

Requirements to be fulfilled by equipment designed to meet several ETS/ENs can be found in clause 4.

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 and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

- [1] Directive 99/5/EC of the European Parliament and of the Council Relating to Radio Equipment and Telecommunications Terminal Equipment and of the Mutual Recognition of their Conformance.
- [2] ANSI C63.5 (1998): " American National Standard for Calibration of Antennas Used for Radiated Emission Measurements in Electromagnetic Interference (EMI) Control-Calibration of Antennas (9 kHz to 40 GHz)".
- [3] ITU-T Recommendation O.41: "Psophometer for use on telephone-type circuits".
- [4] ETSI EN 300 793 (1998): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land mobile service; Presentation of equipment for type testing".
- [5] ETSI ETR 028: "Radio Equipment and Systems (RES); Uncertainties in the measurement of mobile radio equipment characteristics".
- [6] ETSI ETR 273: "Electromagnetic compatibility and Radio Spectrum Matters (ERM); Improvement of radiated methods of measurement (using test sites) and evaluation of the corresponding measurement uncertainties".
- [7] ETSI EN 300 086-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service; Radio equipment with an internal or external RF connector intended primarily for analogue speech; Part 1: Technical characteristics and methods of measurement".
- [8] ETSI EN 300 341-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service (RP 02); Radio equipment using an integral antenna transmitting signals to initiate a specific response in the receiver; Part 1: Technical characteristics and methods of measurement".
- [9] IEC 60489-3: "Methods of measurement for radio equipment used in the mobile services. Part 3: Receivers for A3E or F3E emissions".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

base station: equipment fitted with an antenna socket, for use with an external antenna, and intended for use in a fixed location

mobile station: mobile equipment fitted with an antenna socket, for use with an external antenna, normally used in a vehicle or as a transportable station

handportable station: equipment either fitted with an antenna socket or an integral antenna, or both, normally used on a stand-alone basis, to be carried on a person or held in the hand

integral antenna: antenna designed to be connected to the equipment without the use of a 50 Ω external connector and considered to be part of the equipment. An integral antenna may be fitted internally or externally to the equipment

angle modulation: either phase modulation (G3) or frequency modulation (F3)

full tests: in all cases except where qualified as "limited", tests shall be performed according to the present document

limited tests: limited tests, for application in EN 300 793 [4] called up by clause 4.1, are as follows:

- transmitter frequency error, clause 8.1;
- transmitter carrier power (conducted), clause 8.2;
- transmitter effective radiated power, clause 8.3, integral antenna equipment only;
- transmitter adjacent channel power, clause 8.4;
- receiver maximum usable sensitivity (responses, conducted), clause 9.2;
- receiver maximum usable sensitivity (responses, field strength), clause 9.3, integral antenna equipment only;
- receiver adjacent channel selectivity, clause 9.5.

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

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

psophometric weighting network: psophometric weighting network is described in ITU-T Recommendation O.41 [3]

3.2 Symbols

The symbols used in the clauses relating to transients and timings can be found in clause 8.7.1.

3.3 Abbreviations

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

AC	alternating current
bit	binary digit
dB	decibel
dB μ V	decibel relative to 1 μ V
dBm	decibel relative to 1 mW
EMC	Electromagnetic Compatibility
emf	electro-motive force
IF	Intermediate Frequency
OATS	Open Area Test Site
PSTN	Public Switched Telephone Network
RF	Radio Frequency
rms	root mean square
Rx	Receiver
SINAD	(Signal + Noise + Distortion)/(Noise + Distortion)
SR	Switching Range
Tx	Transmitter

4 General

Equipment may be designed to meet the requirements of one or more standards (ETSS/ENs).

In the case of combined speech/non-speech equipment the speech part shall be tested to EN 300 086-1 [7] and additionally the tests described in the following clauses of the present document shall be carried out:

- clause 8.4: Adjacent channel power;
- clause 9.2: Maximum usable sensitivity (responses, conducted);
- clause 9.3: Average usable sensitivity (responses, field strength) in the case of equipment having an integral antenna.

These requirements also apply for equipment with an analogue output facility provided for test purposes only.

Where an equipment has already been tested to EN 300 086-1 [7], and is re-tested using the present document, the tests described in the following clauses of the present document shall be carried out:

- clause 5.1.4 (8.4): adjacent channel power;
- clause 5.1.5 (8.5): spurious emissions;
- clause 5.2.2 (9.2): maximum usable sensitivity (responses, conducted);
- clause 5.2.3 (9.3): average usable sensitivity (responses, field strength); in the case of equipment having an integral antenna.

More precisely, the measurement of the spurious emissions (clauses 5.1.5 and 8.5) should be performed when an equipment, previously tested to EN 300 086-1 [7], is being tested to the present document with an add-on signalling unit. If the equipment has been originally combined for analogue and signalling operation, the measurement of the spurious emissions need not to be performed again if the signalling port(s) (and the signalling circuits/modules) were active while making this measurement for the test to EN 300 086-1 [7].

In the case where an equipment has already been tested according to the present document and is re-tested with an add-on-signalling unit using another type of modulation without affecting any other characteristic of the equipment, only some additional measurements should be performed; they shall ensure that the equipment fulfils the requirements of the following clauses:

- clause 5.1.4 (8.4): adjacent channel power;
- clause 5.1.5 (8.5): spurious emissions;
- clause 5.2.2 (9.2): maximum usable sensitivity (responses, conducted);
- clause 5.2.3 (9.3): average usable sensitivity (responses, field strength).

In the case where signalling is transmitted simultaneously with analogue speech, the speech part of the equipment is tested according to EN 300 086-1 [7], and it shall also be checked that the signalling does not cause the adjacent channel power and spurious emissions to exceed the appropriate limits.

4.1 Presentation of equipment for testing purposes

For information regarding the presentation of equipment for testing purposes, refer to EN 300 793 [4].

4.2 Mechanical and electrical design

4.2.1 General

Equipment shall be designed, constructed and manufactured in accordance with sound engineering practice, and with the aim of minimizing harmful interference to other equipment and services.

4.2.2 Controls

Those controls which if maladjusted might increase the interfering potentialities of the equipment shall not be accessible to the user.

4.2.3 Transmitter shut-off facility (time-out)

When a timer for an automatic shut-off facility is operative, at the moment of the time-out the transmitter shall automatically be switched off. (The activation of the transmitter key shall reset the timer). A shut off facility shall be inoperative for the duration of the measurements unless it has to remain operative to protect the equipment.

4.2.4 Marking

The marking shall be in accordance with EC Directives and/or CEPT decisions or recommendations as appropriate.

4.3 Interpretation of the measurement results

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

- a) the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements for that parameter of the present document;
- b) the actual measurement uncertainty of the laboratory carrying out the measurements, for each particular measurement, shall be included in the test report (if any);
- c) the values of the actual measurement uncertainty shall be, for each measurement, equal to or lower than the figures given in clause 11 (maximum acceptable values of the measurement uncertainties).

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with ETR 028 [5] 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 characterising the actual measurement uncertainties are normal (Gaussian)).

The particular expansion factor used for the evaluation of the measurement uncertainty shall be stated.

5 Technical characteristics

This clause contains the limit values for the Transmitter (Tx) and Receiver (Rx) measurement parameters defined in clauses 8 and 9.

5.1 Transmitter parameter limits

5.1.1 Frequency error

For the definition and the method of measurement see clause 8.1.

If an unmodulated carrier cannot be obtained, the adjacent channel power shall also be measured under extreme test conditions and the limits given in clause 5.1.4 shall be met.

The frequency error shall not exceed the values given in table 1 under normal, extreme or any intermediate set of conditions. For practical reasons the measurements will be performed only under normal and extreme test conditions as defined in clause 8.1.