SLOVENSKI STANDARD
SIST EN 300 296-1 V1.1.1:2003

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Elektromagnetna združljivost in zadeve v zvezi z radijskim spektrom (ERM) ï Storitev kopenskih mobilnih komunikacij ï Radijska oprema, namenjena predvsem za analogni prenos govora, ki uporablja vgrajeno anteno ï 1. del: Tehniļne karakteristike in merilne metode

ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Land Mobile Service; Radio equipment using integral antennas intended primarily for analogue speech; Part 1: Technical characteristics and methods of measurement

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Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service; Radio equipment using integral antennas intended primarily for analogue speech; 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 is part 1 of a multi-part deliverable covering the Land Mobile Service; Radio equipment using integral antennas intended primarily for analogue speech, as identified below:

Part 1: "Technical characteristics and methods of measurement";

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 on ETS 300 296, which covers analogue radio equipment intended primarily for the transmission of speech for use in the Land Mobile Radio service and having an integral antenna.

Equipment similar to that covered by the present document, but having an RF connector is covered by ETS 300 086 (for details, see the scope of the present document as well as the scope of ETS 300 086).

Equipment intended to transmit signals to initiate a specific response is covered by EN 300 219 (for details, see the scope of the present document as well as the scope of EN 300 219), or by ETS 300 341 in the case of integral antenna equipment (for details, see the scope of the present document as well as the scope of ETS 300 341).

Equipment intended for the transmission of data is covered by ETS 300 113 (for details, see the corresponding scope), or by ETS 300 390 in the case of integral antenna equipment (for details, see the corresponding scope).

Requirements to be fulfilled by equipment designed to meet several standards can be found in Part 1,clause 4 of standards such as ETS 300 341 and/or ETS 300 390 as appropriate.

Angle modulation is used for radio equipment covered by the present document, but individual national administrations are free to choose the type of modulation. Channel separations, maximum transmitter output power/effective radiated power 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 corresponding to the selection of equipment for testing purposes.

Annex D contains specifications for the test discriminator used in transient measurements.

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 CEPT 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 and 9).

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.

1 Scope

The present document covers the minimum characteristics considered necessary in order to avoid harmful interference and to make acceptable 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 equipment with integral antennas, used in angle modulation systems in the land mobile service, operating on radio frequencies between 30 MHz and 1 000 MHz, with channel separations of 12,5 kHz, 20 kHz and 25 kHz, and is intended primarily for analogue speech.

The present document is based upon ETS 300 296, and is a general standard, the provisions of which may be superseded in whole or in part by specific standards for specific applications.

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 type of equipment covered by the present document is handportable stations with integral antennas.

The present document covers angle modulation to be used for radio equipment, but individual national administrations are free to choose the type of modulation. Channel separations, maximum transmitter output power/effective radiated power and the inclusion of automatic transmitter shut-off facility may all be conditions attaching to the issue of a licence by the appropriate administration.

The present document is complementary to ETS 300 086, which covers radio equipment with an internal or external RF connector, for use in the land mobile service. It is primarily intended for omnidirectional applications.

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

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

[2] ETSI EN 300 793 (V1.1.1) (1998): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Land mobile service; Presentation of equipment for type testing".

[3] ETSI ETR 028 (1998): "Radio Equipment and Systems (RES); Uncertainties in the measurement of mobile radio equipment characteristics".

[4] ETSI ETR 273 (1998): "Electromagnetic compatibility and Radio Spectrum Matters (ERM): Improvement of radiated methods of measurement (using test sites) and evaluation of the corresponding measurement uncertainties".

[5] IEC 60489-3 (1988): "Methods of measurement for radio equipment used in the mobile services; Part 3: Receivers for A3E or F3E emissions".

[6] ITU-T Recommendation O.41 (1994): "Psophometer for use on telephone-type circuits".

3 Definitions, abbreviations and symbols

3.1 Definitions

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

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

audio frequency load: audio frequency load is normally a resistor of sufficient power rating to accept the maximum audio output power from the equipment under test. The value of this resistor should be that stated by the manufacturer and equal to the impedance of the audio transducer at 1 000 Hz. In some cases it may be necessary to place an isolating transformer between the output terminals of the receiver under test and the load

audio frequency termination: audio frequency termination is any connection other than the audio frequency load which may be required for the purpose of testing the receiver. The termination device should be, as appropriate, either chosen by the manufacturer or agreed between the manufacturer and the testing laboratory and details included in test reports. If special equipment is required then it should be provided by the manufacturer

band-stop filter (for the SINAD meter): characteristics of the band-stop filter used in the audio distortion factor meter and SINAD meter should be such that at the output the 1 000 Hz tone will be attenuated by at least 40 dB and at 2 000 Hz the attenuation will not exceed 0,6 dB. The filter characteristic shall be flat within 0,6 dB over the ranges 20 Hz to 500 Hz and 2 000 Hz to 4 000 Hz. In the absence of modulation the filter must not cause more than 1 dB attenuation of the total noise power of the audio frequency output of the receiver under test

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

psophometric weighting network: psophometric weighting network is described in ITU-T Recommendation O.41 [6]

Types of measurements:

- **conducted measurements:** measurements which are made using a direct connection to the equipment under test;
- **radiated measurements:** measurements which involve the absolute measurement of a radiated field.

Types of station:

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

Types of tests:

- **full tests:** in all cases except where qualified as "limited", tests are performed according to the present document;
- **limited tests**: limited tests, as defined in EN 300 793 [2], are as follows:
  - transmitter frequency error, clause 8.1;
  - transmitter effective radiated power, clause 8.2;
  - transmitter adjacent channel power, clause 8.4;
  - receiver average usable sensitivity (field strength), clause 9.1;
  - receiver adjacent channel selectivity, clause 9.4.

3.2 Abbreviations

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

AR1	(see clause 4.1)
AR2	(see clause 4.1)
dBc	dB relative to the carrier power
emf	electro-motive force
IF	Intermediate Frequency
OFR	Operating Frequency Range
RF	Radio Frequency
Rx	Receiver
SINAD	(signal + noise + distortion)/(noise + distortion)
SR	Switching Range
Tx	Transmitter
VSWR	Voltage Standing Wave Ratio

3.3 Symbols

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

Eo	Reference field strength (see annex A)
Ro	Reference distance (see annex A)

4 General

4.1 Selection of equipment for testing purposes

For information regarding the selection of equipment for testing purposes, refer to EN 300 793 [2].

It is expected that the usage of similar measurement methodologies will make it more likely that different laboratories measuring the same equipment get comparable measurement results.

4.2 Mechanical and electrical design

4.2.1 General

The 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 easily accessible to the user.

4.2.3 Transmitter shut-off facility

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.

4.2.4 Marking

The equipment shall be marked in a visible place. This marking shall be legible, tamperproof and durable.

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 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 shall be used to decide whether an equipment meets the requirements for that parameter of the present document;

b1) the values of the actual measurement uncertainty shall be, for each measurement, equal to or lower than the figures given in clause 10 (maximum acceptable value of the measurement uncertainties);

b2) the actual measurement uncertainty of the laboratory carrying out the measurements, for each particular measurement, shall be included in the corresponding test report (if any).

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with ETR 028 [3] 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)).

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

5 Technical characteristics

This clause contains the limit values of the parameters defined in clauses 8 and 9.

5.1 Transmitter parameter limits

5.1.1 Frequency error

For the definition and the measuring method see clause 8.1.

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 stated in clause 8.1.

Table 1: Frequency error

Channel separation (kHz)	Frequency error limit (kHz)				
	below 47 MHz	47 MHz to 137 MHz	above 137 MHzto 300 MHz	above 300 MHz to 500 MHz	above 500 MHz to 1 000 MHz
20 & 25	±0,60	±1,35	±2,00	±2,00	±2,50 (note)
12,5	±0,60	±1,00	±1,50	±1,50 (note)	No value specified

NOTE: For handportable stations having integral power supplies, the figures given in the table only apply to the limited temperature range 0°C to +30°C. However for the full extreme temperature conditions (clause 6.4.1) exceeding the limited temperature range above, the following frequency error limits apply:
±2,50 kHz between 300 MHz and 500 MHz;
±3,00 kHz between 500 MHz and 1 000 MHz.

5.1.2 Effective radiated power

For the definition and the measuring method see clause 8.2.

The maximum effective radiated power under normal test conditions shall be within d_f from the rated maximum effective radiated power.

The average effective radiated power under normal test conditions shall also be within d_f from the rated average effective radiated power.

The allowance for the characteristics of the equipment (±1,5 dB) shall be combined with the actual measurement uncertainty in order to provide d_f, as follows:

- $d_f^2 = d_m^2 + d_e^2$;

where uncertainty:

- d_m is the actual measurement uncertainty;
- d_e is the allowance for the equipment (±1,5 dB);
- d_f is the final difference;
- all values shall be expressed in linear terms.

The variation of power due to the change of temperature and voltage for the measurements under extreme test conditions shall not exceed +2 dB or -3 dB (the measurements shall be performed using the test fixture).

In all cases the actual measurement uncertainty shall comply with clause 10.

Furthermore the maximum effective radiated power shall not exceed the maximum value allowed by the administrations.

Example of the calculation of d_f:

- d_m = 6 dB (value acceptable, as indicated in the table of maximum uncertainties);
- = 3,98 in linear terms;
- d_e = 1,5 dB (fixed value for all equipment fulfilling the requirements of the present document);
- = 1,41 in linear terms;
- d_f^2 = $[3,98]^2 + [1,41]^2$;
- Therefore d_f = 4,22 in linear terms, or 6,25 dB.

This calculation shows that in this case d_f is in excess of 0,25 dB compared to dm, the actual measurement uncertainty (6 dB).