



SLOVENSKI STANDARD

SIST ETS 300 086:1998

01-oktober-1998

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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

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Ta slovenski standard je istoveten z: **ETS 300 086 Edition 1**

ICS:

33.060.20	Sprejemna in oddajna oprema	Receiving and transmitting equipment
33.070.01	Mobilni servisi na splošno	Mobile services in general
33.100.01	Elektromagnetna združljivost na splošno	Electromagnetic compatibility in general

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EUROPEAN
TELECOMMUNICATION
STANDARD

ETS 300 086

January 1991

Source: ETSI TC-STC RES 2

Reference: DE/RES-02002

ICS: 33.060.20, 33.060.30

Key words: land mobile radio, analogue speech, testing

Radio Equipment and Systems
Land mobile service
Technical characteristics and test conditions for radio
equipment with an internal or external RF connector
intended primarily for analogue speech

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Foreword

This European Telecommunication Standard has been prepared by the Radio Equipment and Systems (RES) Technical Committee of the European Telecommunications Standards Institute (ETSI). The draft has undergone the ETSI public enquiry process, and is now published.

The standard which is based upon CEPT Recommendation T/R 24-01, is a general standard which may be superseded by specific standards covering specific applications.

Angle modulation shall be used for radio equipment covered by this standard, but individual national administrations are free to choose the type of modulation. Channel separations, temperature range, 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 attaching to the issue of a licence by the appropriate administration.

Additional standards or specifications may be required for equipment such as that intended for connection to the public switched telephone network (PSTN).

This standard does not cover requirements for radiated emissions below 30 MHz. It is anticipated that methods of measurements and minimum standards for such emissions will be covered by specifications supporting EMC Directive 89/336 EEC.

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 the normative subclause 3.1, referring to the presentation of equipment for testing purposes.

Introduction

This standard 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. Clause 4 provides the corresponding limits. These limits have been chosen to ensure an acceptable grade of service and to minimise harmful interference to other equipment and services. They are based on the interpretation of the measurement results described in subclause 3.3.

This standard will also be used by accredited test laboratories for the assessment of the performance of the equipment. The performance of the equipment submitted for type testing shall be representative for the performance of the corresponding production model. In order to avoid any ambiguity in that assessment, this standard contains instructions for the presentation of equipment for type testing purposes (clause 3), conditions (clause 5) and measurement methods (clauses 7 and 8).

This standard was drafted on the assumption that:

- the type test measurements will be performed only once, in one of the accredited test laboratories, and the measurements accepted by the various authorities in order to grant type approval,
- if equipment available on the market is required to be checked it shall be tested in accordance with the methods of measurement specified in this standard.

This standard covers base stations, mobile stations and two categories of handportable stations. One category is fitted with a 50 Ω external antenna socket or connector. The other category has no external antenna socket, but:

- either it is fitted with a permanent internal 50 Ω RF connector,

- or it can be fitted with a temporary internal 50 Ω RF connector, so that conducted measurements can be performed.

The means to access and/or implement the internal connector shall be provided by the manufacturer.

Details of the means used during type testing shall be provided by the accredited test laboratory with the test report, subclause 3.1.12.

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1 Scope

This standard covers the minimum characteristics considered necessary in order 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. It applies to angle modulation systems for use in the land mobile service, operating on radio frequencies between 30 MHz and 1000 MHz, with channel separations of 12.5 kHz, 20 kHz and 25 kHz, and intended primarily for analogue speech.

In this standard 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 this standard 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 R.F. connector which allows access to the transmitter output and the receiver input.

For the type of equipment defined in (b) the additional measurements which shall be made using the equipment antenna connected to the station (and not using any connector) are as follows:

- Transmitter effective radiated power
- Transmitter radiated spurious emissions
- Receiver maximum usable sensitivity (field strength)
- Receiver radiated spurious emissions

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 this standard.

2 Definitions, abbreviations and symbols

2.1 Definitions

For the purpose of this standard, the following 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: an 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 this standard.

Limited tests: the limited tests, subclause 3.1, are as follows:

- receiver maximum usable sensitivity (conducted), subclause 8.1,
- receiver maximum usable sensitivity (field strength), subclause 8.2, integral antenna equipment only,
- receiver adjacent channel selectivity, subclause 8.5,
- transmitter frequency error, subclause 7.1,
- transmitter carrier power conducted, subclause 7.2,
- transmitter effective radiated power, subclause 7.3, integral antenna equipment only,
- transmitter adjacent channel power, subclause 7.5.

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.

2.2 Abbreviations

SND/ND	(signal + noise + distortion)/(noise + distortion),
dBc	dB relative to the carrier power,
RF	radio frequency,
IF	intermediate frequency,
Tx	transmitter,
Rx	receiver.

2.3 Symbols

E ₀	reference field strength, annex A,
R ₀	reference distance, annex A.

3 General

3.1 Presentation of equipment for testing purposes

Each equipment submitted for type testing shall fulfil the requirements of this standard on all channels over which it is intended to operate.

To simplify and harmonise the type testing procedures between the different test laboratories, measurements shall be performed, according to this standard, on samples of equipment defined in subclause 3.1.1 to 3.1.12.

These clauses are intended to give confidence that the requirements set out in this standard have been met without the necessity of performing measurements on all channels.

3.1.1 Choice of model for type approval

The manufacturer shall provide one or more production model(s) of the equipment, as appropriate, for type approval testing.

If type approval is given on the basis of tests on a preliminary model, then the corresponding production models must be identical in all respects with the preliminary model tested.

In the case of handportable equipment without a 50 Ω external antenna connector, see subclause 3.1.12.

3.1.2 Definitions of alignment range and switching range

The manufacturer shall, when submitting equipment for test, state the alignment ranges for the receiver and the transmitter.

The alignment range is defined as the frequency range over which the receiver and the transmitter can be programmed and/or realigned to operate, without any physical change of components other than programmable read only memories or crystals (for the receiver and the transmitter).

The manufacturer shall also state the switching range of the receiver and the transmitter (which may differ).

The switching range is the maximum frequency range over which the receiver or the transmitter can be operated without reprogramming or realignment.

For the purpose of all measurements, the receiver and transmitter shall be considered separately.

3.1.3 Definition of the categories of the alignment range (AR1 and AR2)

The alignment range falls into one of two categories.

The first category corresponds to a limit of the alignment range of the receiver and the transmitter, which is less than 10 % of the highest frequency of the alignment range for equipment operating on frequencies up to 500 MHz, or less than 5 % for equipment operating above 500 MHz. This category is defined as AR1.

The second category corresponds to an alignment range of the receiver and transmitter which is greater than 10 % of the highest frequency of the alignment range for equipment on frequencies up to 500 MHz, or greater than 5 % for equipment operating above 500 MHz. This category is defined as AR2.

3.1.4 Choice of frequencies

The frequencies for testing shall be chosen by the manufacturer in consultation with the appropriate authority, in accordance with subclauses 3.1.5 to 3.1.11 and annex C. The manufacturer selects the frequencies for testing and will ensure that the chosen frequencies are within one or more of the national bands for which type approval is required.

3.1.5 Testing of single channel equipment of category AR1.

In the case of equipment of the category AR1, one sample of the equipment shall be tested.

Full tests shall be carried out on a channel within 100 kHz of the centre frequency of the alignment range.

3.1.6 Testing of single channel equipment of category AR2

In the case of equipment of the category AR2, three samples of the equipment shall be tested. Tests shall be carried out on a total of three channels.

The frequency of the channel of the first sample shall be within 100 kHz of the highest frequency of the alignment range.

The frequency of the channel of the second sample shall be within 100 kHz of the lowest frequency of the alignment range.

The frequency of the channel of the third sample shall be within 100 kHz of the centre frequency of the alignment range.

Full tests shall be carried out on all three channels.

3.1.7 Testing of two channel equipment of category AR1

In the case of equipment of category AR1, one sample of the equipment shall be tested. Tests shall be carried out on the two channels.

The frequency of the upper channel shall be within 100 kHz of the highest frequency of the switching range.

The frequency of the lower channel shall be within 100 kHz of the lowest frequency of the switching range. In addition the average of the frequencies of the two channels shall be within 100 kHz of the centre frequency of the alignment range.

Full tests shall be carried out on the upper channel and limited tests on the lower channel.

3.1.8 Testing of two channel equipment of category AR2

In the case of equipment of the category AR2, three samples of the equipment shall be tested. Tests shall be carried out on a total of four channels.

The highest frequency of the switching range of one sample shall be within 100 kHz of the centre frequency of the alignment range. The frequency of the upper channel shall be within 100 kHz of the highest frequency of the switching range and the frequency of the lower channel shall be within 100 kHz of the lowest frequency of the switching range.

Full tests shall be carried out on the upper channel and limited tests on the lower channel.

The frequency of one of the channels of the second sample shall be within 100 kHz of the highest frequency of the alignment range.

Full tests shall be carried out on this channel.

The frequency of one of the channels of the third sample shall be within 100 kHz of the lowest frequency of the alignment range.

Full tests shall be carried out on this channel.

3.1.9 Testing of multi channel equipment (more than two channels) of category AR1.

In the case of equipment of the category AR1, one sample of the equipment shall be tested.

The centre frequency of the switching range of the sample shall correspond to the centre frequency of the alignment range.

Full tests shall be carried out on a frequency within 100 kHz of the centre frequency of the switching range. Limited tests shall be carried out within 100 kHz of the lowest and also within 100 kHz of the highest frequency of the switching range.

3.1.10 Testing of multi channel equipment (more than two channels) of category AR2 (switching range less than alignment range).

In the case of equipment of the category AR2, three samples of the equipment shall be tested. Tests shall be carried out on a total of five channels.

The centre frequency of the switching range of one sample shall be within 100 kHz of the centre frequency of the alignment range. The frequency of the upper channel shall be within 100 kHz of the highest frequency of the switching range and the frequency of the lower channel shall be within 100 kHz of the lowest frequency of the switching range.

Full tests shall be carried out on the centre channel and limited tests on the upper and lower channel.

The frequency of one of the channels of the second sample shall be within 100 kHz of the highest frequency of the alignment range.

Full tests shall be carried out on this channel.

The frequency of one of the channels of the third sample shall be within 100 kHz of the lowest frequency of the alignment range.

Full tests shall be carried out on this channel.

3.1.11 Testing of multi channel equipment (more than two channels) of category AR2 (switching range equals the alignment range).

In the case of equipment of the category AR2, one sample of the equipment shall be tested.

The centre frequency of the switching range of the sample shall correspond to the centre frequency of the alignment range.

Full tests shall be carried out on a frequency within 100 kHz of the centre frequency of the switching range and within 100 kHz of the lowest and also within 100 kHz of the highest frequency of the switching range.

3.1.12 Testing of equipment (without an external 50 Ω RF connector).

3.1.12.1 Equipment with a temporary or internal permanent antenna connector

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

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

3.1.12.2 Equipment with a temporary antenna connector

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

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

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

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

Each equipment shall be used for the appropriate tests.