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Ground-based VHF hand-held, mobile and fixed radio transmitters, receivers and transceivers for the VHF aeronautical mobile service using amplitude modulation; Part 1:Technical characteristics and methods of measurement

Reference
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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the ETSI standards One-step Approval Procedure.

The present document is part 1 of a multi-part deliverable covering the Ground-based VHF hand-held, mobile and fixed radio transmitters, receivers and transceivers for the VHF aeronautical mobile service using amplitude modulation, as identified below:

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

Part 2: "Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive".

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

Introduction

The present document states the minimum performance requirements for ground based radio transmitters, transceivers and receivers for the aeronautical mobile service operating in the VHF band (118 MHz to 136,975 MHz), using Double Sideband Amplitude Modulation with 8,33 kHz or 25 kHz channel spacing.

For equipment designed to cover the extended VHF frequency band of 108 MHz to 155,975 MHz the same test methods and procedures may be applied to show technical acceptance of the product in the bands 108 MHz to 7,975 MHz and 137 MHz to 155,975 MHz.

(Additional requirements, outside the scope of the present document, may be required to ensure operation in the 108 MHz to 117,975 MHz band does not cause interference to the FM broadcast band.)

The present document may be used by accredited test laboratories for the assessment of the performance of the equipment. The performance of the equipment submitted for type testing should be representative for the performance of the corresponding production model.

The present document has been written on the assumption that:

- the type test measurements will be performed only once, in an accredited test laboratory 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 will be tested in accordance with the methods of measurement specified in the present document.

1 Scope

The present document states the minimum performance requirements for radio transmitters, receivers and transceivers at ground-based aeronautical stations operating in the VHF band (118 MHz to 136,975 MHz) allocated to the aeronautical mobile service.

In situations where transmitters and receivers are located in close proximity there is the possibility of interference. In such cases, external filters and isolators may be necessary as part of the installation to achieve an isolation performance in excess of the minima defined in the present document to overcome the interference.

The present document applies to DSB AM systems, with channel separations of 8,33 kHz or 25 kHz intended for analogue speech and ground base stations with a channel spacing of 25 kHz intended for ACARS data communication.

The test methods and procedures in the present document may also be used to show technical acceptance for radio transmitters, receivers and transceivers at ground based aeronautical stations operating with 25 kHz channel spacing in the extended VHF band (108 MHz to 155,975 MHz).

The scope of the present document is limited to ground base stations, ground mobile and hand held radios for ground use.

2 References

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.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
  - for informative references.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] ITU-T Recommendation O.41: "Psophometer for use on telephone-type circuits".

[2] ICAO Annex 10 volume V (1996): "Aeronautical Radio Frequency Spectrum Utilization".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

[i.1] ETSI TR 100 028 (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

[i.2] ISO 7637 (parts 1 and 2): "Road vehicles - Electrical disturbances from conduction and coupling".

[i.3] 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).

[i.4] ETSI EN 300 113-1: "Electromagnetic compatibility and Radio Matters (ERM): Land mobile service; Radio equipment intended for the transmission of data (and/or speech) using constant or non-constant envelope modulation and having an antenna connector: Part 1: Technical characteristics and methods of measurement".

3 Definitions and abbreviations

3.1 Definitions

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

aeronautical mobile service: mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate

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

ground base station: aeronautical station equipment, in the aeronautical mobile service, for use with an external antenna and intended for use at a fixed location

hand held: radio equipment with integral batteries, designed to be hand portable and operated hand held

integral antenna equipment: radio communications equipment with an antenna integrated into the equipment without the use of an external connector and considered to be part of the equipment

NOTE: An integral antenna may be internal or external to the equipment. In equipment of this type, a 50 Ω RF connection point should be provided for test purposes. A connection point for an AF modulating input and for AF output measurements should also be provided.

mobile station: radio equipment designed for permanent or temporary vehicle installation and operation, including provision for vehicle DC power supply, and connections for external antenna, PTT key, microphone, speaker and/or headphone

non-integral antenna equipment: radio communications equipment with a connector intended for connection to an antenna

portable station: radio equipment with integral battery for independent hand-carried use

NOTE: Provisions may be made for connections of an external antenna, PTT key, microphone, headphone and charger, but principally to be operated as a self contained unit.

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

3.2 Abbreviations

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

ACARS	Aircraft Communications Addressing and Reporting System
AF	Audio Frequency
AGC	Automatic Gain Control
AM	Amplitude Modulation
dBc	dB relative to the carrier power
DSB	Double Side Band
ICAO	International Civil Aviation Organization
IF	Intermediate Frequency
ppm	parts per million

RF	Radio Frequency
rms	root mean square
SINAD	(Signal + Noise + Distortion)/(Noise + Distortion)
VSWR	Voltage Standing Wave Ratio

4 General requirements

8,33 kHz equipment shall be able to operate on all channels in the List of Assignable Frequencies defined in Appendix 2, chapter 4, Group F (see clause 4.1.8.1.2) of the ICAO Annex 10 Volume V [2].

The channel labelling used for 8,33 kHz channel spacing is based on a frequency-channel pairing in accordance with table 4.1 (bis) of ICAO Annex 10 Volume V [2] clause 4.1.2.4.

25 kHz equipment shall be able to operate on the frequencies 118,0 MHz to 136,975 MHz in accordance with ICAO Annex 10 Volume V [2], Appendix to Chapter 4.

It shall not be possible to transmit while any frequency synthesizer used within the transmitter is out of lock.

It shall not be possible to transmit during channel switching operations.

4.1 Controls and indicators

The equipment shall have the following controls and indicators as a minimum:

- a visual indication that the device is switched on;
- a facility to disable the squelch for test purposes;
- a visual indication that the carrier is being produced.

The equipment shall also meet the following requirements:

- the user shall not have access to any control which, if wrongly set, might impair the technical characteristics of the equipment.

4.2 Class of emission and modulation characteristics

The equipment shall use Double Side Band (DSB) Amplitude Modulation (AM) full carrier, (6K80A3EJN for 25 kHz, 5K00A3EJN for 8,33 kHz), for speech and 13k0A2D for data. The equipment shall be designed to operate satisfactorily with a channel separation of 8,33 kHz or 25 kHz.

4.3 Warm up

After being switched on the equipment shall meet the requirements of the present document within one minute under normal test conditions (see clause 5.3).

If the equipment includes parts which require to be heated in order to operate correctly (e.g. crystal ovens) a warming up period of 10 minutes of those parts shall be allowed.

5 Test conditions, power sources and ambient temperatures

5.1 Normal and extreme test conditions

Measurements shall be made under normal test conditions (see clause 5.3) and also, where stated, under extreme test conditions (see clauses 5.4.1 and 5.4.2).

5.2 Test power source

During testing, the equipment shall be supplied from a test power source capable of producing normal and extreme test voltages.

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 testing the power source voltage shall be measured at the input terminals of the equipment.

During testing, the power source voltages shall be maintained within a tolerance of ±3 % relative to the voltage level at the beginning of each test.

5.3 Normal test conditions

5.3.1 Normal temperature and humidity

The normal temperature and humidity conditions for tests shall be a combination of temperature and humidity within the following ranges:

- temperature: +15 °C to +35 °C;
- relative humidity: 20 % to 75 %.

When it is impracticable to carry out the tests under these conditions, a note to this effect, stating the ambient temperature and relative humidity during the tests, shall be added to the test report.

5.3.2 Normal power sources

5.3.2.1 Mains voltage and frequency

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 declared voltage or any of the declared voltages for which the equipment was designed.

The frequency of the test power source corresponding to the AC mains shall be between 49 Hz and 51 Hz.

5.3.2.2 Regulated lead-acid battery power sources used on vehicles

When the radio equipment is intended for operation from the usual types of regulated lead-acid battery power source used on vehicles, the normal test voltage shall be 1,1 times the nominal voltage of the battery (6 V, 12 V, etc.).

5.3.2.3 Other power sources

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