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Candidate Harmonized European Standard (Telecommunications series)

Electromagnetic compatibility and Radio spectrum Matters (ERM); Radiotelephone transmitters and receivers for the maritime mobile service operating in VHF bands; Part 3: Harmonized EN covering essential requirements of article 3.3 (e) of the R&TTE Directive

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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
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Foreword

This Candidate Harmonized 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 3, of a multi-part deliverable covering radiotelephone transmitters and receivers for the maritime mobile service operating in VHF bands, 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";

Part 3: "Harmonized EN covering essential requirements of article 3.3 (e) of the R&TTE Directive".

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations and following Commission Decision 2000/638/EC of 22 September 2000.

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the 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 ("the R&TTE Directive") [1].

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):	18 months after doa

Introduction

The present document is part of a set of standards designed to fit in a modular structure to cover all radio and telecommunications terminal equipment under the R&TTE Directive [1]. Each standard is a module in the structure. The modular structure is shown in figure 1.

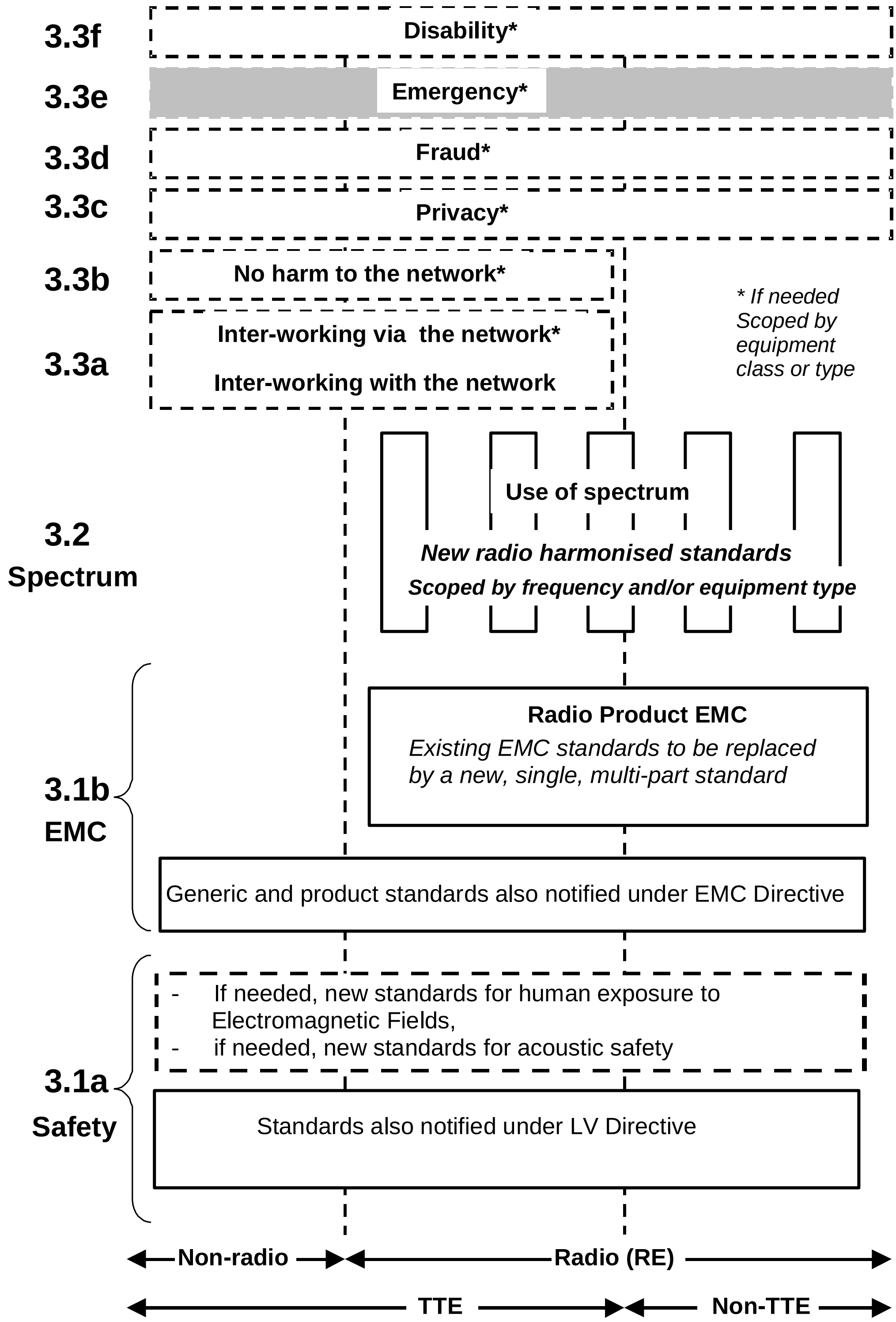

Figure 1: Modular structure for the various standards used under the R&TTE Directive [1]

The left hand edge of the figure 1 shows the different clauses of article 3 of the R&TTE Directive [1].

For article 3.3 various horizontal boxes are shown. Dotted lines indicate that at the time of publication of the present document essential requirements in these areas have to be adopted by the Commission. If such essential requirements are adopted, and as far and as long as they are applicable, they will justify individual standards whose scope is likely to be specified by function or interface type.

The vertical boxes show the standards under article 3.2 for the use of the radio spectrum by radio equipment. The scopes of these standards are specified either by frequency (normally in the case where frequency bands are harmonized) or by radio equipment type.

For article 3.1b the diagram shows the new single multi-part product EMC standard for radio, and the existing collection of generic and product standards currently used under the EMC Directive [2]. The parts of this new standard will become available in the second half of 2000, and the existing separate product EMC standards will be used until it is available.

For article 3.1a the diagram shows the existing safety standards currently used under the LV Directive [3] and new standards covering human exposure to electromagnetic fields. New standards covering acoustic safety may also be required.

The bottom of the figure shows the relationship of the standards to radio equipment and telecommunications terminal equipment. A particular equipment may be radio equipment, telecommunications terminal equipment or both. A radio spectrum standard will apply if it is radio equipment. An article 3.3 standard will apply as well only if the relevant essential requirement under the R&TTE Directive [1] is adopted by the Commission and if the equipment in question is covered by the scope of the corresponding standard. Thus, depending on the nature of the equipment, the essential requirements under the R&TTE Directive [1] may be covered in a set of standards.

The modularity principle has been taken because:

- it minimizes the number of standards needed. Because equipment may, in fact, have multiple interfaces and functions it is not practicable to produce a single standard for each possible combination of functions that may occur in an equipment;
- it provides scope for standards to be added:
    - under article 3.2 when new frequency bands are agreed; or
    - under article 3.3 should the Commission take the necessary decisions

  without requiring alteration of standards that are already published;
- it clarifies, simplifies and promotes the usage of Harmonized Standards as the relevant means of conformity assessment.

1 Scope

The present document applies to shipborne Very High Frequency (VHF) transmitters and receivers capable of voice and Digital Selective Calling (DSC), radio equipment.

The present document lays down minimum requirements for VHF radio transmitters and receivers operating in all or any part of the 156,0 MHz to 174,0 MHz frequency band allocated to the maritime mobile service, utilizing class of emission G3E and G2B.

The present document is intended to cover the provisions of Directive 1999/5/EC (R&TTE Directive) [1].

Article 3.3 (e), which states that radio equipment within the scope of the present document shall be so constructed that: "it supports certain features ensuring access to emergency services".

In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of article 3 of the R&TTE Directive [1] will apply to equipment within the scope of the present document.

NOTE: A list of such ENs is included on the web site http://www.newapproach.org/.

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 terminal equipment and the mutual recognition of their conformity (R&TTE Directive).

[2] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive).

[3] Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (LV Directive).

[4] International Telecommunication Union; Radio Regulations (1998), Appendix S18: "Table of Transmitting Frequencies in the VHF maritime mobile band".

[5] ITU-R Recommendation M.493-10 (1997): "Digital selective-calling system for use in the maritime mobile service".

[6] ITU-R Recommendation M.541-8 (1997): "Operational procedures for the use of digital selective-calling (DSC) equipment in the maritime mobile service".

[7] ITU-T Recommendation E.161 (1993): "Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network".

[8] IMO Resolution A.803(19): "Performance Standards for Shipborne VHF Radio Installations capable of Voice Communications and Digital Selective Calling".

[9] IMO Resolution A.524(13): "Performance Standard for VHF Multiple Watch facilities".

[10] ETSI EN 300 338 (V1.2.1) (1999): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Technical characteristics and methods of measurement for equipment for generation, transmission and reception of Digital Selective Calling (DSC) in the maritime MF, MF/HF and/or VHF mobile service".

[11] IEC 1162-1 (1995): "Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 1: Single talker and multiple listeners".

[12] ITU-T Recommendation P.53 (1988): "Psophometer for use on telephone-type circuits".

[13] ETSI ETR 028 (1994): "Radio Equipment and Systems (RES); Uncertainties in the measurement of mobile radio equipment characteristics".

[14] ETSI EN 300 162-2 (V1.1.1) (2000): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Radiotelephone transmitters and receivers for the maritime mobile service operating in VHF bands; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in the R&TTE Directive [1], and the following terms and definitions apply.

environmental profile: range of environmental conditions under which equipment within the scope of the present document is required to comply with the provisions of the present document.

channel 16: frequency of 156,800 MHz.

G3E: phase-modulation (Frequency modulation with a pre-emphasis of 6 dB/octave) for speech.

G2B: phase-modulation with digital information, with a sub-carrier for Digital Selective Calling (DSC) operation.

modulation index: ratio between the frequency deviation and the modulation frequency.

performance check: a check of:

- the transmitter carrier power and frequency; and
- receiver sensitivity (see clause 5.3.1.3).

3.2 Abbreviations

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

EMC	Electro-Magnetic Compatibility
LV	Low Voltage
R&TTE	Radio and Telecommunications Terminal Equipment
RE	Radio Equipment
ad	amplitude difference
DSC	Digital Selective Calling
EUT	Equipment Under Test
fd	frequency difference
FSI	Frequency Set Information
RF	Radio Frequency
rms	root mean square
SFI	Scanning Frequency Information
SINAD	Signal + Noise + Distortion / Noise + Distortion
VHF	Very High Frequency

4 Technical requirements specifications

4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be determined by the environmental class of the equipment. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the required operational environmental profile.

4.2 General, operational and technical requirements

4.2.1 General and operational requirements

4.2.1.1 Construction

The mechanical and electrical construction and finish of the equipment shall conform in all respects to good engineering practice, and the equipment shall be suitable for use on board ships.

All parts of the equipment to be checked during inspection or maintenance operations shall be readily accessible. The components shall be readily identifiable.

All controls shall be of sufficient size to enable the usual control functions to be easily performed and the number of controls should be the minimum necessary for simple and satisfactory operation.

Technical documentation and adequately detailed operating instructions shall be supplied with the equipment.

The VHF maritime mobile service uses both single-frequency and two-frequency channels. For two-frequency channels there shall be a separation of 4,6 MHz between the transmitting frequency and the receiving frequency (see Appendix S18 to the Radio Regulations [4]).

The equipment, which can consist of more than one unit, shall be capable of operating on single-frequency and two-frequency channels with manual control (simplex). It may also be capable of operating on two-frequency channels without manual control (duplex).

The equipment shall be able to operate on all channels defined in Appendix S18 to the Radio Regulations [4].

Operation on channels 75 and 76 shall be permitted but only by using reduced power, of 1 W maximum, which shall be controlled automatically by appropriate means. Additional VHF channels outside those defined by Appendix S18 to the Radio Regulations [4] may also be provided.

The equipment shall be so designed that use of channel 70 for purposes other than Digital Selective Calling (DSC) is prevented (see ITU-R Recommendations M.493-10 [5] and M.541-8 [6]).

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.

The equipment shall be fitted with a telephone handset or microphone, and an integral loudspeaker and/or a socket for an external loudspeaker. A handset is required if duplex operation is provided.

It shall be possible to switch off the loudspeaker without causing a variation in the audio frequency power provided to the handset, if supplied.

During transmission in simplex operation the receiver output shall be muted. During transmission in duplex operation only the handset shall be operative. Measures shall be taken to ensure correct operation when duplex is used and precautions shall be taken to prevent harmful electrical or acoustic feedback which might produce oscillations.

4.2.1.2 Controls and indicators

The equipment shall have a channel selector and shall indicate the designator, as shown in Appendix S18 to the Radio Regulations [4], of the channel at which the installation is set. The channel designator shall be legible irrespective of the external lighting conditions.

Channels 16 and 70 should be distinctively marked. Selection of channel 16, and if possible channel 70, shall be by readily accessible means (e.g. a distinctively marked key). Where an input panel on the equipment for entering the digits 0 - 9 is provided, this shall conform to ITU-T Recommendation E.161 [7].

The equipment shall have the following additional controls and indicators (see IMO Resolution A.803(19) [8]):

- on/off switch for the entire installation with a visual indication that the installation is in operation;
- a manual non-locking push to talk switch to operate the transmitter;
- on/off switch for the loudspeaker;
- a switch for reducing transmitter output power to no more than 1 W;
- an audio frequency power volume control;
- a squelch control;
- a control for reducing the brightness of the equipment illumination to zero;
- a visual indication that the transmitter is activated.

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;
- if the accessible controls are located on a separate console and if there are two or more control consoles, one of the consoles shall have priority over the others. If there are two or more control consoles, the operation of one console shall be indicated on the other console(s).

4.2.1.3 Safety precautions

Measures shall be taken to prevent damage to the equipment that might arise from an accidental reversal of polarity of the electrical power source.

Means shall be provided for earthing exposed metallic parts of the equipment.

No damage to the equipment shall occur when the antenna terminals are placed on open circuit or short circuit for a period of at least 5 minutes in each case.

In order to provide protection against damage due to the build up of static voltages at the antenna terminals, there shall be a dc path from the antenna terminals to chassis not exceeding 100 kΩ.

The information in any volatile memory device shall be protected from interruptions in the power supply of up to 60 s duration.

4.2.1.4 Labelling

All controls, instruments, indicators and terminals shall be clearly labelled (see IMO Resolution A.803(19) [8]).

Details of the power supply from which the equipment is intended to operate shall be clearly indicated on the equipment.

All units of the equipment shall be clearly marked on the exterior with the identification of the manufacturer, type designation of the equipment, and the serial number of the unit.

The compass safe distance shall be stated on the equipment or in the user document supplied with the equipment.

4.2.1.5 Warm up

After being switched on the equipment shall be operational within 5 s.

4.2.2 Technical requirements

4.2.2.1 Switching time

The channel switching arrangement shall be such that the time necessary to change over from using one of the channels to using any other channel does not exceed 5 s.

The time necessary to change over from transmission to reception or vice versa, shall not exceed 0,3 s.

4.2.2.2 Class of emission and modulation characteristics

The equipment shall use phase modulation, G3E (frequency modulation with a pre-emphasis of 6 dB/octave) for speech, and G2B for DSC signalling.

The equipment shall be designed to operate satisfactorily with a channel separation of 25 kHz.

The frequency deviation corresponding to 100 % modulation shall be ±5 kHz as nearly as practicable.

4.2.2.3 Multiple watch facilities

4.2.2.3.1 Additional performance standards

VHF radiotelephone equipment having multiple watch facilities shall comply with the following additional performance standards:

a) the equipment shall include a provision for the automatic scanning of a priority channel and one additional channel. Facilities for the automatic sequential change of the additional channel may be provided, which are not accessible to the user. Means shall be provided to block/unblock;

b) the priority channel is that channel which will be sampled even if there is a signal on the additional channel and on which the receiver will lock during the time a signal is detected;

c) the additional channel is that channel which will be monitored during the periods the equipment is not sampling or receiving signals on the priority channel;

d) provision shall be included to switch the scanning facility on and off by means of a manually operated control. In addition it shall be ensured that the receiver remains on the same channel as the transmitter for the entire duration of any communication with the ship, e.g. the scanning facility could be switched off automatically when the handset is off its hook;

e) selection of the additional channel and selection of the priority channel shall be possible at the operating position;

f) when the scanning facility is in operation, the channel number of both channels on which the equipment is operating shall be clearly indicated simultaneously;

g) in a transceiver, transmission shall not be possible when the scanning facility is operating. When the scanning facility is switched off, both transmitter and receiver shall be tuned automatically to the selected additional channel;

h) a transceiver shall be provided with a single manual control (e.g. push-button) in order to switch the equipment quickly for operation on the priority channel;

j) at the operating position of a transceiver the selected additional channel shall be clearly indicated as being the operational channel of the equipment.

With VHF DSC capable equipment having multiple watch facilities the scan facilities shall not be possible on the DSC channel (channel 70), see EN 300 338 [10].

NOTE: EN 301 025-1 also refers to DSC equipment (see Bibliography).

4.2.2.3.2 Scanning characteristics

When the scanning facility is switched on, the priority channel shall be sampled with a sampling period of not more than 2 s. If a signal is detected on the priority channel the receiver shall remain on this channel for the duration of that signal.

If a signal is detected on the additional channel the sampling of the priority channel shall continue, thus interrupting the reception on the channel for periods as short as possible and not greater than 150 ms.

The design of the receiver shall provide for its proper functioning during the period the priority channel is sampled since the receiving conditions on the priority channel may differ from those on the additional channel.

In the absence of a signal on the priority channel, and, during reception of a signal on the additional channel, the duration of each listening period on this channel shall be at least 850 ms.

Means shall be provided to indicate the channel on which a signal is being received.

4.2.2.4 Interfaces

4.2.2.4.1 DSC controller interfaces

The equipment shall have DSC signal input and output impedances of 600 Ω, symmetrical and free of earth.

If the equipment is designed as an integral unit or fitted with digital interface to a DSC controller, the equipment shall also comply with the relevant requirements of EN 300 338 [10], as an integral equipment.

4.2.3.4.2 Operational interfaces

The interface for control shall comply with IEC 1162-1 [11].

The protocols shall at least comply to Frequency Set Information (FSI) (see annex C). Transmitter key input interface shall be a 2-wire circuit closure to transmit with a maximum/minimum open circuit voltage of 50 V and a maximum closed circuit current of 100 mA.

Readily available commercial connections should be used. Manufacturers shall provide means for user identification of the connectors used.

4.3 Environmental requirements

4.3.1 Vibration test

4.3.1.1 Definition

This test determines the ability of equipment to withstand vibration without resulting in mechanical weakness or degradation in performance.

4.3.1.2 Requirement

The equipment shall meet the requirements of the performance check.

There shall be no harmful deterioration of the equipment visible.

4.3.1.3 Conformance

Relevant environment tests as defined in clause 5.3.1 shall be carried out.

4.3.2 Temperature tests

4.3.2.1 Definition

The immunity against the effects of temperature is the ability of the equipment to maintain the specified mechanical and electrical performance after the following tests has been carried out.

4.3.2.2 Dry heat

4.3.2.2.1 Definition

This test determines the ability of equipment to be operated at high ambient temperatures and to operate through temperature changes.

4.3.2.2.2 Requirement

The equipment shall meet the requirements of the performance check.

4.3.2.2.3 Conformance

Relevant environment tests as defined in clause 5.3.1 shall be carried out.

4.3.2.3 Damp heat

4.3.2.3.1 Definition

This test determines the ability of equipment to be operated under conditions of high humidity.

4.3.2.3.2 Requirement

The equipment shall meet the requirements of the performance check.

4.3.2.3.3 Conformance

Relevant environment tests as defined in clause 5.3.1 shall be carried out.

4.3.2.4 Low temperature cycle

4.3.2.4.1 Definition

These tests determine the ability of equipment to be operated at low temperatures. They also allow equipment to demonstrate an ability to start up at low ambient temperatures.

4.3.2.4.2 Requirement

The equipment shall meet the requirements of the performance check.

4.3.2.4.3 Conformance

Relevant environment tests as defined in clause 5.3.1 shall be carried out.

4.4 Conformance requirements

4.4.1 Transmitter carrier power, specific channels

4.4.1.1 Definition

The carrier power is the mean power delivered to the artificial antenna during one radio frequency cycle in the absence of modulation. The specific channels are 75 and 76, as shown in Appendix S18 to the Radio Regulations [4].

4.4.1.2 Limit

When channel 75 or 76 is selected the carrier power shall 1 W maximum.

4.4.1.3 Conformance

Conformance tests as defined in clause 5.3.2 shall be carried out.

4.4.2 Sensitivity of the modulator, including microphone

4.4.2.1 Definition

This characteristic expresses the capability of the transmitter to produce sufficient modulation when an audio frequency signal corresponding to the normal mean speech level is applied to the microphone.

4.4.2.2 Limit

The resulting frequency deviation shall be between ±1,5 kHz and ±3 kHz.

4.4.2.3 Conformance

Conformance tests as defined in clause 5.3.3 shall be carried out.

4.4.3 Audio frequency response

4.4.3.1 Definition

The audio frequency response is the frequency deviation of the transmitter as a function of the modulating frequency.

4.4.3.2 Limit

The audio frequency response shall be within +1 dB and -3 dB of a 6 dB / octave line passing through the reference point (see figure 2).

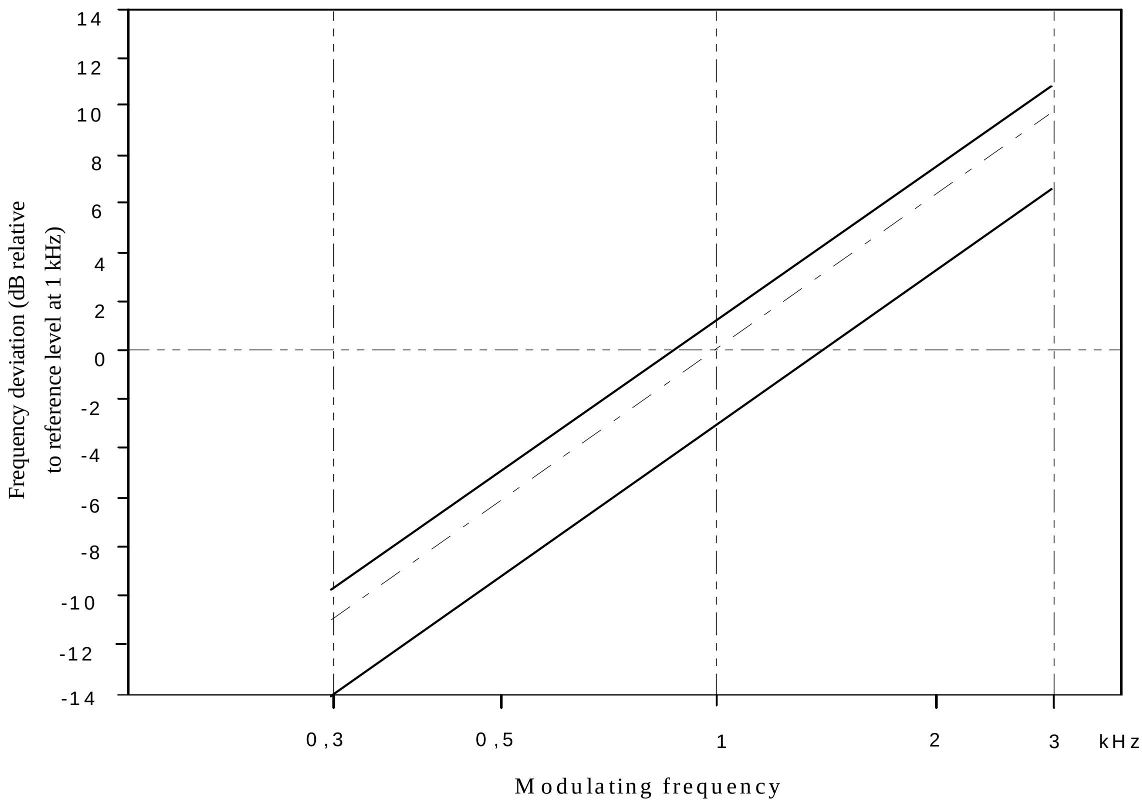

Figure 2: Audio frequency response

4.4.3.3 Conformance

Conformance tests as defined in clause 5.3.4 shall be carried out.

4.4.4 Audio frequency harmonic distortion of the emission

4.4.4.1 Definition

The harmonic distortion of the emission modulated by an audio frequency signal is defined as the ratio, expressed as a percentage, of the root mean square (rms) voltage of all the harmonic components of the fundamental frequency to the total rms voltage of the signal after linear demodulation.

4.4.4.2 Limit

The harmonic distortion shall not exceed 10 %.

4.4.4.3 Conformance

Conformance tests as defined in clause 5.3.5 shall be carried out.

4.4.5 Residual modulation of the transmitter

4.4.5.1 Definition

The residual modulation of the transmitter is the ratio, in dB, of the demodulated RF signal in the absence of wanted modulation, to the demodulated RF signal produced when the normal test modulation is applied.

4.4.5.2 Limit

The residual modulation shall not exceed -40 dB.

4.4.5.3 Conformance

Conformance tests as defined in clause 5.3.6 shall be carried out.

4.4.6 DSC audio input characteristics

4.4.6.1 Definition

This test is to ensure the transmitter's ability to correctly modulate a DSC audio signal.

4.4.6.2 Limit

The modulation index shall in both cases be between 1,8 and 2,2.

4.4.6.3 Conformance

Conformance tests as defined in clause 5.3.7 shall be carried out.

4.4.7 DSC audio input limitation

4.4.7.1 Definition

This test is to ensure, that the transmitter is able to limit deviation in case of excessive DSC input signals.

4.4.7.2 Limit

The modulation index shall be below 2,4.

4.4.7.3 Conformance

Conformance tests as defined in clause 5.3.8 shall be carried out.

4.4.8 Modulation attack time

4.4.8.1 Definition

The modulator attack time is the time elapsed between keying the transmitter and the transmitter being correctly modulated.

4.4.8.2 Limit

The settling time t_{set} shall be less than 90 ms as shown in figure 3.

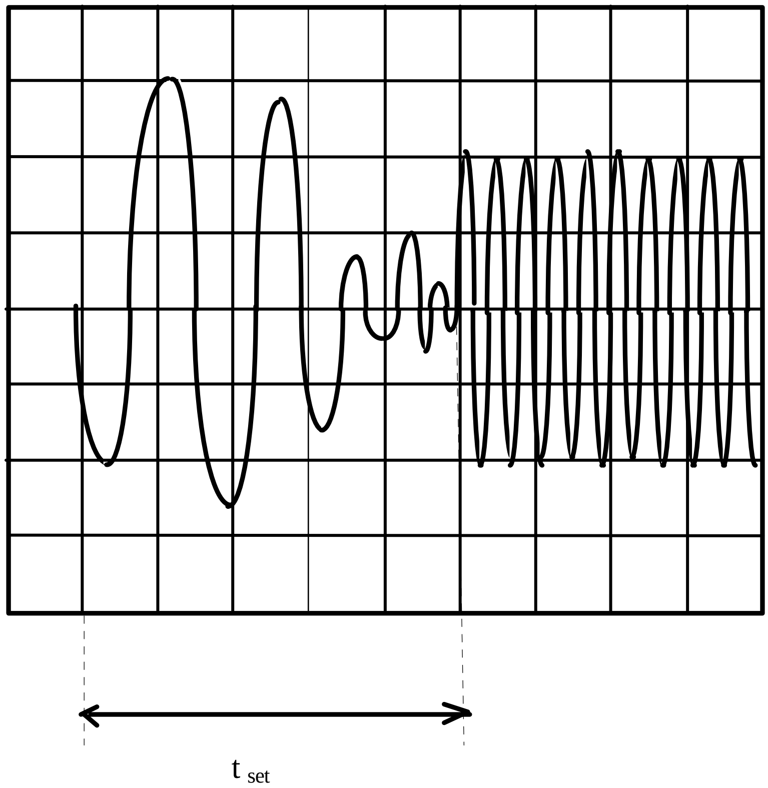

Figure 3: Test oscilloscope output

4.4.8.3 Conformance

Conformance tests as defined in clause 5.3.9 shall be carried out.

4.4.9 Harmonic distortion and rated audio frequency output power

4.4.9.1 Definition

The harmonic distortion at the receiver output is defined as the ratio, expressed as a percentage, of the total rms voltage of all the harmonic components of the modulation audio frequency to the total rms voltage of the signal delivered by the receiver.

The rated audio frequency output power is the value stated by the manufacturer to be the maximum power available at the output, for which all the requirements of the present document are met.

4.4.9.2 Limit

The rated audio frequency output power shall be at least:

- 2 W in a loudspeaker;
- 1 mW in the handset earphone.

The harmonic distortion shall not exceed 10 %.

4.4.9.3 Conformance

Conformance tests as defined in clause 5.4.2 may be carried out.

4.4.10 Audio frequency response

4.4.10.1 Definition

The audio frequency response is the variation in the receiver's audio frequency output level as a function of the modulating frequency of the radio frequency signal with constant deviation applied to its input.

4.4.10.2 Limit

The audio frequency response shall not deviate by more than +1 dB or -3 dB from a characteristic giving the output level as a function of the audio frequency, decreasing by 6 dB per octave and passing through the measured point at 1 kHz as shown in figure 4.

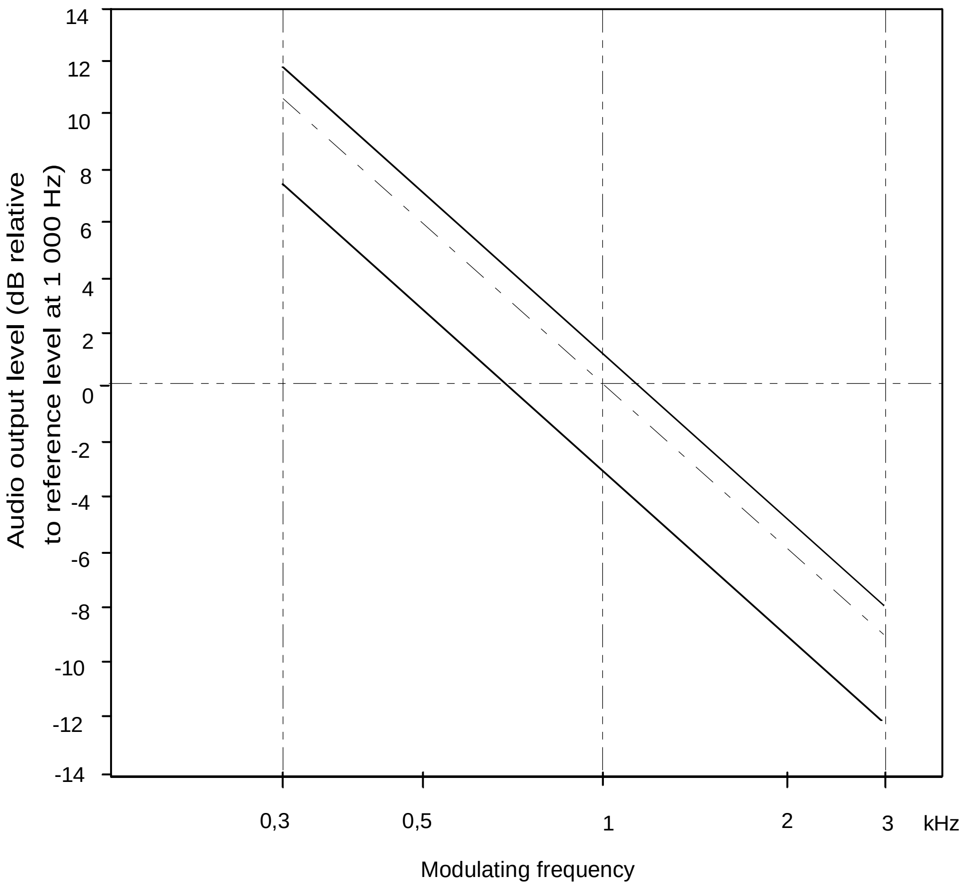

Figure 4: Audio frequency response

4.4.10.3 Conformance

Conformance tests as defined in clause 5.4.3 may be carried out.

4.4.11 Maximum usable sensitivity

4.4.11.1 Definition

The maximum usable sensitivity of the receiver is the minimum level of the signal (emf) at the nominal frequency of the receiver which, when applied to the receiver input with normal test modulation (see clause 5.1.3), will produce:

- in all cases, an audio frequency output power equal to 50 % of the rated output power (see clause 4.4.9); and
- a SINAD ratio of 20 dB, measured at the receiver output through a psophometric telephone filtering network such as described in ITU-T Recommendation P.53 [12].

4.4.11.2 Limit

The maximum usable sensitivity shall not exceed +6 dBμV (emf) under normal test conditions and +12 dBμV (emf) under extreme test conditions.

4.4.11.3 Conformance

Conformance tests as defined in clause 5.4.4 may be carried out.

4.4.12 Receiver noise and hum level

4.4.12.1 Definition

The receiver noise and hum level is defined as the ratio, in dB, of the audio frequency power of the noise and hum resulting from spurious effects of the power supply system or from other causes, to the audio frequency power produced by a high frequency signal of average level, modulated by the normal test modulation and applied to the receiver input.

4.4.12.2 Limit

The receiver noise and hum level shall not exceed -40 dB, relative to the modulated signal.

4.4.12.3 Conformance

Conformance tests as defined in clause 5.4.5 may be carried out.

4.4.13 Squelch operation

4.4.13.1 Definition

The purpose of the squelch facility is to mute the receiver audio output signal when the level of the signal at the receiver input is less than a given value.

4.4.13.2 Limit

Under the conditions specified in a) clause 5.4.6 the audio frequency output power shall not exceed -40 dB relative to the rated output power.

Under the conditions specified in b) clause 5.4.6, the input level shall not exceed +6 dBμV (emf).

Under the conditions specified in c) clause 5.4.6, the input signal shall not exceed +6 dBμV (emf) when the control is set at maximum.

4.4.13.3 Conformance

Conformance tests as defined in clause 5.4.6 may be carried out.

4.4.14 Squelch hysteresis

4.4.14.1 Definition

Squelch hysteresis is the difference in dB between the receiver input signal levels at which the squelch opens and closes.

4.4.14.2 Limit

The squelch hysteresis shall be between 3 dB and 6 dB.

4.4.14.3 Conformance

Conformance tests as defined in clause 5.4.7 may be carried out.

4.4.15 DSC audio output characteristic

4.4.15.1 Definition

DSC audio characteristic is the level of the two DSC tones at the DSC audio output terminal when the receiver is receiving a correctly modulated DSC signal.

4.4.15.2 Limit

The level of the audio signal developed across the load of the DSC output terminals shall be between 0,55 V rms and 1,1 V rms.

4.4.15.3 Conformance

Conformance tests as defined in clause 5.4.8 may be carried out.

5 Testing for compliance with technical requirements

5.1 Test conditions, power supply and ambient temperatures

5.1.1 Arrangements for test signals applied to the receiver input

Test signal sources shall be connected to the receiver input in such a way that the impedance presented to the receiver input is 50 Ω, irrespective of whether one or more test signals are applied to the receiver simultaneously.

The levels of the test signals shall be expressed in terms of the emf at the terminals to be connected to the receiver.

The nominal frequency of the receiver is the carrier frequency of the selected channel.

5.1.2 Squelch

Unless otherwise specified, the receiver squelch facility shall be made inoperative for the duration of the conformance tests.

5.1.3 Normal test modulation

For normal test modulation, the modulation frequency shall be 1 kHz and the frequency deviation shall be ±3 kHz.

5.1.4 Artificial antenna

When tests are carried out with an artificial antenna, this shall be a non-reactive, non-radiating 50 Ω load.

5.1.5 Arrangements for test signals applied to the transmitter input

For the purpose of the present document, the audio frequency modulating signal applied to the transmitter shall be produced by a signal generator applied to the connection terminals replacing the microphone transducer.

5.1.6 Test channels

Tests shall be made on channel 16 unless otherwise stated.

5.1.7 Test conditions, power sources and ambient temperatures

5.1.7.1 Normal and extreme test conditions

Conformance tests shall be made under normal test conditions and also, where stated, under extreme test conditions (clauses 5.1.9.1 and 5.1.9.2 applied simultaneously).

5.1.7.2 Test power source

During conformance testing, the equipment shall be supplied from a test power source capable of producing normal and extreme test voltages as specified in clauses 5.1.8.2 and 5.1.9.2.

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.

5.1.8 Normal test conditions

5.1.8.1 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 the relative humidity is lower than 20 %, it shall be stated in the test report.

5.1.8.2 Normal power sources

5.1.8.2.1 Mains voltage and frequency

The normal test voltage for equipment to be connected to the ac 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 is indicated as having been designed. The frequency of the test voltage shall be 50 Hz ± 1 Hz.

5.1.8.2.2 Battery power source

Where the equipment is designed to operate from a battery, the normal test voltage shall be the nominal voltage of the battery (12 V, 24 V etc.).

5.1.8.2.3 Other power sources

For operation from other power sources the normal test voltage shall be that declared by the manufacturer.

5.1.9 Extreme test conditions

Unless otherwise stated the extreme tests conditions means that the Equipment Under Test (EUT) shall be tested at the upper temperature and at the upper limit of the supply voltage applied simultaneously, and at the low temperature and the lower limit of the supply voltage applied simultaneously.

5.1.9.1 Extreme temperatures

For tests at extreme temperatures, measurements shall be made in accordance with clause 5.1.10, at a lower temperature of -15°C and an upper temperature of +55°C.

5.1.9.2 Extreme values of test power sources

5.1.9.2.1 Mains voltage

The extreme test voltages for equipment to be connected to the ac mains shall be the nominal mains voltage ±10 %. The frequency of the test voltage shall be 50 Hz ± 1 Hz.

5.1.9.2.2 Battery power source

Where the equipment is designed to operate from a battery, the extreme test voltages shall be 1,3 and 0,9 times the nominal voltage of the battery (12 V, 24 V etc.).

5.1.9.2.3 Other power sources

For operation from other power sources the extreme test voltages shall be agreed between the testing authority and the equipment manufacturer.

5.1.10 Procedure for tests at extreme temperatures

The equipment shall be switched off during the temperature stabilizing periods.

Before conducting tests at the upper temperature, the equipment shall be placed in the test chamber and left until thermal equilibrium is reached. The equipment shall then be switched on for half an hour in the high power transmit condition at the normal voltage, the equipment shall meet the requirement of the present document.

For tests at the lower temperature, the equipment shall be left in the test chamber until thermal equilibrium is reached and shall then be switched to the standby or receive position for one minute, after which the equipment shall meet the requirements of the present document.

5.1.11 Substitution antenna

Variations in the measuring results may occur with the use of different types of substitution antenna at the lower frequencies below about 80 MHz.

Where a shortened dipole antenna is used at these frequencies, details of the type of antenna used should be included with the results of the tests carried out on the site. Correction factors shall be taken into account when shortened dipole antennas are used.

5.2 Interpretation of the measurement results

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

- the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of the present document;

- the value of the measurement uncertainty for the measurement of each parameter shall be included in the test report;

- the recorded value of the measurement uncertainty shall be, for each measurement, equal to or lower than the figures in table 1.

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with ETR 028 [13] 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)).

Table 1 is based on such expansion factors.

Table 1: Maximum measurement uncertainty

Parameter	Maximum uncertainty
RF frequency	$\pm 1 \times 10^{-7}$
RF power	±0,75 dB
Adjacent channel power	±5 dB
Audio output power	±0,5 dB
Amplitude characteristics of receiver limiter	±1,5 dB
Sensitivity at 20 dB SINAD	±3 dB
Two-signal measurement	±4 dB
Three-signal measurement	±3 dB

5.3 Essential radio test suites

5.3.1 Environmental tests

5.3.1.1 Introduction

Environmental tests shall be carried out before tests are performed on the same equipment with respect to the other requirements of the present document.

5.3.1.2 Procedure

Environmental tests shall be carried out before tests are performed on the same equipment with respect to the other requirements of the present document. Unless otherwise stated, the equipment shall be connected to an electrical power source during the periods for which it is specified that electrical tests shall be carried out. These tests shall be performed using the normal test voltage.

5.3.1.3 Performance check

The performance check shall be a check of:

a) transmitter frequency error which is defined as the difference between the measured carrier frequency and its nominal value;

b) transmitter carrier power which is defined as the mean power delivered to the artificial antenna during one radio frequency cycle in the absence of modulation;

c) maximum usable sensitivity of the receiver (see clause 4.4.11):

- The transmitter carrier frequency shall be measured on channel 16 in the absence of modulation with the transmitter connected to an artificial antenna (see clause 5.1.4). The test shall be carried out with output switch set in the maximum position. The frequency error shall be within ±1,5 kHz.

- The transmitter carrier power shall be measured on channel 16 with the transmitter connected to the artificial antenna (see clause 5.1.4). The test shall be carried out with the output switch set in the maximum position. The carrier power shall be between 6 W and 25 W.

- The maximum usable sensitivity of the receiver shall be measured on channel 16. A test signal modulated by the normal test modulation (see clause 5.1.3) shall be applied to the receiver input. An audio frequency load and an instrument for measuring SINAD ratio (through a psophometric filter as specified in clause 4.4.11) shall be connected to the receiver output terminals. The level of the test signal shall be adjusted until a SINAD ratio of 20 dB is obtained and with the receiver's audio frequency power control adjusted to produce at least 50 % of the rated output power. The level of the test signal shall not exceed +12 dBμV (emf).

5.3.1.4 Vibration test

The EUT, complete with any shock and vibration absorbers with which it is provided, shall be clamped to the vibration table by its normal means of support and in its normal attitude. The EUT may be resiliently suspended to compensate for weight not capable of being withstood by the vibration table. Provision may be made to reduce or nullify any adverse effect on EUT performance, which could be caused by the presence of an electro-magnetic field due to the vibration unit.

The EUT shall be subjected to sinusoidal vertical vibration at all frequencies between:

- 5 Hz and up to 13,2 Hz with an excursion of ±1 mm ±10 % (7 m/s^2 maximum acceleration at 13,2 Hz);
- above 13,2 Hz and up to 100 Hz with a constant maximum acceleration of 7 m/s^2.

The frequency sweep rate shall be slow enough to allow the detection of resonances in any part of the EUT.

A resonance search shall be carried out throughout the test. If any resonance of the EUT has $Q \geq 5$ measured relative to the base of the vibration table, the EUT shall be subjected to a further vibration endurance test at each resonant frequency at the vibration level specified in the test with a duration of two hours. If any resonance with $Q < 5$ occurs the further endurance test shall be carried out at one single observed frequency. If no resonance occurred, the further endurance test shall be carried out at a frequency of 30 Hz.

Performance check(s) shall be carried out at the end of each two-hour endurance test period.

The procedure shall be repeated with vibration in each of two mutually perpendicular directions in the horizontal plane.

After conducting the vibration tests, the equipment shall be inspected for any mechanical deterioration.

The results obtained shall be compared to the limits in clause 4.3.1.2 in order to prove compliance with the requirement.

5.3.1.5 Temperature tests

5.3.1.5.1 Dry heat

The EUT shall be placed in a chamber at normal room temperature and relative humidity. The EUT and, if appropriate, any climatic control devices with which it is provided shall then be switched on. The temperature shall then be raised to and maintained at +55°C ± 3°C.

At the end of a soak period of 10 to 16 hours at +55°C ± 3°C, the EUT shall be subjected to the performance check. The temperature of the chamber shall be maintained at +55°C ± 3°C during the whole performance check period. At the end of the test, the EUT shall be returned to normal environmental conditions or to those required at the start of the next test. The maximum rate of raising or reducing the temperature of the chamber in which the equipment is being tested shall be 1°C/minute.

The results obtained shall be compared to the limits in clause 4.3.2.2.2 in order to prove compliance with the requirement.

5.3.1.5.2 Damp heat

The EUT shall be placed in a chamber at normal room temperature and relative humidity. The temperature shall then be raised to +40°C ± 2°C, and the relative humidity raised to 93 % ± 3 % over a period of three hours ± 0,5 hour. These conditions shall be maintained for a period of 10 to 16 hours. Any climatic control devices provided in the EUT may be switched on at the conclusion of this period. The EUT shall be switched on 30 minutes later, or after such period as agreed by the manufacturer, and shall be kept operational for at least two hours during which period the EUT shall be subjected to the performance check. The temperature and relative humidity of the chamber shall be maintained as specified during the whole test period. At the end of the test period and with the EUT still in the chamber, the chamber shall be brought to room temperature in not less than one hour. At the end of the test the EUT shall be returned to normal environmental conditions or to those required at the start of the next test. The maximum rate of raising or reducing the temperature of the chamber in which the equipment is being tested shall be 1°C/minute.

The results obtained shall be compared to the limits in clause 4.3.2.3.2 in order to prove compliance with the requirement.

5.3.1.5.3 Low temperature cycle

The EUT shall be placed in a chamber at normal room temperature and relative humidity. The temperature shall then be reduced to and maintained at -15°C ± 3°C, for a period of 10 to 16 hours. Any climatic control devices provided in the EUT may be switched on at the conclusion of this period. The EUT shall be switched on 30 minutes later, and shall be kept operational for at least two hours during which period the EUT shall be subjected to the performance check. The temperature of the chamber shall be maintained at -15°C ± 3°C during the whole test period. At the end of the test the EUT shall be returned to normal environmental conditions or to those required at the start of the next test. The maximum rate of raising or reducing the temperature of the chamber in which the equipment is being tested shall be 1°C/minute.

The results obtained shall be compared to the limits in clause 4.3.2.4.2 in order to prove compliance with the requirement.

5.3.2 Transmitter carrier power, specific channels

The transmitter shall be connected to an artificial antenna (see clause 5.1.4). The measurements given below shall be made under normal test conditions (see clause 5.1.3) and under extreme test conditions (see clause 5.1.9).

Each of the specified channels shall be selected in turn and the power delivered to this artificial antenna shall be measured.

The results obtained shall be compared to the limits in clause 4.4.1.2 in order to prove compliance with the requirement.

5.3.3 Sensitivity of the modulator, including microphone

An acoustic signal with a frequency of 1 kHz and sound level of 94 dBA shall be applied to the microphone. The resulting deviation shall be measured.

The results obtained shall be compared to the limits in clause 4.4.2.2 in order to prove compliance with the requirement.

5.3.4 Audio frequency response

A modulating signal at a frequency of 1 kHz shall be applied to the transmitter and the deviation shall be measured at the output. The audio input level shall be adjusted so that the frequency deviation is ±1 kHz. This is the reference point in figure 2 (1 kHz corresponds to 0 dB).

The modulation frequency shall then be varied between 300 Hz and 3 kHz, with the level of the audio frequency signal being kept constant and equal to the value specified above.

The test shall be carried out on one channel only (see clause 5.1.6).

The results obtained shall be compared to the limits in clause 4.4.3.2 in order to prove compliance with the requirement.

5.3.5 Audio frequency harmonic distortion of the emission

5.3.5.1 Method

The RF signal produced by the transmitter shall be applied via an appropriate coupling device to a linear demodulator with a de-emphasis network of 6 dB per octave. This test shall be carried out with the output power switch at both maximum and minimum under the test conditions given in clauses 5.3.5.2 and 5.3.5.3.

5.3.5.2 Normal test conditions

Under normal test conditions (see clause 5.1.8) the RF signal shall be modulated successively at frequencies of 300 Hz, 500 Hz and 1 kHz with a constant modulation index of 3.

The distortion of the audio frequency signal shall be measured at all the frequencies specified above.

5.3.5.3 Extreme test conditions

Under extreme test conditions (see clauses 5.1.9.1 and 5.1.9.2 applied simultaneously), the measurements shall be carried out at 1 kHz with a frequency deviation of ±3 kHz.

The results obtained shall be compared to the limits in clause 4.4.4.2 in order to prove compliance with the requirement.

5.3.6 Residual modulation of the transmitter

The normal test modulation defined in clause 5.1.3 shall be applied to the transmitter. The high frequency signal produced by the transmitter shall be applied, via an appropriate coupling device, to a linear demodulator with a de-emphasis network of 6 dB per octave. The time constant of this de-emphasis network shall be at least 750 µs.

Precautions shall be taken to avoid the effects of emphasizing the low audio frequencies produced by internal noise.

The signal shall be measured at the demodulator output using an rms voltmeter.

The modulation shall then be switched off and the level of the residual audio frequency signal at the output shall be measured again.

The results obtained shall be compared to the limits in clause 4.4.5.2 in order to prove compliance with the requirement.

5.3.7 DSC audio input characteristics

The test shall be performed on channel 70.

The transmitter shall be set into transmission using the DSC key lines.

The transmitter shall be modulated, using the DSC audio input terminal, by a single tone of 1 300 Hz with a level of 0,775 V ± 0,075 V.

The modulation index of the transmitter shall be measured. The test shall be repeated with an audio tone of 2 100 Hz having the same amplitude.

The results obtained shall be compared to the limits in clause 4.4.6.2 in order to prove compliance with the requirement.

5.3.8 DSC audio input limitation

The test shall be performed on channel 70.

The transmitter shall be set into transmission using the DSC key lines.

The transmitter shall be modulated, using the DSC audio input terminal, by a single tone of 2 100 Hz with a level of 2,45 V ±0,3 V.

The modulation index of the transmitter shall be measured.

The results obtained shall be compared to the limits in clause 4.4.7.2 in order to prove compliance with the requirement.

5.3.9 Modulation attack time

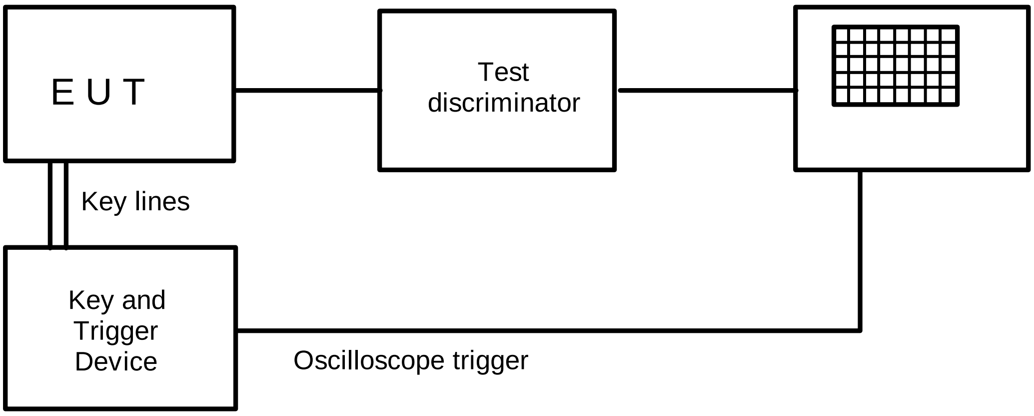

Figure 5: Test arrangement

The test shall be performed on channel 70. A signal of 1 300 Hz and an amplitude of 0,775 V ± 0,075 V rms shall be connected to the transmitter DSC input terminals. The transmitter shall be connected by suitable means to a wideband test discriminator.

The recovered audio from the test discriminator shall be applied to a storage oscilloscope.

The vertical sensitivity of the oscilloscope shall be set, so the recovered audio signal after settling has a peak-to-peak amplitude corresponding to 4 divisions. The vertical time base of the oscilloscope shall be set to 20 ms per division. The oscilloscope shall be set to trigger at 1 division from the left edge.

An arrangement shall be provided to key the transmitter using the DSC key lines and at the same time trigger the oscilloscope, see figure 5. The oscilloscope shows the modulation behaviour of the transmitter and shows when the transmitter's modulation circuits have settled, see figure 3 in clause 4.4.8.2.

The settling time t_{set} is the time elapsed from when triggering occurs, i.e. the time from when the transmitter is keyed until the recovered audio remains constant with an amplitude of 4 divisions.

The test shall be repeated with the transmitter modulated by a 2 100 Hz tone at the same amplitude.

The results obtained shall be compared to the limits in clause 4.4.8.2 in order to prove compliance with the requirement.

5.4 Other test specifications

5.4.1 General

The requirements in clauses 4.4.9 to 4.4.16 inclusive have been set on the assumption that the test specifications in clauses 5.4.2 to 5.4.9 will be used to verify the performance of the equipment.

5.4.2 Harmonic distortion and rated audio frequency output power

Test signals at a level of +100 dBμV, at a carrier frequency equal to the nominal frequency of the receiver and modulated by the normal test modulation (see clause 6.3) shall be applied in succession to the receiver input under the conditions specified in clause 5.1.5.

For each measurement, the receiver's audio frequency volume control shall be set so as to obtain, in a resistive load which simulates the receiver's operating load, the rated audio frequency output power (see clause 4.4.9). The value of this load shall be stated by the manufacturer.

Under normal test conditions (see clause 5.1.8) the test signal shall be modulated successively at 300 Hz, 500 Hz and 1 kHz with a constant modulation index of 3 (ratio between the frequency deviation and the modulation frequency). The harmonic distortion and audio frequency output power shall be measured at all the frequencies specified above.

Under extreme test conditions (see clauses 5.1.9.1 and 5.1.9.2 applied simultaneously), the tests shall be made at the receiver's nominal frequency and at the nominal frequency ±1,5 kHz. For these tests, the modulation shall be 1 kHz and the frequency deviation shall be ±3 kHz.

The results obtained shall be compared to the limits in clause 4.4.9.2 in order to prove compliance with the requirement.

5.4.3 Audio frequency response

A test signal of +60 dBµV (emf), at a carrier frequency equal to the nominal frequency of the receiver and modulated with normal test modulation (see clause 5.1.3), shall be applied to the receiver antenna port under the conditions specified in clause 5.1.1.

The receiver's audio frequency power control shall be set so as to produce a power level equal to 50 % of the rated output power (see clause 4.4.9). This setting shall remain unchanged during the test.

The frequency deviation shall then be reduced to 1 kHz and the audio output is the reference point in figure 7 (1 kHz corresponds to 0 dB) (see clause 4.4.10.2).

The frequency deviation shall remain constant while the modulation frequency is varied between 300 Hz and 3 kHz and the output level shall then be measured.

The measurement shall be repeated with a test signal at frequencies 1,5 kHz above and below the nominal frequency of the receiver.

The test shall be carried out on one channel only (see clause 5.1.6.6).

The results obtained shall be compared to the limits in clause 4.4.10.2 in order to prove compliance with the requirement.

5.4.4 Maximum usable sensitivity

The test shall be made on the lowest frequency channel, the highest frequency channel and on channel 16.

A test signal at a carrier frequency equal to the nominal frequency of the receiver, modulated by the normal test modulation (see clause 5.1.3) shall be applied to the receiver input. An audio frequency load and a measuring instrument for measuring the SINAD ratio (through a psophometric network as specified in clause 4.2.8.1) shall be connected to the receiver output terminals.

The level of the test signal shall be adjusted until a SINAD ratio of 20 dB is obtained, using the psophometric network and with the receiver's audio frequency power control adjusted to produce 50 % of the rated output power. Under these conditions, the level of the test signal at the input is the value of the maximum usable sensitivity.

The measurements shall be made under normal test conditions (see clause 5.1.8) and under extreme test conditions (see clauses 5.1.9.1 and 5.1.9.2 applied simultaneously).

A receiver output power variation of ±3 dB relative to 50 % of the rated output power may be allowed for sensitivity measurements under extreme test conditions.

The results obtained shall be compared to the limits in clause 4.4.11.2 in order to prove compliance with the requirement.

5.4.5 Receiver noise and hum level

A test signal with a level of +30 dBµV (emf) at a carrier frequency equal to the nominal frequency of the receiver, and modulated by the normal test modulation specified in clause 5.1.3, shall be applied to the receiver input. An audio frequency load shall be connected to the output terminals of the receiver. The audio frequency power control shall be set so as to produce the rated output power level conforming to clause 4.4.9.

The output signal shall be measured by an rms voltmeter having a -6 dB bandwidth of at least 20 kHz. The modulation shall then be switched off and the audio frequency output level measured again.

The results obtained shall be compared to the limits in clause 4.4.12.2 in order to prove compliance with the requirement.

5.4.6 Squelch operation

The following procedure shall be followed:

a) with the squelch facility switched off, a test signal of +30 dBµV, at a carrier frequency equal to the nominal frequency of the receiver and modulated by the normal test modulation specified in clause 5.1.3, shall be applied to the input terminals of the receiver. An audio frequency load and a psophometric filtering network (see clause 4.4.11) shall be connected to the output terminals of the receiver. The receiver's audio frequency power control shall be set so as to produce the rated output power defined in clause 4.4.9.

   The output signal shall be measured with the aid of an rms voltmeter.

   The input signal shall then be suppressed, the squelch facility switched on and the audio frequency output level measured again;

b) with the squelch facility switched off again, a test signal modulated by the normal test modulation shall be applied to the receiver input at a level of +6 dBµV (emf) and the receiver shall be set to produce 50 % of the rated output power. The level of the input signal shall then be reduced and the squelch facility shall be switched on. The input signal shall then be increased until the above-mentioned output power is reached. The SINAD ratio and the input level shall then be measured;

c) (applicable only to equipment with continuously adjustable squelch control) with the squelch facility switched off, a test signal with normal test modulation shall be applied to the receiver input at a level of +6 dBµV (emf), and the receiver shall be adjusted to give 50 % of the rated audio output power. The level of the input signal shall then be reduced and the squelch facility shall be switched on. The squelch shall then be at its maximum position and the level of the input signal increased until the output power again is 50 % of the rated audio output power.

The results obtained shall be compared to the limits in clause 4.4.13.2 in order to prove compliance with the requirement.

5.4.7 Squelch hysteresis

If there is any squelch control on the exterior of the equipment it shall be placed in its maximum muted position. With the squelch facility switched on, an unmodulated input signal at a carrier frequency equal to the nominal frequency of the receiver shall be applied to the input of the receiver at a level sufficiently low to avoid opening the squelch. The input signal shall be increased to the level just opening the squelch. This input level shall be recorded. With the squelch still open, the level of the input signal shall be slowly decreased until the squelch mutes the receiver audio output again.

The results obtained shall be compared to the limits in clause 4.4.14.2 in order to prove compliance with the requirement.

5.4.8 DSC audio output characteristic

The test shall be performed at channel 70.

The test signal at the nominal carrier frequency shall be applied to the receiver input. The signal shall be modulated by a 1 300 Hz tone to a modulation index of 2. The signal level of the generator shall be set to +26 dBµV.

The DSC audio output terminals shall be loaded with a 600 Ω load.

The audio level at the terminals shall be measured.

The test shall be repeated with the test signal modulated by a 2 100 Hz tone maintaining the modulation index of 2.

The results obtained shall be compared to the limits in clause 4.4.15.2 in order to prove compliance with the requirement.

Annex A (normative): The EN Requirements Table (EN-RT)

The EN Requirements Table (EN-RT) serves a number of purposes, as follows:

- it provides a tabular summary of all the requirements;
- it shows the status of each EN-R, whether it is essential to implement in all circumstances (Mandatory), or whether the requirement is dependent on the supplier having chosen to support a particular optional service or functionality (Optional). In particular it enables the EN-Rs associated with a particular optional service or functionality to be grouped and identified;
- when completed in respect of a particular equipment it provides a means to undertake the static assessment of conformity with the EN.

Table A.1: EN Requirements Table (EN-RT)

EN Reference		**EN 300162-3**				**Comment**
No.	**Reference**	**EN-R** (note)	**Status**			
1	4.2	General, operational and technical requirements	M			
2	4.3.1	Vibration	M			
3	4.3.2.2	Dry Heat	M			
4	4.3.2.3	Damp heat	M			
5	4.3.2.4	Low temperature cycle	M			
6	4.4.1	Transmitter carrier power, specific channels	M			
7	4.4.2	Sensitivity of the modulator, including microphone	M			
8	4.4.3	Audio frequency response	M			
9	4.4.4	Audio frequency harmonic distortion of the emission	M			
10	4.4.5	Residual modulation of the transmitter	M			
11	4.4.6	DSC audio input characteristics	M			
12	4.4.7	DSC audio input limitation	M			
13	4.4.8	Modulation attack time	M			
14	4.4.9	Harmonic distortion and rated audio frequency output power	M			
15	4.4.10	Audio frequency response	M			
16	4.4.11	Maximum usable sensitivity	M			
17	4.4.12	Receiver noise and hum level	M			
18	4.4.13	Squelch operation	M			
19	4.4.14	Squelch hysteresis	M			
20	4.4.15	DSC audio output characteristic	M			
NOTE: These EN-Rs are justified under Article 3.3 e) of the R&TTE Directive.						

Key to columns:

No Table entry number;

Reference Subclause reference number of conformance requirement within the present document;

EN-R Title of conformance requirement within the present document;

Status Status of the entry as follows:

- M Mandatory, shall be implemented under all circumstances;
- O Optional, may be provided, but if provided shall be implemented in accordance with the requirements;
- O.n this status is used for mutually exclusive or selectable options among a set. The integer "n" shall refer to a unique group of options within the EN-RT. A footnote to the EN-RT shall explicitly state what the requirement is for each numbered group. For example, "It is mandatory to support at least one of these options", or, "It is mandatory to support exactly one of these options".

Comments To be completed as required.

Annex B (informative): The EN title in the official languages

Language	EN title
Danish	Elektromagnetisk kompatibilitet og Radiospektrum Anliggender (ERM); Radiotelefoni sendere og modtagere i den maritime mobile tjeneste, som anvender frekvenser i VHF båndene; Del 3: Harmoniseret EN som dækker de væsentlige krav I R&TTE direktivets artikel 3.3e
Dutch	Elektromagnetische compatibiliteit en radiospectrum zaken (ERM); Radiotelefonie apparatuur tbv de maritiem mobiele dienst werkend in de VHF banden; Deel 3: Geharmoniseerde EN welke invulling geeft aan de wezenlijke vereisten, neergelegd in artikel 3.3e van de R&TTE Directive
English	Electromagnetic compatibility and Radio spectrum Matters (ERM); Radiotelephone transmitters and receivers for the maritime mobile service operating in VHF bands; Part 3: Harmonized EN covering essential requirements of article 3.3e of the R&TTE Directive
Finnish	Sähkömagneettinen yhteensopivuus ja radiospektriasiat (ERM); Siirtyvän meriradioliikenteen VHF - taajuuksilla toimivat radiolähettimet ja vastaanottimet; Osa 3: Harmonisoitu EN, joka kattaa R&TTE - direktiivin artiklan 3.3e olennaiset vaatimukset
French	CEM et spectre radioélectrique (ERM) - Émetteurs et récepteurs de radiotéléphones en VHF pour le service mobile maritime - Partie 3: Norme harmonisée couvrant l'article 3.3e de la Directive R&TTE
German	Elektromagnetische Verträglichkeit und Funkspektrumangelegenheiten (ERM); UKW-Sprechfunkanlagen für den mobilen Seefunkdienst; Teil 3: Harmonisierte Europäische Norm (EN) mit wesentlichen Anforderungen nach R&TTE-Richtlinie Artikel 3.3e
Greek	Ηλεκτρομαγνητική συμβατότητα και Θέματα Ραδιοφάσματος (ERM) – Πομποί και δέκτες ραδιοτηλεφώνου για ναυτιλιακή κινητή υπηρεσία που λειτουργεί στις ζώνες VHF – Μέρος 3: Εναρμονισμένο EN για την κάλυψη των ουσιωδών απαιτήσεων του άρθρου 3.3e της Οδηγίας R&TTE
Icelandic	
Italian	Compatibilità elettromagnetica e Questioni relative allo spettro delle radiofrequenze (ERM); Ricevitori e trasmettitori di radiotelefoni per il servizio mobile marittimo in banda VHF; Parte 3: Norma armonizzata relativa ai requisiti essenziali dell'articolo 3.3e della direttiva R&TTE
Portuguese	Assuntos de Espectro Radioeléctrico e Compatibilidade Electromagnética (ERM);receptores e transmissores radiotelefónicos para o serviço móvel marítimo operando na faixa de VHF; Parte 3: EN harmonizada cobrindo os requisitos essenciais no âmbito do Artigo 3.3e da Directiva R&TTE
Spanish	Compatibilidad electromagnética y cuestiones de espectro de radiofrecuencia (ERM);Transmisores y receptores radioteléfono para el servicio móvil marítimo operando en bandas VHF; Parte 3: EN armonizada cubriendo los requisitos esenciales según el artículo 3.3e de la directiva de R&TTE
Swedish	Elektromagnetisk kompatibilitet och radiospektrumfrågor (ERM); Sändare och mottagare för radiotelefoni för den maritima mobila tjänsten arbetande i VHF-banden; Del 3: Harmoniserad EN omfattande väsentliga krav enligt artikel 3.3e i R&TTE-direktivet

Annex C (informative): Bibliography

- ETSI EN 300 162-1 (V1.3.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Radiotelephone transmitters and receivers for the maritime mobile service operating in VHF bands; Part 1: Technical characteristics and methods of measurement".

- ETSI EN 301 025-1 (V1.2.2): "Electromagnetic compatibility and Radio spectrum Matters (ERM); VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC); Part 1: Technical characteristics and methods of measurement".

- Commission Decision 2000/638/EC of 22 September 2000 on the application of Article 3(3)(e) of Directive 1999/5/EC to marine radio communication equipment intended to be fitted to seagoing non-SOLAS vessels and which is intended to participate in the global maritime distress and safety system (GMDSS) and not covered by Council Directive 96/98/EC on marine equipment.

History

Document history		
V1.1.1	December 2000	One-step Approval Procedure OAP 20010427: 2000-12-27 to 2001-04-27