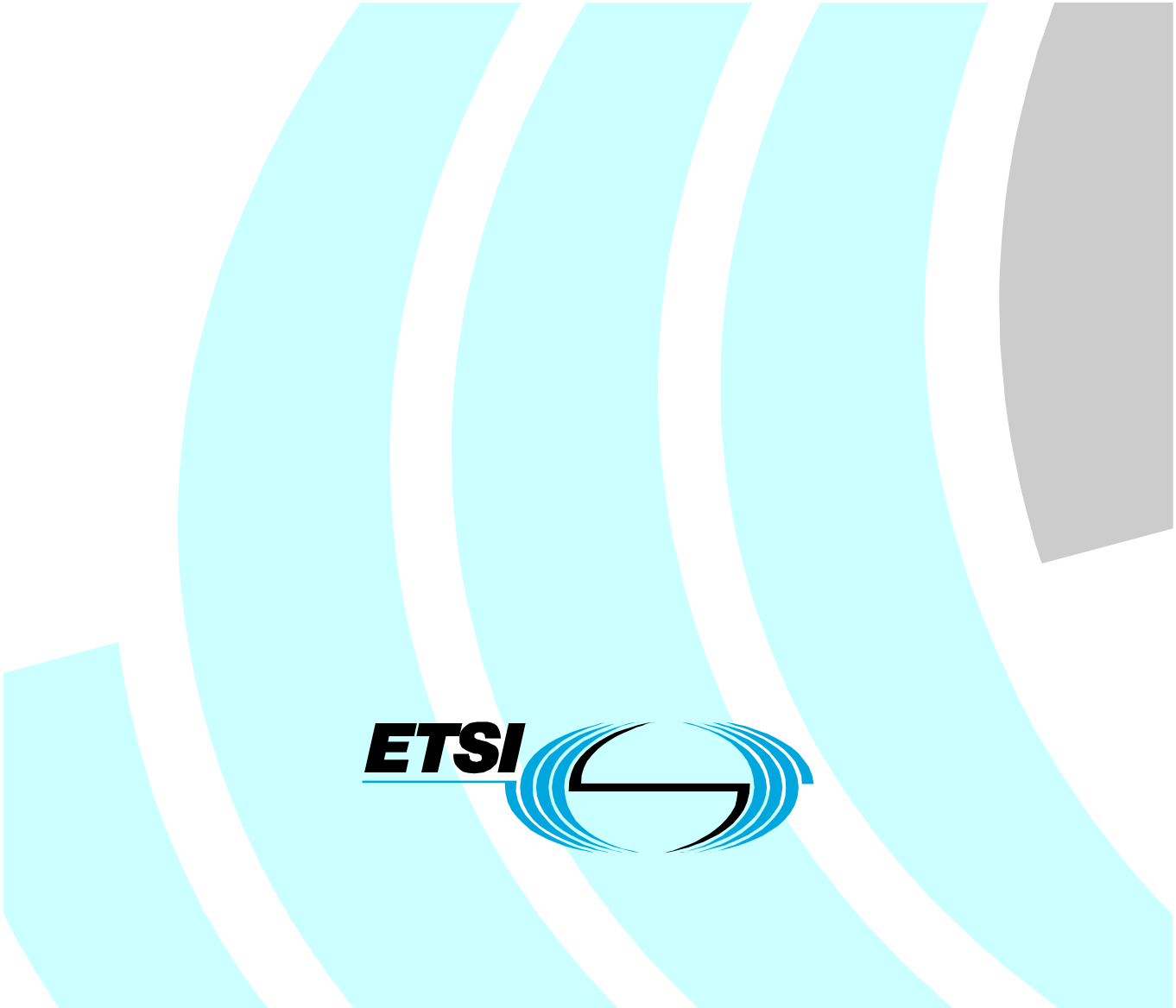
ETSI EN 301 025-3 V1.2.1 (2004-09)

Candidate Harmonized European Standard (Telecommunications series)

Electromagnetic compatibility and Radio spectrum Matters (ERM); VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC); Part 3: Harmonized EN under article 3.3(e) of the R&TTE Directive



Reference
REN/ERM-TG26-057-3

Keywords
maritime, radio, regulation, traffic, VHF

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Association à but non lucratif enregistrée à la
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Contents

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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).

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC laying down a procedure for the provision of information in the field of technical standards and regulations and following the 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 [1] 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").

The present document is part 3 of a multi-part deliverable covering the Electromagnetic compatibility and Radio spectrum Matters (ERM); VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC), as identified below:

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

Part 2: "Harmonized EN under article 3.2 of the R&TTE Directive";

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

National transposition dates	
Date of adoption of this EN:	10 September 2004
Date of latest announcement of this EN (doa):	31 December 2004
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 June 2005
Date of withdrawal of any conflicting National Standard (dow):	30 June 2006

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.

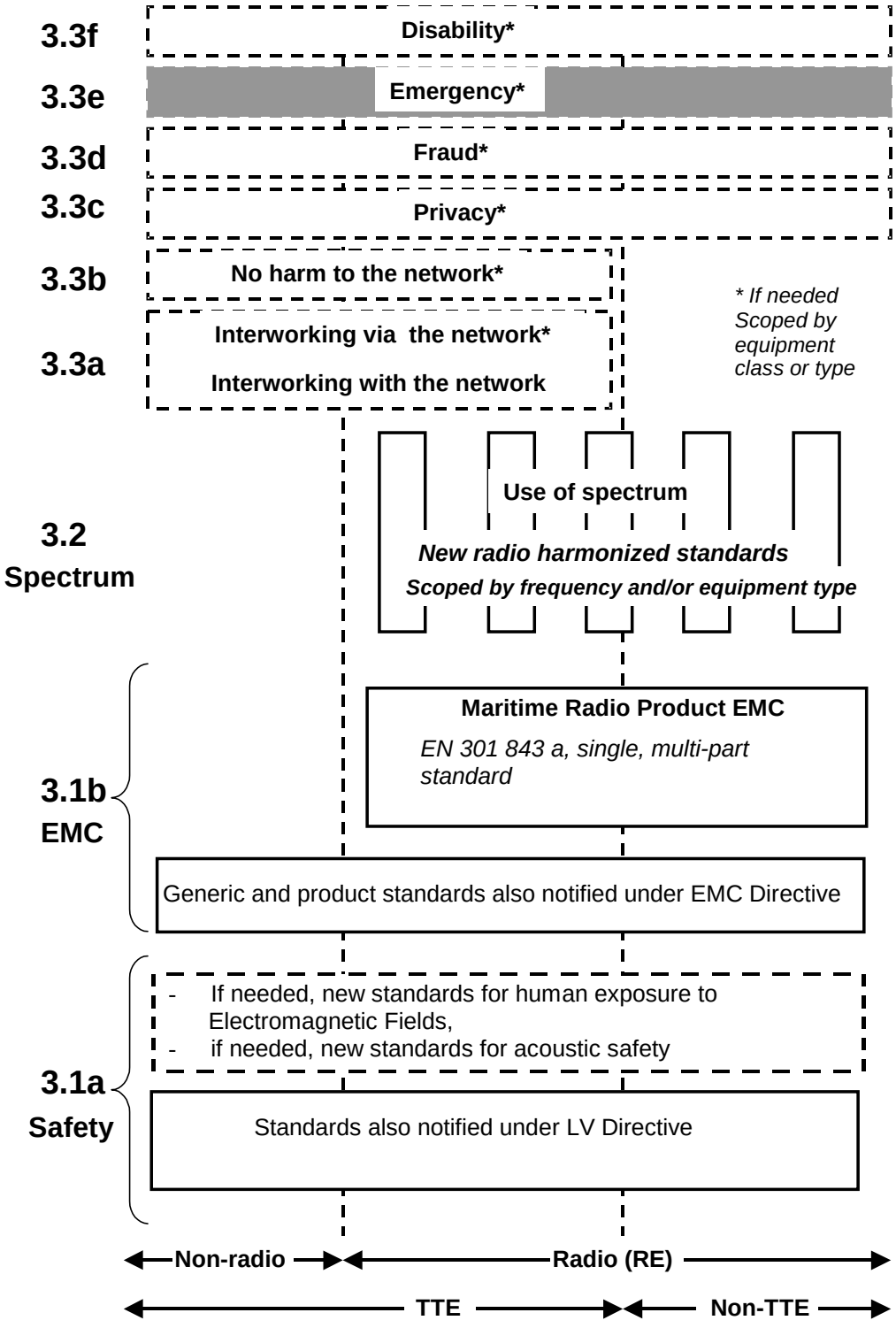

Figure 1: Modular structure for the various standards used under the R&TTE Directive

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 EN 301 843, the multi-part product EMC standard for maritime radio, and the existing collection of generic and product standards currently used under the EMC Directive [2].

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 VHF radiotelephone equipment for general communications and associated equipment for class "D" Digital Selective Calling (DSC).

This radio equipment operates within all or any part of the frequency band 156 MHz to 174 MHz allocated to the Maritime Mobile Service and utilizes class of emission G3E, and G2B.

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

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

[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] ITU Radio Regulations, Appendix 18 (2001): "Table of transmitting frequencies in the VHF maritime mobile band".

[5] ITU-T Recommendation E.161 (2001): "Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network".

[6] ITU-R Recommendation M.493-10 (2000): "Digital selective-calling system for use in the maritime mobile service".

[7] CENELEC EN 61162-1 (2000): "Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 1: Single talker and multiple listeners".

[8] ITU-R Recommendation M.825-3 (1998): "Characteristics of a transponder system using digital selective calling techniques for use with vessel traffic services and ship-to-ship identification".

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

[10] ITU-R Recommendation M.821-1 (1997): "Optional expansion of the digital selective-calling system for use in the maritime mobile service".

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

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 apply:

environmental profile: range of environmental conditions under which equipment within the scope of the EN 301 025-3 is required to comply with the provisions of EN 301 025-3

class D: class D equipment is intended to provide minimum facilities for VHF DSC distress, urgency and safety as well as routine calling and reception, not necessarily in full accordance with IMO GMDSS carriage requirements for VHF installations (ITU-R Recommendation M.493-10 [6])

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 DSC operation

modulation index: ratio between the frequency deviation and the frequency of the modulation signal

3.2 Abbreviations

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

ac	alternating current
dc	direct current
DSC	Digital Selective Calling
EMC	Electro-Magnetic Compatibility
e.m.f.	electromotive force
EUT	Equipment Under Test
FM	Frequency Modulation
GGA	Global positioning system fixed data
GLL	Geographic position Latitude/Longitude
GNS	Global Navigation System
GPS	Global Positioning System
IMO	International Maritime Organization
ISO	International Organization for Standardization
LV	Low Voltage
MMS	Maritime Mobile Service
MMSI	Maritime Mobile Service Identity
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
RMC	Recommended Minimum specific GPS/transit data
r.m.s.	root mean square
SINAD	Signal + Noise + Distortion to 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 Composition

The equipment shall, as a minimum, include:

- a VHF radiotelephone transmitter;
- a VHF radiotelephone receiver;
- a dedicated channel 70 watchkeeping receiver for DSC decoder;
- a DSC encoder; and
- a DSC decoder.

4.2.1.2 Construction

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.

Adequately detailed operating instructions shall be provided with the equipment.

The equipment shall be capable of operating on single frequency and two-frequency channels with manual control (simplex).

The equipment shall be able to operate on all channels defined in appendix 18 to the Radio Regulations [4].

Additional VHF channels outside those defined by appendix 18 to the Radio Regulations [4] may also be provided, but means shall be provided to block any or all of these additional channels, as may be required by the licence before installation on board vessels. It shall not be possible for the user to unblock any blocked channels.

The equipment shall be so designed that use of channel 70 for purposes other than DSC is prevented, and that use of channels AIS1 and AIS2 for purposes other than AIS is prevented.

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.

4.2.1.3 Controls and indicators

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

If the equipment can be operated from more than one position, the control unit provided at the position from where the vessel is normally navigated shall have priority and the individual control units shall be provided with an indicator showing whether the equipment is in operation.

The following controls or functions shall be provided:

- DISTRESS BUTTON (see clause 4.2.1.4.3): The default shall be an undesignated distress message;
- CALL (see clause 4.2.1.4.1): The default (initial display) shall be an individual call;
- CANCEL: to revert to the initial display or to silence the aural alarm and visual indication used to indicate receipt of a DSC alert. The cancel function shall take place automatically after a maximum of five min of inactivity;
- ENTER/Accept/OK: for accepting a menu item;
- a means of easily entering MMSI for calling and manual position information. If a numeric key pad is provided this shall conform to ITU-T Recommendation E.161 [5];
- ALPHA - NUMERIC DISPLAY (see clause 4.2.1.5);
- 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 with a visual indication that the transmitter is activated and facilities to limit the transmission time to a maximum of 5 min. A short audible alarm and a visual indication may be provided to show when the transmission will be automatically terminated within the next 10 s. It shall be possible to reoperate the push to talk switch and reactivate the transmitter after a 10 s period;
- a switch for reducing transmitter output power to no more than 1 W, on both telephony and DSC, with a visual indication that low power is selected ;
- an audio-frequency power volume control;
- a squelch control;
- a control for dimming to extinction the equipment illumination with the exception of a visual indicator (see clause 4.2.1.4.3);
- controls for multiple watch facilities, if provided (see clause 4.2.2.8).

The equipment shall have means to select manually a channel and shall indicate the designator (where applicable), as shown in appendix 18 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.

Channel 16 shall be distinctively marked. Selection of channel 16, shall be preferably by readily accessible means (e.g. a distinctively marked key). Selection of channel 16 by any means shall automatically set the transmitter output power to maximum. This power level may subsequently be reduced by manual user control if required.

Where the capability for automatically switching a radiotelephone channel on receipt of a DSC call exists, a means for disabling that capability should be provided. This capability should be provided for all calls other than individual station calls of category distress or urgency.

4.2.1.4 Facilities for coding and decoding of DSC

4.2.1.4.1 Call functions

The facilities for coding and composition of calls shall be so arranged that it is possible for the operator quickly and precisely to enter a call. The types of DSC calls provided in this equipment are specified in annex B.

The CALL functions (see clause 4.2.1.3) shall permit selection of the following functions:

- INDIVIDUAL: for making a call to a specific MMSI;
- GROUP: for making a call to a specific Group MMSI (see clause 4.2.2.4);
- ALL SHIPS URGENCY/SAFETY: for making all ships calls;
- RECEIVED CALLS: for retrieving stored incoming DSC calls;

- OTHER: for equipment housekeeping functions.

If INDIVIDUAL is selected, either a MANUAL call (see clause 4.2.1.4.2) or a DIRECTORY call shall be selected. The DIRECTORY list shall have a facility for at least 10 entries. Their MMSIs shall be programmable.

4.2.1.4.2 MANUAL calls

The MANUAL call facility shall permit the entry of a MMSI. If the called station is a coast station (i.e. MMSI commencing 00) no further information shall be requested from the operator. If the called station is a ship station the equipment shall request input of a channel number. The equipment shall assist the operator by suggesting a suitable inter-ship channel.

NOTE: In appendix 18 of the Radio Regulations channels 6, 8, 72 and 77 are reserved solely for intership communications. Channels 9, 10, 13, 15, 17, 67, 69 and 73 may also be used for intership communications but are also available for port operations and ship movement.

4.2.1.4.3 Distress calls

It shall only be possible to transmit distress DSC calls by means of a single dedicated button which is used for no other purpose. This button shall not be any key of ITU-T Recommendation E.161 [5] digital input panel or an ISO keyboard provided on the equipment. This button shall be red in colour and marked "DISTRESS" and protected against inadvertent operation with an individual, non-removable, spring loaded cover. Where a non-transparent protective lid or cover is used, it shall also be marked "DISTRESS". It shall not be necessary for the user to remove seals or to break the lid or cover in order to operate the distress button.

The operation of the distress button shall generate a visible and audible indication (see clause 4.2.2.6.3). The distress button shall be kept pressed for at least 3 s. A flashing light and an intermittent acoustic signal shall start immediately. After the 3 s, the transmission of the distress alert is initiated and the indication becomes steady.

The distress alert initiation shall require at least two independent actions. Lifting the protective lid or cover is considered as the first action. Pressing the distress button is considered as the second independent action.

It shall be possible to select the nature of distress prior to initiating the transmission of a distress call. The default nature of distress shall be the undesignated distress. The equipment shall be capable of receiving and displaying any designated nature of distress, but shall not be capable of transmitting a nature of distress of EPIRB (symbol 112), see ITU-R Recommendation M.493-10 [6].

Initiation of a distress call shall automatically have priority over any other operation of the equipment. The equipment shall automatically select channel 70 and the maximum transmitter power.

The distress call shall automatically be transmitted five times in succession with no intervals between the individual calls so that bit synchronization between the transmitter and receiver of the call can be maintained. Each call shall include the appropriate dot pattern.

Following the distress call sequence, a DSC expansion message giving enhanced position resolution according to ITU-R Recommendation M.821-1 [10] shall be transmitted.

After the transmission of the distress call sequence including the DSC expansion message the equipment shall automatically tune to channel 16 and select the maximum transmitter power.

4.2.1.4.4 ALL SHIPS calls

It shall only be possible to transmit ALL SHIPS URGENCY and ALL SHIPS SAFETY calls by means of deliberate actions, such as two levels of menu instructions.

After the transmission of the all ships call, the equipment shall automatically tune to channel 16 and select the maximum transmitter power.

4.2.1.4.5 Incoming calls

The DSC equipment shall be provided with suitable facilities for converting incoming calls with relevant address content to visual form in plain language. The contents of at least the last 10 received DSC calls shall be stored until read manually from the RECEIVED CALL menu. In the case of an incompatible working channel request, the unit shall reply 'Unable to comply' with 104 as the first telecommand and 108 as the second telecommand.

The radiotelephone shall be capable of switching to any channel identified in an incoming call, which is available in the equipment. The user shall be provided with a visual indication that a channel change is requested. Switching to the channel identified shall be performed after a manual 'Able to comply' acknowledgement has been initiated. In the case of incoming distress and urgency calls the radiotelephone shall be capable of switching to channel 16 and automatically selecting the maximum transmitter power.

4.2.1.4.6 Other calls

If automatic response to polling or position reporting calls is included, means for disabling those responses shall be provided.

4.2.1.5 DSC display

The equipment shall be provided with facilities which show the functions currently available, prompts the operator if an incorrect operation is attempted, displays error messages and displays incoming and logged calls.

The equipment shall be provided with facilities for visual indication, and possible manual correction of the user programmable information content of the call before the call is sent.

There shall be an indication that unread received messages are present in memory.

Display of geographic position and time shall be readily available. The equipment shall be provided with facilities to display the last entered position.

For DSC displays located on the handset, the display should be easily read from a distance of 40 cm. For DSC displays located on the transceiver unit, the display should be easily read from 85 cm.

The DSC display must be capable of continuously displaying a complete enhanced position according to ITU-R Recommendation M.821-1 [10].

4.2.1.6 Handset and loudspeaker

The equipment shall be fitted with a telephone handset or microphone, and an integral loudspeaker and/or a socket for an external loudspeaker. Where there are connections to external loudspeakers, these shall also relay acoustic alarms.

During transmission in simplex operation the receiver output shall be muted.

4.2.1.7 Safety precautions

Measures shall be taken to protect the equipment against the effects of excessive current or excessive voltage.

Measures shall be taken to prevent any damage 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.

The components and wiring in which the a.c. or d.c. voltage (other than radio-frequency voltage), produce, singly or in combination, peak voltages in excess of 50 V, shall be protected against any accidental access and shall be automatically isolated from all electrical power sources if the protective covers are removed. Alternatively, the equipment shall be constructed in such a way as to prevent access to components operating at such voltages unless an appropriate tool is used such as a nut-spanner or screwdriver. Conspicuous warning labels shall be affixed both inside the equipment and on the protective covers.

No damage to the equipment shall occur when the antenna terminals are placed on open circuit or short circuit for the period permitted by the push-to-talk switch in clause 4.2.1.3.

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

The information in programmable memory devices and the vessel's identity and information inherent to the DSC process shall be stored in non-volatile memory devices.

4.2.1.8 Labelling

All controls, instruments, indicators and terminals shall be clearly labelled.

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

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

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

4.2.1.9 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 manually 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 (FM) with pre-emphasis of 6 dB/octave) for speech, and G2B for DSC signalling.

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

4.2.2.3 Facilities for DSC transmission and reception

4.2.2.3.1 General

The equipment shall comprise the necessary facilities for coding and transmission of DSC on channel 70 and for decoding and conversion of the information content of received DSC to visual form in plain language.

The equipment may be either:

a) an independent unit for connection to an associated radiotelephone; or

b) mechanically and electrically integrated in such radio equipment.

However in both cases the DSC equipment shall be capable of automatic channel switching in the radio equipment.

The watchkeeping receiver part of the DSC equipment shall be designed for continuous operation on channel 70 but the receiver need not operate when the transmitter is in use.

4.2.2.3.2 Decoding

The DSC equipment shall be so designed that in the decoding process use shall be made of parity bits for error detection, time diversity repetitions and error check characters in the received call as specified in ITU-R Recommendation M.493-10 [6].

4.2.2.3.3 Automatic acknowledgement

The equipment shall not be provided with facilities for automatic transmission of acknowledgements.

4.2.2.3.4 Automatic re-transmission of distress calls

Where no DSC distress acknowledgement is received, the equipment shall automatically re-transmit the distress call attempt on channel 70 after a random delay of between 3 ½ min and 4 ½ min from the beginning of the previous call.

After the transmission of each distress call attempt the equipment shall automatically re-tune to channel 16 and select the maximum transmitter power.

This sequence shall be continued until a DSC distress acknowledgement has been received, or until the automatic transmission of the distress call is discontinued manually. This manual operation shall not interrupt the transmission of any distress call attempt in progress.

Means shall be provided for transmitting the distress call attempt again by manual intervention at any time.

A visual indication shall be provided that a distress alert is in automatic retransmit mode. An audible indication shall be provided during retransmission.

4.2.2.4 Ships identity - MMSI and Group MMSI

The equipment shall be capable of storing permanently a ship's 9 digit Maritime Mobile Service Identity (MMSI) number which shall be inserted automatically in the call. The 10th digit shall be added automatically set to zero. It shall not be possible to change the identity number using any combination of operator controls. The ship's MMSI shall be readily accessible to the operator, either displayed at equipment power-up, or by a simple action of the operator. It shall not be possible to transmit a DSC call until the ship's MMSI has been stored.

Facilities shall be provided to permit the operator to program and store a Group MMSI number to enable the equipment to recognize calls addressed to both the ship's MMSI and the Group MMSI. These facilities shall limit the number of operator programmable digits to 8 and the leading zero shall be automatically inserted by the equipment.

4.2.2.5 Entry of position information

Means shall be provided for manual entry of the geographical position information and of the time when this position information was valid. In addition, facilities for automatic entry and encoding of the geographical position and time information shall be provided. Such facilities shall conform with EN 61162-1 [7]. As a minimum, the sentences GLL, GGA, RMC and GNS shall be recognized.

No connection of, or failure within, any external circuits shall disable the DSC equipment. When no position information has been entered either manually or due to the failure of any automatic system or the absence of a valid external data stream (EN 61162-1 [7]), the operator shall be aurally or visually prompted for a manual input of position. This prompt shall be repeated every 4 h.

If the position information has not been updated for 23,5 h the position shall default to the repeated digit "9" as specified in ITU-R Recommendation M.493-10 [6].

4.2.2.6 Alarm circuits

4.2.2.6.1 Distress and urgency

The equipment shall be provided with a specific acoustic alarm and a visual indication, activated automatically when a call with format specifier distress or category distress or urgency has been received. If the acoustic alarm is intermittent, it shall be repeated at least every 5 s. It shall not be possible to disable these alarm circuits.

The alarm for distress and urgency calls shall be distinguishable from the tone for safety and routine calls.

The alarm should not be activated where duplicate distress relay calls are received within 1 hour. A duplicate distress relay call is one having format specifier all ships or geographic area that contains identical message information to that of the initiating distress alert, and an identical distress MMSI.

4.2.2.6.2 Other categories

The equipment shall be provided with an acoustic alarm and a visual indication, activated automatically on receipt of calls of categories other than distress and urgency. It shall not be possible to disable the acoustic alarm circuit.

4.2.2.6.3 Acoustic alarms

The acoustic alarm shall initially be of a power that is clearly distinguishable, but not interfere with, radiotelephone communications. If not manually cancelled within 10 s, the power shall rise to a level of at least 80 dB(A) at a distance of 1 m from the equipment.

4.2.2.6.4 Cancellation of alarms

A means of manual cancellation of alarms shall be provided. In the event that an alarm is not cancelled manually, then automatic cancellation shall take place after 2 min.

4.2.2.7 Facilities for automatic identification

If facilities for automatic identification to ITU-R Recommendation M.825-3 [8] are provided, then the equipment shall not permit the operator to originate this type of call. The equipment shall only be capable of responding to requests for identification.

4.2.2.8 Multiple watch facilities

4.2.2.8.1 General

The VHF radiotelephone equipment may be provided with multiple watch facilities on traffic channels but operation using DSC shall always take precedence. It shall not be possible to adopt scanning techniques on channel 70.

4.2.2.8.2 Scanning provisions

Equipment having multiple watch facilities shall comply with the following:

- 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;
- 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;
- 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;
- 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, e.g. the scanning facility may be switched off automatically when the handset is off its hook;
- selection of the additional channel and selection, if provided, of the priority channel shall be possible at the operating position of the receiver or transceiver. If selection of the priority channel is not provided, the priority channel shall be channel 16;
- when the scanning facility is in operation, the channel number of both channels on which the equipment is operating shall be indicated;
- 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;
- 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;

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

4.2.2.8.3 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.

4.3 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 have been carried out. The maximum rate of raising or reducing the temperature of the chamber in which the equipment is being tested shall be 1°C/min.

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 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

4.3.2.4.1 Definition

This test determines the ability of equipment to be operated at low temperatures. It also allows 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 Sensitivity of the modulator, including microphone

4.4.1.1 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.

4.4.1.2 Limit

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

4.4.1.3 Conformance

Conformance tests as defined in clause 5.3.2.1 shall be carried out.

4.4.2 Audio frequency response

4.4.2.1 Definition

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

4.4.2.2 Limit

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

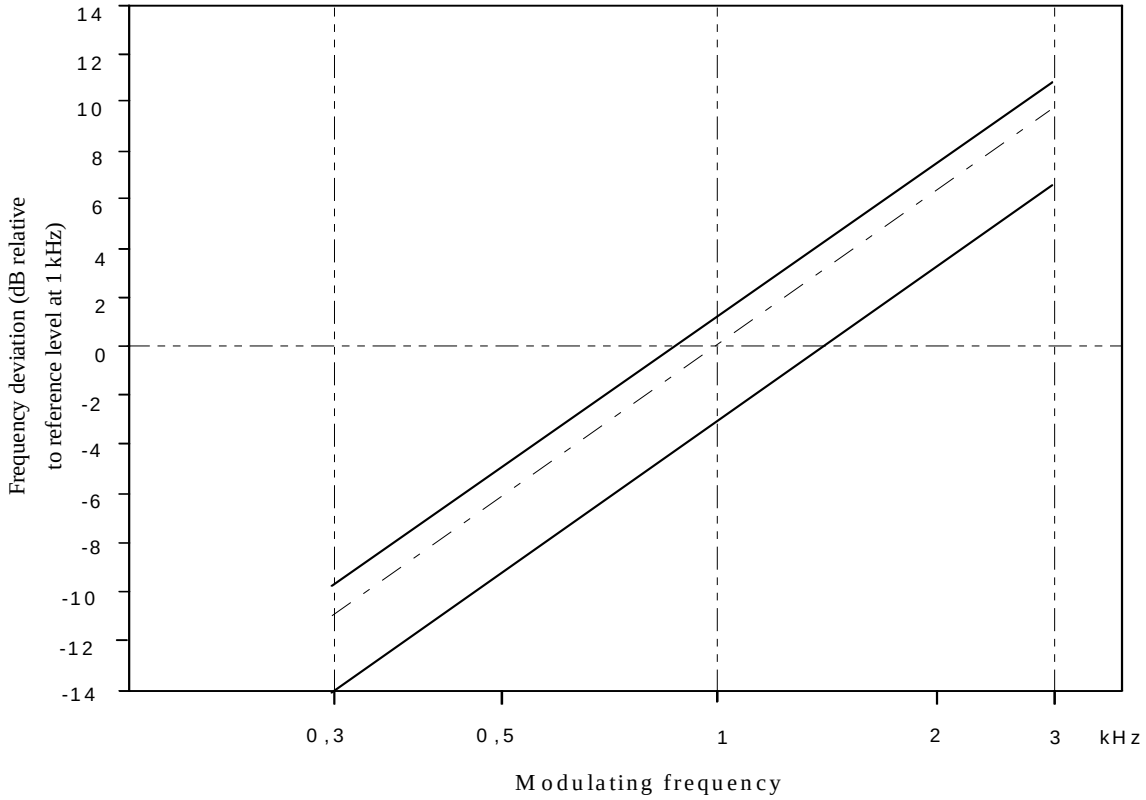

Figure 2: Audio frequency response

4.4.2.3 Conformance

Conformance tests as defined in clause 5.3.2.2 shall be carried out.

4.4.3 Audio frequency harmonic distortion of the emission

4.4.3.1 Definition

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

4.4.3.2 Limit

The harmonic distortion shall not exceed 10 %.

4.4.3.3 Conformance

Conformance tests as defined in clause 5.3.2.3 shall be carried out.

4.4.4 Residual modulation of the transmitter

4.4.4.1 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.

4.4.4.2 Limit

The residual modulation shall not exceed -40 dB.

4.4.4.3 Conformance

Conformance tests as defined in clause 5.3.2.4 shall be carried out.

4.4.5 Testing of generated call sequences

4.4.5.1 Definition

Generated call sequences are calls which comply with the requirements of ITU-R Recommendation M.493-10 [6].

4.4.5.2 Limit

The requirements of ITU-R Recommendation M.493-10 [6] regarding message composition and content shall be met.

The generated calls shall be analysed with the calibrated apparatus for correct configuration of the signal format, including time diversity.

It shall be verified that, after transmission of a DSC call, the transmitter re-tunes to the original channel. However in the case of a distress call the transmitter shall tune to channel 16 and automatically select the maximum power.

The telecommands used and the channels tested for switching shall be stated in the test report.

4.4.5.3 Conformance

Conformance tests as defined in clause 5.3.2.5 shall be carried out.

4.4.6 Harmonic distortion and rated audio-frequency output power

4.4.6.1 Definition

The harmonic distortion at the receiver output is defined as the ratio, expressed as a percentage, of the total r.m.s. voltage of all the harmonic components of the modulation audio frequency to the total r.m.s. 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.

4.4.6.2 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 %.

4.4.6.3 Conformance

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

4.4.7 Receiver audio frequency response

4.4.7.1 Definition

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

4.4.7.2 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 3.

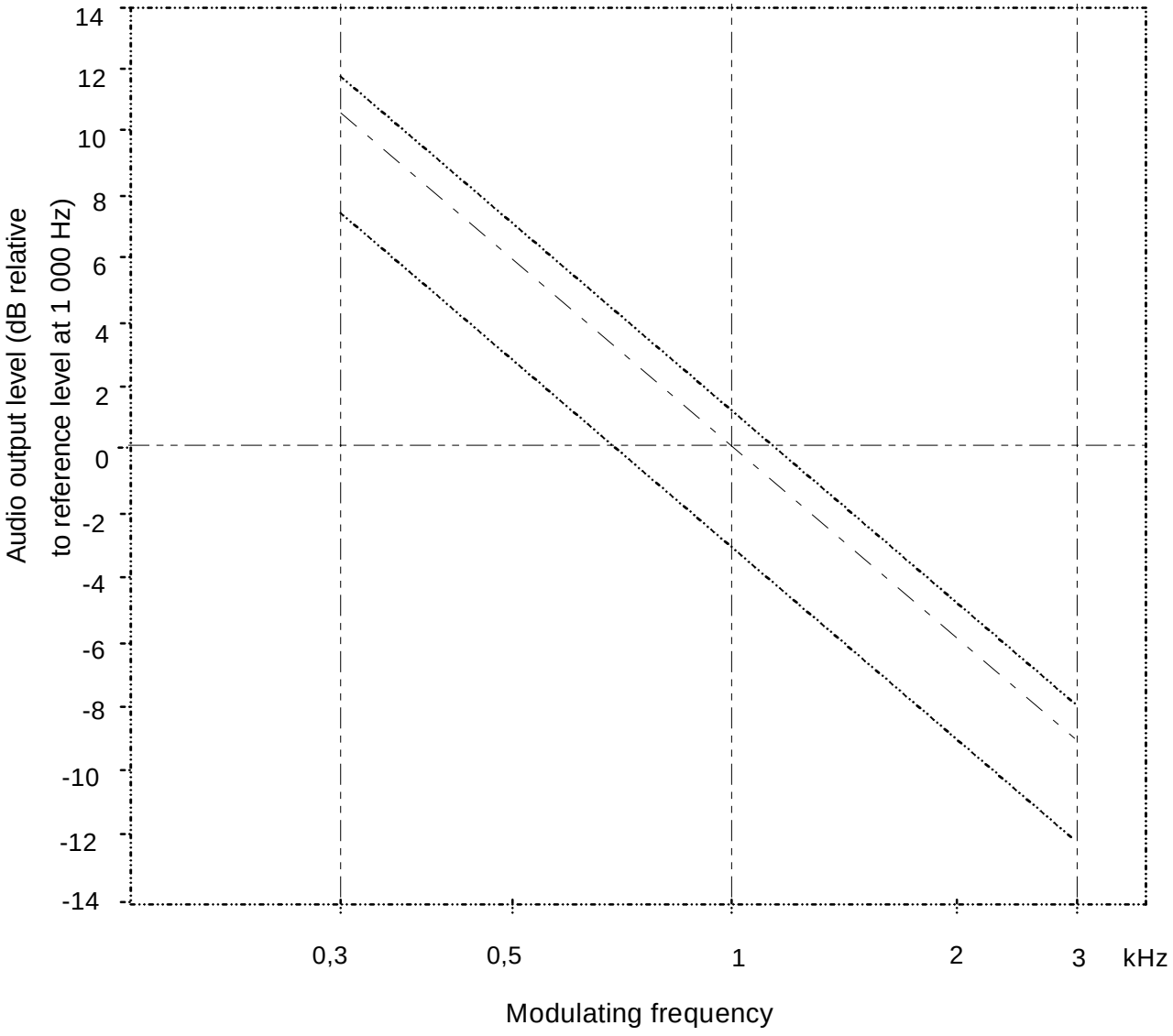

Figure 3: Audio frequency response

4.4.7.3 Conformance

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

4.4.8 Radio-telephone receiver Maximum Usable Sensitivity

4.4.8.1 Definition

The maximum usable sensitivity of the receiver is the minimum level of the signal (e.m.f.) 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 4.4.6.1); and
- a Signal + Noise + Distortion to Noise + Distortion (SINAD) ratio of 20 dB, measured at the receiver output through a psophometric telephone filtering network such as described in ITU-T Recommendation O.41 [11].

4.4.8.2 Limits

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

4.4.8.3 Conformance

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

4.4.9 Radio-telephone receiver co-channel rejection

4.4.9.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

4.4.9.2 Limit

The co-channel rejection ratio shall be between -10 dB and 0 dB.

4.4.9.3 Conformance

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

4.4.10 Radio-telephone receiver adjacent channel selectivity

4.4.10.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal which differs in frequency from the wanted signal by 25 kHz.

4.4.10.2 Limits

The adjacent channel selectivity shall be not less than 70 dB under normal test conditions and not less than 60 dB under extreme test conditions.

4.4.10.3 Conformance

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

4.4.11 Radio-telephone receiver spurious response rejection

4.4.11.1 Definition

The spurious response rejection is a measure of the capability of the receiver to discriminate between the wanted modulated signal at the nominal frequency and an unwanted signal at any other frequency at which a response is obtained.

4.4.11.2 Limit

At any frequency separated from the nominal frequency of the receiver by more than 25 kHz, the spurious response rejection ratio shall be not less than 70 dB.

4.4.11.3 Conformance

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

4.4.12 Radio-telephone receiver intermodulation response

4.4.12.1 Definition

The intermodulation response is a measure of the capability of a receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with a specific frequency relationship to the wanted signal frequency.

4.4.12.2 Limit

The intermodulation response ratio shall be greater than 68 dB.

4.4.12.3 Conformance

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

4.4.13 Radio-telephone receiver blocking or desensitization

4.4.13.1 Definition

Blocking is a change (generally a reduction) in the wanted output power of the receiver or a reduction of the SINAD ratio due to an unwanted signal on another frequency.

4.4.13.2 Limit

The blocking level for any frequency within the specified ranges, shall be not less than 90 dBµV (e.m.f.), except at frequencies on which spurious responses are found (see clause 5.4.7).

4.4.13.3 Conformance

Conformance tests as defined in clause 5.4.9 may be carried out.

4.4.14 Receiver residual noise level

4.4.14.1 Definition

The receiver residual noise 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.

4.4.14.2 Limit

The receiver residual noise level shall not exceed -40 dB.

4.4.14.3 Conformance

Conformance tests as defined in clause 5.4.10 may be carried out.

4.4.15 Squelch operation

4.4.15.1 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.

4.4.15.2 Limit

Under the conditions specified in a) clause 5.4.11, the audio frequency output power shall not exceed -40 dB relative to the rated output power.

Under the conditions specified in b) clause 5.4.11, the input level shall not exceed +6 dBµV (e.m.f.) and the SINAD ratio shall be at least 20 dB.

Under the conditions specified in c) clause 5.4.11, the input signal shall not exceed +6 dBµV (e.m.f.) when the control is set at maximum.

4.4.15.3 Conformance

Conformance tests as defined in clause 5.4.11 may be carried out.

4.4.16 Squelch hysteresis

4.4.16.1 Definition

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

4.4.16.2 Limit

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

4.4.16.3 Conformance

Conformance tests as defined in clause 5.4.12 may be carried out.

4.4.17 Dynamic range

4.4.17.1 Definition

The dynamic range of the equipment is the range from the minimum to the maximum level of a radio frequency input signal at which the bit error ratio in the output of the decoder does not exceed a specified value.

4.4.17.2 Limit

The bit error ratio shall be equal to or less than 10^{-2}.

4.4.17.3 Conformance

Conformance tests as defined in clause 5.4.13 may be carried out.

4.4.18 Verification of correct decoding of various types of DSC calls

4.4.18.1 Definition

DSC call sequences are calls that comply with ITU-R Recommendation M.493-10 [6].

4.4.18.2 Limit

The requirements of ITU-R Recommendation M.493-10 [6] regarding message composition and content shall be met.

The decoded call sequences at the output of the receiver shall be examined for correct technical format, including error-check characters.

When receiver measurements are made by use of a printer or a computer, a check shall be made to ensure accordance between printer output and display indication.

It shall be verified that the equipment is capable of switching to a channel identified in the DSC call.

The telecommands used and channels tested for switching shall be stated in the test report.

4.4.18.3 Conformance

Conformance tests as defined in clause 5.4.14 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 electromotive force (e.m.f.) 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.

For DSC conformance testing and maintenance purposes, the equipment shall have facilities not accessible to the operator to generate a continuous B or Y signal and dot pattern.

Additionally for conformance testing, the VHF equipment shall have facilities not accessible to the operator for generating an unmodulated carrier.

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 purposes 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

Conformance tests shall be made on channel 16 for voice and channel 70 for DSC tests, unless otherwise stated.

5.1.7 Generation and examination of the digital selective call signal

During the conformance tests the DSC signals generated by the equipment shall be examined by means of calibrated apparatus for decoding and printing out the information content of the signals.

The decoding part of the equipment may be provided with a printer or an output terminal for connecting an external printer.

The equipment delivered for the purposes of testing shall be provided with a printer or an output terminal for connecting a printer or computer for registration of the decoded call sequences. Details concerning such output signals to an external printer or computer shall be agreed between the manufacturer and the testing laboratory.

The facilities of the equipment for reception and/or decoding of DSC shall be examined by feeding DSC signals from a calibrated DSC generator.

5.1.8 Standard test signals for DSC

The standard test signal for a VHF DSC decoder shall be a phase-modulated signal at VHF channel 70 with modulation index = 2. The modulating signal shall have a nominal frequency of 1 700 Hz and a frequency shift of ±400 Hz with a modulation rate of 1 200 baud.

Standard test signals shall consist of a series of identical call sequences, each of which contain a known number of information symbols (format specifier, address, category, identification etc. of ITU-R Recommendation M.493-10 [6]).

Standard test signals shall be of sufficient length for the measurements to be performed or it shall be possible to repeat them without interruption to make the measurements.

5.1.9 Determination of the symbol error ratio in the output of the receiving part

The information content of the decoded call sequence displayed at the readout device of the receiving part shall be divided into blocks, each of which corresponds to one information symbol in the applied test signal (see clause 5.1.8). The total number of incorrect information symbols relative to the total number of information symbols shall be registered. In the present document, bit error ratio measurements are taken to be equivalent to symbol error ratio measurements.

5.1.10 Test conditions, power sources, and ambient temperatures

5.1.10.1 Normal and extreme test conditions

Conformance tests shall be made under normal test conditions and also, where stated, under extreme test conditions (see clauses 5.1.12.1 and 5.1.12.2 applied simultaneously).

5.1.10.2 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 5.1.11.2 and 5.1.12.2.

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.

5.1.11 Normal test conditions

5.1.11.1 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 %.

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

5.1.11.2 Normal power sources

5.1.11.2.1 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.).

5.1.11.2.2 Other power sources

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

5.1.12 Extreme test conditions

Unless otherwise stated the extreme test conditions means that the EUT shall be tested at the upper temperature and at the upper limit of the supply voltage applied simultaneously, and at the lower temperature and the lower limit of the supply voltage applied simultaneously.

5.1.12.1 Extreme temperatures

For tests at extreme temperatures, measurements shall be made in accordance with clause 5.1.13, at a lower temperature of -15°C and an upper temperature of +55°C.

5.1.12.2 Extreme values of test power sources

5.1.12.2.1 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.).

5.1.12.2.2 Other power sources

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

5.1.13 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. The equipment shall meet the requirements of the present document after this period.

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 min, after which the equipment shall meet the requirements of the present document.

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 TR 100 028 [9] 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
Radio Frequency (RF)	$\pm 1 \times 10^{-7}$
RF power/level	±0,75 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

Unless otherwise stated, the EUT 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 (see clause 5.1.11.2).

5.3.1.3 Performance check

Where the term "performance check" is used, this shall be taken to mean a visual inspection of the equipment, a test of the transmitter output power and frequency error, and the receiver sensitivity to show that the equipment is functioning and that there is no visible damage or deterioration.

a) For the transmitter:

- The transmitter shall be connected to the artificial antenna (see clause 5.1.4) and tuned to channel 16. The measurements shall be made in the absence of modulation with the power switch set at maximum. The output power shall be between 6 W and 25 W, and the frequency error shall be less than ±1,5 kHz.

b) For the radio-telephone receiver:

- 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 with a level of +12 dBµV. The SINAD ratio at the receiver output shall be equal to or greater than 20 dB.

c) For the DSC receiver:

- A standard DSC test signal (see clause 5.1.8) shall be applied to the receiver input. The symbol error ratio in the decoder output shall be determined as described in clause 5.1.9 and the input level shall be reduced until the symbol error ratio is 10^{-2}. The level of the input signal (maximum usable sensitivity) shall be less than +6 dBµV.

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. Provision may be made to reduce or nullify any adverse effect on equipment performance which could be caused by the presence of an electromagnetic field due to the vibration unit.

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

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

A resonance search shall be carried out throughout the test. If any resonance of the equipment had $Q \geq 5$ measured relative to the base of the vibration table, the equipment 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 2 h. If resonances occur only with $Q < 5$, the further endurance test shall be carried out at one single observed resonant frequency. If no resonance occurs, the endurance test shall be carried out at a frequency of 30 Hz.

The performance check shall be carried out at the end of each 2 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 requirements 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 the period of 10 h to 16 h at +55°C (±3°C), the EUT shall be subjected to a performance check. The temperature of the chamber shall be maintained at +55°C (±3°C) during the whole of the performance check period. At the end of the test, the EUT shall be returned to normal environmental conditions or to those at the start of the next test.

The results obtained shall be compared to the requirements 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 3 h ± 0,5 h. These conditions shall be maintained for a period of 10 h to 16 h. 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 min later, or after such period as agreed with the manufacturer, and shall be kept operational for at least 2 h 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 1 h. 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 results obtained shall be compared to the requirement in clause 4.3.2.3.2 in order to prove compliance with the requirement.

5.3.1.5.3 Low temperature

The EUT shall be placed in a chamber at normal room temperature and relative humidity. The temperature shall then be reduced to, and be maintained at, -15°C (±3°C) for a period of 10 h to 16 h. 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 min later, or after such period as agreed by the manufacturer, and shall be kept operational for at least 2 h during which period the EUT shall be subjected to a performance check. The temperature of the chamber shall be maintained at -15°C (±3°C) during the whole of the 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 results obtained shall be compared to the requirement in clause 4.3.2.4.2 in order to prove compliance with the requirement.

5.3.2 Conformance tests

5.3.2.1 Sensitivity of the modulator, including microphone

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

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

5.3.2.2 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 (1 000 Hz 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 results obtained shall be compared to the limits in clause 4.4.2.2 in order to prove compliance with the requirement.

5.3.2.3 Audio frequency harmonic distortion of the emission

5.3.2.3.1 Methodology

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.

The results obtained under each of the stated test conditions shall be compared to the limits in clause 4.4.3.2 in order to prove compliance with the requirement.

5.3.2.3.2 Normal test conditions

Under normal test conditions (see clause 5.1.11) 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.

5.3.2.3.3 Extreme test conditions

Under extreme test conditions (see clauses 5.1.12.1 and 5.1.12.2 applied simultaneously), the measurements shall be carried out at 1 kHz with a frequency deviation of ±3 kHz.

5.3.2.4 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 r.m.s. 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 4.4.4.2 in order to prove compliance with the requirement.

5.3.2.5 Testing of generated call sequences

The output of the transmitter shall be suitably connected to a calibrated apparatus for decoding and printing out the information content of the call sequences generated by the equipment.

The transmitter shall be set to transmit DSC calls as specified in annex B.

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

5.4 Other test suites

5.4.1 General

The requirements in clauses 4.4.6 to 4.4.17 inclusive have been set on the assumption that the test specifications in clauses 5.4.2 to 5.4.13 will be used to verify the performance of the equipment.

5.4.2 Harmonic distortion and rated audio-frequency output power

Test signals at levels of +60 dBµV (e.m.f.) and +100 dBµV (e.m.f.), at a carrier frequency equal to the nominal frequency of the receiver and modulated by the normal test modulation (see clause 5.1.3) shall be applied in succession to the receiver input under the conditions specified in clause 5.1.1.

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 4.4.6.1). The value of this load shall be stated by the manufacturer.

Under normal test conditions (see clause 5.1.11) 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.

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

5.4.3 Receiver audio frequency response

A test signal of +60 dBµV (e.m.f.), 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 4.4.6.1). This setting shall remain unchanged during the test.

The frequency deviation shall then be reduced to ±1kHz and the audio output is the reference point in figure 3 (1 kHz corresponds to 0 dB).

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

5.4.4 Radio-telephone receiver maximum usable sensitivity

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 SINAD ratio (through a psophometric network as specified in clause 4.4.8.1) 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 5.1.11) and under extreme test conditions (see clauses 5.1.12.1 and 5.1.12.2 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 4.4.8.2 in order to prove compliance with the requirement.

5.4.5 Radio-telephone receiver co-channel rejection

The two input signals shall be connected to the receiver via a combining network (see clause 5.1.1). The wanted signal shall have normal test modulation (see clause 5.1.3). The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz. Both input signals shall be at the nominal frequency of the receiver under test and the measurement repeated for displacements of the unwanted signal of ±3 kHz.

The wanted input signal shall be set to the value corresponding to the measured maximum usable sensitivity (see clause 5.4.4). The amplitude of the unwanted input signal shall then be adjusted until the SINAD ratio (psophometrically weighted) at the output of the receiver is reduced to 14 dB.

The co-channel rejection ratio shall be expressed as the ratio in dB of the level of the unwanted signal to the level of the wanted signal at the receiver input for which the specified reduction in SINAD ratio occurs.

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

5.4.6 Radio-telephone receiver adjacent channel selectivity

The two input signals shall be applied to the receiver input via a combining network (see clause 5.1.1). The wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation (see clause 5.1.3). The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz, and shall be at the frequency of the channel immediately above that of the wanted signal.

The wanted input signal level shall be set to the value corresponding to the maximum usable sensitivity. The amplitude of the unwanted input signal shall then be adjusted until the SINAD ratio at the receiver output, psophometrically weighted, is reduced to 14 dB. The measurement shall be repeated with an unwanted signal at the frequency of the channel below that of the wanted signal.

The adjacent channel selectivity shall be expressed as the lower value of the ratios in dB for the upper and lower adjacent channels of the level of the unwanted signal to the level of the wanted signal.

The measurements shall then be repeated under extreme test conditions (see clauses 5.1.12.1 and 5.1.12.2 applied simultaneously) with the wanted signal set to the value corresponding to the maximum usable sensitivity under these conditions.

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

5.4.7 Radio-telephone receiver spurious response rejection

Two input signals shall be applied to the receiver input via a combining network (see clause 5.1.1). The wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation (see clause 5.1.3).

The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz.

The wanted input signal level shall be set to the value corresponding to the maximum usable sensitivity. The amplitude of the unwanted input signal shall be adjusted to an e.m.f. of +86 dBµV. The frequency shall then be swept over the frequency range from 100 kHz to 2 000 MHz.

At any frequency at which a response is obtained, the input level shall be adjusted until the SINAD ratio psophometrically weighted, is reduced to 14 dB.

The spurious response rejection ratio shall be expressed as the ratio in dB between the unwanted signal and the wanted signal at the receiver input when the specified reduction in the SINAD ratio is obtained.

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

5.4.8 Radio-telephone receiver intermodulation response

Three signal generators, A, B and C shall be connected to the receiver via a combining network (see clause 5.1.1). The wanted signal, represented by signal generator A shall be at the nominal frequency of the receiver and shall have normal test modulation (see clause 5.1.3). The unwanted signal from signal generator B shall be unmodulated and adjusted to the frequency 50 kHz above (or below) the nominal frequency of the receiver. The second unwanted signal from signal generator C shall be modulated by 400 Hz with a deviation of ±3 kHz, and adjusted to a frequency 100 kHz above (or below) the nominal frequency of the receiver.

The wanted input signal shall be set to a value corresponding to the maximum usable sensitivity. The amplitude of the two unwanted signals shall be maintained equal and shall be adjusted until the SINAD ratio at the receiver output, psophometrically weighted, is reduced to 14 dB. The frequency of signal generator B shall be adjusted slightly to produce the maximum degradation of the SINAD ratio. The level of the two unwanted test signals shall be readjusted to restore the SINAD radio of 14 dB. The intermodulation response ratio shall be expressed as the ratio in dB between the two unwanted signals and the wanted signal at the receiver input, when the specified reduction in the SINAD ratio is obtained.

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

5.4.9 Radio-telephone receiver blocking or desensitization

Two input signals shall be applied to the receiver via a combining network (see clause 5.1.1). The modulated wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation (see clause 5.1.3). Initially the unwanted signal shall be switched off and the wanted signal set to the value corresponding to the maximum usable sensitivity.

The output power of the wanted signal shall be adjusted, where possible, to 50 % of the rated output power and in the case of stepped volume controls, to the first step that provides an output power of at least 50 % of the rated output power. The unwanted signal shall be unmodulated and the frequency shall be swept between +1 MHz and +10 MHz, and also between -1 MHz and -10 MHz, relative to the nominal frequency of the receiver. The input level of the unwanted signal, at all frequencies in the specified ranges, shall be so adjusted that the unwanted signal causes:

a) a reduction of 3 dB in the output level of the wanted signal; or

b) a reduction to 14 dB of the SINAD ratio at the receiver output using a psophometric telephone filtering network such as described in ITU-T Recommendation O.41 [11] whichever occurs first. This level shall be noted.

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

5.4.10 Receiver residual noise level

A test signal with a level of +30 dBµV (e.m.f.) 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 4.4.6.1.

The output signal shall be measured by an r.m.s. 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 4.4.14.2 in order to prove compliance with the requirement.

5.4.11 Squelch operation

a) With the squelch facility switched off, a test signal of +30 dBµV (e.m.f.), 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 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 4.4.6.1.

   The output signal shall be measured with the aid of an r.m.s. 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 (e.m.f.) 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 (e.m.f.), 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 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 in each of the tests shall be compared to the appropriate limits in clause 4.4.15.2 in order to prove compliance with the requirement.

5.4.12 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 at 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 4.4.16.2 in order to prove compliance with the requirement.

5.4.13 Dynamic range

A test signal in accordance with the DSC standard test signal (see clause 5.1.8) containing consecutive DSC calls, shall be applied to the receiver input. The level of the test signal shall alternate between 100 dBµV and 0 dBµV.

The bit error ratio in the decoder output shall be determined as described in clause 5.1.9.

The results obtained shall be compared to the limits in clause 4.4.17.2 in order to prove compliance with the requirement.

5.4.14 Verification of correct decoding of various types of DSC calls

The input terminal of the receiver shall be suitably connected to a calibrated apparatus for generation of digital selective call signals.

DSC calls as specified in annex B shall be applied to the receiver.

The results obtained shall be compared to the limits in clause 4.4.18.2 in order to prove compliance with the requirement.

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

Notwithstanding the provisions of the copyright clause related to the text of the present document, ETSI grants that users of the present document may freely reproduce the EN-RT proforma in this annex so that it can be used for its intended purposes and may further publish the completed 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 301 025-3				Comment
No.	**Reference**	**EN-R (see note)**	**Status**			**Comments**
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	M			
6	4.4.1	Sensitivity of the modulator, including microphone	M			
7	4.4.2	Audio frequency response	M			
8	4.4.3	Audio frequency harmonic distortion of the emission	M			
9	4.4.4	Residual modulation of the transmitter	M			
10	4.4.5	Testing of generated call sequences	M			
11	4.4.6	Harmonic distortion and rated audio-frequency output power	M			
12	4.4.7	Receiver audio frequency response	M			
13	4.4.8	Radio-telephone receiver maximum usable sensitivity	M			
14	4.4.9	Radio-telephone receiver co-channel rejection	M			
15	4.4.10	Radio-telephone receiver adjacent channel selectivity	M			
16	4.4.11	Radio-telephone receiver spurious response rejection	M			
17	4.4.12	Radio-telephone receiver intermodulation response	M			
18	4.4.13	Radio-telephone receiver blocking and desensitization	M			
19	4.4.14	Receiver residual noise level	M			

EN Reference		EN 301 025-3				Comment
No.	Reference	EN-R (see note)	Status			Comments
20	4.4.15	Squelch operation	M			
21	4.4.16	Squelch hysteresis	M			
22	4.4.17	Dynamic range	M			
23	4.4.18	Verification of correct decoding of various types of DSC calls	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 Clause 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 (normative): DSC Calls

Table B.1: DSC calls

Format Specifier	Category	1st Telecommand (Symbol No.)	Receive	Transmit
Distress		F3E/G3E simplex (100)	X	X
All ships	Distress	Distress Ack (110)	X	
All ships	Distress	Distress Relay (112)	X	
All ships	Urgency	F3E/G3E simplex (100)	X	X
All ships	Safety	F3E/G3E simplex (100)	X	X
Individual	Urgency	F3E/G3E simplex (100)	X	
Individual	Safety	F3E/G3E simplex (100)	X	
Individual	Routine	F3E/G3E simplex (100)	X	X
Group	Routine	F3E/G3E simplex (100)	X	X
2nd Telecommand Transmit and Receive (126) No information				

Table B.2: DSC calls to ITU-R Recommendation M.821-1 [10]

Expansion data specifier	Receive	Transmit
100 Enhanced position resolution	X	X

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

Language	EN title
Czech	
Danish	Elektromagnetisk kompatibilitet og Radiospektrum Anliggender (ERM); VHF radiotelefoni udstyr til generel kommunikation og tilknyttet udstyr til "Klasse D" Digitale, selektive opkald (DSC); Del 3: Harmoniseret EN, som dækker de væsentlige krav i R&TTE direktivets artikel 3.3e
Dutch	Elektromagnetische compatibiliteit en radiospectrum zaken (ERM); VHF radiotelefonie apparatuur tbv algemene communicatie en bijbehorende apparatuur voor klasse "D" Digital Selective Calling (DSC); Deel 3: Geharmoniseerde EN welke invulling geeft aan de wezenlijke vereisten, neergelegd in artikel 3.3e va de R&TTE Directive
English	Electromagnetic compatibility and Radio spectrum Matters (ERM); VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC); Part 3: Harmonized EN under article 3.3e of the R&TTE Directive
Estonian	
Finnish	Sähkömagneettinen yhteensopivuus ja radiospektriasiat (ERM); Yleisen liikenteen meri-VHF -radiopuhelimet ja D-luokan digitaalisen selektiivikutsun (DSC) lisälaitteet; Osa 3: Harmonisoitu EN R&TTE - direktiivin artiklan 3.3e olennaisten vaatimusten mukaisesti
French	CEM et spectre radioélectrique (ERM) - Appareils de radiotéléphone en VHF pour la téléphonie générale et appareils associés pour Appel numérique sélectif (DSC) de classe "D" - Partie 3: EN harmonisée de l"article 3.3e de la Directive R&TTE
German	Elektromagnetische Verträglichkeit und Funkspektrumangelegenheiten (ERM); UKW-Sprechfunkanlagen des mobilen Seefunkdienstes für "allgemeine Kommunikation" mit Zusatzeinrichtung für den digitalen Selektivruf (DSC) Klasse D; Teil 3: Harmonisierte Europäische Norm (EN) mit wesentlichen Anforderungen nach R&TTE-Richtlinie Artikel 3.3e
Greek	Ηλεκτρομαγνητική συμβατότητα και θέματα Ραδιοφάσματσς (ERM) - Συσκευή ραδιοτηλε-φώνου VHF γενικώ επικοινωνιών και συσχε-τισμένο εξοπλισμό για Ψηφιακή Επιλεκτική Κλήση (DSC) κατηγοριας "D" - Μέρος 3: Εναρμονισμένο EN για την κάλυψη των ουσιω-δών απαιτήσεων του άρθρου 3.2 της οδηγίας R&TTE
Hungarian	
Icelandic	
Italian	Compatibilità elettromagnetica e Questioni relative allo spettro delle radiofrequenze (ERM); apparecchiature radiotelefoniche VHF per comunicazioni generiche ed apparecchiature associate per Chiamate Digitali Selettive (DSC) di Classe "D"; Part 3: Norma Europea armonizzata per l'articolo 3.3e della direttiva R&TTE
Latvian	
Lithuanian	
Maltese	
Polish	Kompatybilność Elektromagnetyczna i Zagadnienia Widma Radiowego (ERM) - Urządzenia radiotelefoniczne VHF dla łączności ogólnej i związane wyposażenie do wywoływania selektywnego cyfrowego (DSC) "klasy D" - Część 3: Zharmonizowana EN zgodna z artykułem 3.3(e) dyrektywy R&TTE
Portuguese	Assuntos de Espectro Radioeléctrico e Compatibilidade Electromagnética (ERM); Equipamento radiotelefónico VHF destinado a comunicações genéricas e equipamento associado para Chamada Selectiva Digital (DSC) de Classe "D"; Parte 3: EN harmonizada cobrindo os requisitos essenciais no âmbito do Artigo 3.3e da Directiva R&TTE
Slovak	Elektromagnetická kompatibilita a záležitosti rádiového spektra (ERM). Rádiotelefónne zariadenia VHF na všeobecné komunikácie a pridružené zariadenia triedy D digitálneho selektívneho volania (DSC). Časť 3: Harmonizovaná EN podľa článku 3.3 (e) smernice R&TTE
Slovenian	
Spanish	Compatibilidad electromagnética y cuestiones de espectro de radiofrecuencia (ERM); Equipos radioteléfono VHF para comunicaciones generales y equipos asociados para clase "D" Llamada selectiva digital (DSC); Parte 3: EN armonizada cubriendo los requisitos esenciales según el artículo 3.3e de la directiva de R&TTE
Swedish	Elektromagnetisk kompatibilitet och radio-spektrumfrågor (ERM); Radiotelefonutrustning på VHF avsedd för allmänna kommunikationer och associerad utrustning för Klass "D" digitalt selektivt anrop (DSC); Del 3: Harmoniserad EN enligt artikel 3.3e i R&TTE-direktivet

Annex D (informative): Bibliography

- ETSI EN 301 025-1: "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.
- Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.

History

Document history				
V1.1.1	August 1998	Publication as EN 301 025		
V1.1.1	May 2001	Publication		
V1.2.1	January 2004	Public Enquiry	PE 20040514:	2004-01-14 to 2004-05-14
V1.2.1	July 2004	Vote	V 20040910:	2004-07-12 to 2004-09-10
V1.2.1	September 2004	Publication		