



SLOVENSKI STANDARD

SIST EN 300 162-1 V1.4.1:2006

01-marec-2006

9`Y_lfca U[bYfbUnXfi y`1j cgh]b`nUXYj Y`j `nj Yn]`n`fUX]`g_`ja `gdY_lfca `fØFAŁĚ
FUX]cH`YZ: bg_]`cXXU`b_]`]b`gdfY`Ya b_]`nUdca cfg_Y`dfYbcgbY`glcf]`h Yž_]`
cVfUhi `Y`c`j`dUgcj]`J<: `Ě`%`XY.`HY` b]`bY`_UfU`hf]gh_]`b`a Yf]`bY`a YtcXY

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

(standards.iteh.ai)

[SIST EN 300 162-1 V1.4.1:2006](https://standards.iteh.ai/catalog/standards/sist/3bc53e57-c881-44a8-8fc9-e71fada72f95/sist-en-300-162-1-v1-4-1-2006)

<https://standards.iteh.ai/catalog/standards/sist/3bc53e57-c881-44a8-8fc9-e71fada72f95/sist-en-300-162-1-v1-4-1-2006>

Ta slovenski standard je istoveten z: EN 300 162-1 Version 1.4.1

ICS:

| | | |
|-----------|---|--|
| 33.060.20 | Sprejemna in oddajna oprema | Receiving and transmitting equipment |
| 33.100.01 | Elektromagnetna združljivost na splošno | Electromagnetic compatibility in general |
| 47.020.70 | Navigacijska in krmilna oprema | Navigation and control equipment |

SIST EN 300 162-1 V1.4.1:2006

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 300 162-1 V1.4.1:2006

<https://standards.iteh.ai/catalog/standards/sist/3bc53e57-c881-44a8-8fc9-e71fada72f95/sist-en-300-162-1-v1-4-1-2006>

ETSI EN 300 162-1 V1.4.1 (2006-05)

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 1: Technical characteristics
and methods of measurement**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 300 162-1 V1.4.1:2006](https://standards.iteh.ai/catalog/standards/sist/3bc53e57-c881-44a8-8fc9-e71fada72f95/sist-en-300-162-1-v1-4-1-2006)

<https://standards.iteh.ai/catalog/standards/sist/3bc53e57-c881-44a8-8fc9-e71fada72f95/sist-en-300-162-1-v1-4-1-2006>



Reference

REN/ERM-TG26-071-1

Keywords

EMC, GMDSS, maritime, radio, telephony,
testing, VHF

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
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 300 162-1 V1.4.1:2006

<https://standards.iteh.ai/catalog/standards/sist/3bc53e57-c881-44a8-8fc9-e71fada72f97/sist-en-300-162-1-v1-4-1-2006>

Important notice

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, please send your comment to one of the following services:

http://portal.etsi.org/chaicor/ETSI_support.asp

Copyright Notification

No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2006.
All rights reserved.

DECT™, **PLUGTESTS™** and **UMTS™** are Trade Marks of ETSI registered for the benefit of its Members.
TIPHON™ and the **TIPHON logo** are Trade Marks currently being registered by ETSI for the benefit of its Members.
3GPP™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

Contents

| | |
|--|----|
| Intellectual Property Rights | 8 |
| Foreword..... | 8 |
| 1 Scope | 9 |
| 2 References | 9 |
| 3 Definitions, symbols and abbreviations | 10 |
| 3.1 Definitions | 10 |
| 3.2 Symbols..... | 10 |
| 3.3 Abbreviations | 10 |
| 4 General and operational requirements..... | 10 |
| 4.1 Construction | 10 |
| 4.2 Controls and indicators..... | 11 |
| 4.3 Handset and loudspeaker..... | 12 |
| 4.4 Safety precautions | 12 |
| 4.5 Labelling..... | 12 |
| 4.6 Warm up..... | 13 |
| 5 Technical requirements | 13 |
| 5.1 Switching time..... | 13 |
| 5.2 Class of emission and modulation characteristics | 13 |
| 5.3 Multiple watch facilities..... | 13 |
| 5.3.1 Additional performance standards | 13 |
| 5.3.2 Scanning characteristics..... | 14 |
| 5.4 DSC controller interfaces | 14 |
| 5.4.1 Operational interfaces | 14 |
| 6 General conditions of measurement..... | 14 |
| 6.1 Arrangements for test signals applied to the receiver input..... | 14 |
| 6.2 Squelch..... | 14 |
| 6.3 Normal test modulation | 15 |
| 6.4 Artificial antenna..... | 15 |
| 6.5 Arrangements for test signals applied to the transmitter input | 15 |
| 6.6 Test channels | 15 |
| 6.7 Measurement uncertainty and interpretation of the measured results | 15 |
| 6.7.1 Measurement uncertainty..... | 15 |
| 6.7.2 Interpretation of the measurement results | 16 |
| 6.8 Test conditions, power sources and ambient temperatures..... | 16 |
| 6.8.1 Normal and extreme test conditions..... | 16 |
| 6.8.2 Test power source | 16 |
| 6.9 Normal test conditions..... | 16 |
| 6.9.1 Normal temperature and humidity | 16 |
| 6.9.2 Normal power sources | 16 |
| 6.9.2.1 Mains voltage and frequency | 16 |
| 6.9.2.2 Battery power source..... | 17 |
| 6.9.2.3 Other power sources..... | 17 |
| 6.10 Extreme test conditions | 17 |
| 6.10.1 Extreme temperatures | 17 |
| 6.10.2 Extreme values of test power sources | 17 |
| 6.10.2.1 Mains voltage..... | 17 |
| 6.10.2.2 Battery power source..... | 17 |
| 6.10.2.3 Other power sources..... | 17 |
| 6.11 Procedure for tests at extreme temperatures..... | 17 |
| 7 Environmental tests | 18 |
| 7.1 Procedure..... | 18 |
| 7.2 Performance check | 18 |

| | | |
|---------|---|----|
| 7.3 | Vibration test | 18 |
| 7.3.1 | Definition | 18 |
| 7.3.2 | Method of measurement | 18 |
| 7.3.3 | Requirement | 19 |
| 7.4 | Temperature tests | 19 |
| 7.4.1 | Definition | 19 |
| 7.4.2 | Dry heat | 19 |
| 7.4.2.1 | Definition | 19 |
| 7.4.2.2 | Method of measurement | 19 |
| 7.4.2.3 | Requirement | 19 |
| 7.4.3 | Damp heat | 19 |
| 7.4.3.1 | Definition | 19 |
| 7.4.3.2 | Method of measurement | 20 |
| 7.4.3.3 | Requirement | 20 |
| 7.4.4 | Low temperature cycle | 20 |
| 7.4.4.1 | Definition | 20 |
| 7.4.4.2 | Method of measurement | 20 |
| 7.4.4.3 | Requirement | 20 |
| 8 | Transmitter | 20 |
| 8.1 | Frequency error | 20 |
| 8.1.1 | Definition | 20 |
| 8.1.2 | Method of measurement | 20 |
| 8.1.3 | Limits | 21 |
| 8.2 | Carrier power | 21 |
| 8.2.1 | Definitions | 21 |
| 8.2.2 | Method of measurement | 21 |
| 8.2.3 | Limits | 21 |
| 8.2.3.1 | Normal test conditions | 21 |
| 8.2.3.2 | Extreme test conditions | 21 |
| 8.3 | Frequency deviation | 21 |
| 8.3.1 | Definition | 21 |
| 8.3.2 | Maximum permissible frequency deviation | 21 |
| 8.3.2.1 | Method of measurement | 21 |
| 8.3.2.2 | Limits | 22 |
| 8.3.3 | Reduction of frequency deviation at modulation frequencies above 3 kHz | 22 |
| 8.3.3.1 | Method of measurement | 22 |
| 8.3.3.2 | Limits | 22 |
| 8.4 | Sensitivity of the modulator, including microphone | 23 |
| 8.4.1 | Definition | 23 |
| 8.4.2 | Method of measurement | 23 |
| 8.4.3 | Limits | 23 |
| 8.5 | Audio frequency response | 23 |
| 8.5.1 | Definition | 23 |
| 8.5.2 | Method of measurement | 24 |
| 8.5.3 | Limit | 24 |
| 8.6 | Audio frequency harmonic distortion of the emission | 24 |
| 8.6.1 | Definition | 24 |
| 8.6.2 | Method of measurement | 24 |
| 8.6.2.1 | Normal test conditions | 25 |
| 8.6.2.2 | Extreme test conditions | 25 |
| 8.6.3 | Limits | 25 |
| 8.7 | Adjacent channel power | 25 |
| 8.7.1 | Definition | 25 |
| 8.7.2 | Method of measurement | 25 |
| 8.7.3 | Limits | 26 |
| 8.8 | Conducted spurious emissions conveyed to the antenna | 26 |
| 8.8.1 | Definition | 26 |
| 8.8.2 | Method of measurement | 26 |
| 8.8.3 | Limit | 26 |
| 8.9 | Cabinet radiation and conducted spurious emissions other than those conveyed to the antenna | 26 |
| 8.9.1 | Definitions | 26 |

| | | |
|--------|--|----|
| 8.9.2 | Method of measurement | 26 |
| 8.9.3 | Limits..... | 27 |
| 8.10 | Residual modulation of the transmitter | 27 |
| 8.10.1 | Definition..... | 27 |
| 8.10.2 | Method of measurement | 27 |
| 8.10.3 | Limit | 28 |
| 8.11 | DSC audio input characteristics | 28 |
| 8.11.1 | Definition..... | 28 |
| 8.11.2 | Method of measurement | 28 |
| 8.11.3 | Limits..... | 28 |
| 8.12 | DSC audio input limitation..... | 28 |
| 8.12.1 | Definition..... | 28 |
| 8.12.2 | Method of measurement | 28 |
| 8.12.3 | Limit | 28 |
| 8.13 | Modulation attack time..... | 29 |
| 8.13.1 | Definition..... | 29 |
| 8.13.2 | Method of measurement | 29 |
| 8.13.3 | Limit | 29 |
| 8.14 | Transient frequency behaviour of the transmitter..... | 30 |
| 8.14.1 | Definitions | 30 |
| 8.14.2 | Method of measurement | 30 |
| 8.14.3 | Limits..... | 33 |
| 9 | Receiver..... | 33 |
| 9.1 | Harmonic distortion and rated audio frequency output power | 33 |
| 9.1.1 | Definition..... | 33 |
| 9.1.2 | Methods of measurement..... | 33 |
| 9.1.3 | Limits..... | 34 |
| 9.2 | Audio frequency response | 34 |
| 9.2.1 | Definition..... | 34 |
| 9.2.2 | Method of measurement | 34 |
| 9.2.3 | Limits..... | 34 |
| 9.3 | Maximum usable sensitivity..... | 35 |
| 9.3.1 | Definition..... | 35 |
| 9.3.2 | Method of measurement | 35 |
| 9.3.3 | Limits..... | 36 |
| 9.4 | Co-channel rejection..... | 36 |
| 9.4.1 | Definition..... | 36 |
| 9.4.2 | Method of measurement | 36 |
| 9.4.3 | Limit | 36 |
| 9.5 | Adjacent channel selectivity..... | 36 |
| 9.5.1 | Definition..... | 36 |
| 9.5.2 | Method of measurement | 36 |
| 9.5.3 | Limits..... | 37 |
| 9.6 | Spurious response rejection..... | 37 |
| 9.6.1 | Definition..... | 37 |
| 9.6.2 | Method of measurement | 37 |
| 9.6.3 | Limit | 37 |
| 9.7 | Intermodulation response | 37 |
| 9.7.1 | Definition..... | 37 |
| 9.7.2 | Method of measurement | 38 |
| 9.7.3 | Limit | 38 |
| 9.8 | Blocking or desensitization | 38 |
| 9.8.1 | Definition..... | 38 |
| 9.8.2 | Method of measurement | 38 |
| 9.8.3 | Limit | 38 |
| 9.9 | Conducted spurious emissions | 38 |
| 9.9.1 | Definition..... | 38 |
| 9.9.2 | Method of measurement | 39 |
| 9.9.3 | Limit | 39 |
| 9.10 | Radiated spurious emissions..... | 39 |
| 9.10.1 | Definition..... | 39 |

| | | |
|-----------------------------|---|-----------|
| 9.10.2 | Method of measurements | 39 |
| 9.10.3 | Limit | 40 |
| 9.11 | Receiver noise and hum level..... | 40 |
| 9.11.1 | Definition..... | 40 |
| 9.11.2 | Method of measurement | 40 |
| 9.11.3 | Limit | 41 |
| 9.12 | Squelch operation | 41 |
| 9.12.1 | Definition..... | 41 |
| 9.12.2 | Method of measurement | 41 |
| 9.12.3 | Limits..... | 41 |
| 9.13 | Squelch hysteresis | 41 |
| 9.13.1 | Definition..... | 41 |
| 9.13.2 | Method of measurement | 42 |
| 9.13.3 | Limit | 42 |
| 9.14 | Multiple watch characteristic | 42 |
| 9.14.1 | Definition..... | 42 |
| 9.14.2 | Method of measurement | 42 |
| 9.14.3 | Limits..... | 42 |
| 9.15 | DSC audio output characteristic | 42 |
| 9.15.1 | Definition..... | 42 |
| 9.15.2 | Methods of measurement | 43 |
| 9.15.3 | Limit | 43 |
| 10 | Duplex operation | 43 |
| 10.1 | Receiver desensitization with simultaneous transmission and reception..... | 43 |
| 10.1.1 | Definition..... | 43 |
| 10.1.2 | Method of measurement | 43 |
| 10.1.3 | Limits..... | 44 |
| 10.2 | Duplex transceiver internal mixing | 44 |
| 10.2.1 | Definition..... | 44 |
| 10.2.2 | Method of measurement | 44 |
| 10.2.3 | Limits..... | 44 |
| Annex A (normative): | Measuring receiver for adjacent channel power measurement..... | 45 |
| A.1 | Power measuring receiver specification..... | 45 |
| A.1.1 | IF filter | 45 |
| A.1.2 | Attenuation indicator..... | 46 |
| A.1.3 | RMS value indicator..... | 46 |
| A.1.4 | Oscillator and amplifier..... | 46 |
| Annex B (normative): | Protocol for the IEC 61162-1 commands Frequency Set Information (FSI) | 47 |
| B.1 | Frequency Set Information (FSI) | 47 |
| Annex C (normative): | Radiated measurements | 48 |
| C.1 | Test sites and general arrangements for measurements involving the use of radiated fields | 48 |
| C.1.1 | Outdoor test site | 48 |
| C.1.2 | Test antenna..... | 48 |
| C.1.3 | Substitution antenna | 49 |
| C.1.4 | Optional additional indoor site | 49 |
| C.2 | Guidance on the use of radiation test sites | 50 |
| C.2.1 | Measuring distance..... | 50 |
| C.2.2 | Test antenna..... | 50 |
| C.2.3 | Substitution antenna | 50 |
| C.2.4 | Artificial antenna..... | 50 |
| C.2.5 | Auxiliary cables..... | 51 |
| C.2.6 | Acoustic measuring arrangement | 51 |
| C.3 | Further optional alternative indoor test site using an anechoic chamber | 51 |
| C.3.1 | Example of the construction of a shielded anechoic chamber | 51 |

| | | |
|---------|--|----|
| C.3.2 | Influence of parasitic reflections in anechoic chambers..... | 52 |
| C.3.3 | Calibration of the shielded anechoic chamber..... | 52 |
| History | | 55 |

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 300 162-1 V1.4.1:2006](https://standards.iteh.ai/catalog/standards/sist/3bc53e57-c881-44a8-8fc9-e71fada72f95/sist-en-300-162-1-v1-4-1-2006)

<https://standards.iteh.ai/catalog/standards/sist/3bc53e57-c881-44a8-8fc9-e71fada72f95/sist-en-300-162-1-v1-4-1-2006>

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<http://webapp.etsi.org/IPR/home.asp>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document is part 1 of a multi-part deliverable covering the 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 of 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".

(standards.iteh.ai)

| National transposition dates | |
|--|------------------|
| Date of adoption of this EN: | 12 May 2006 |
| Date of latest announcement of this EN (doa): | 31 August 2006 |
| Date of latest publication of new National Standard or endorsement of this EN (dop/e): | 28 February 2007 |
| Date of withdrawal of any conflicting National Standard (dow): | 28 February 2007 |

1 Scope

The present document specifies the minimum requirements for shipborne Very High Frequency (VHF) transmitters and receivers capable of voice and Digital Selective Calling (DSC), fitted with an external antenna connector for use on board ships.

The present document lays down minimum requirements for VHF radio transmitters and receivers operating in certain frequency bands allocated to the maritime mobile service using both 25 kHz and 12,5 kHz channels, and incorporates the requirements of the relevant recommendations of the International Maritime Organization (IMO).

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>.

- STANDARD PREVIEW
(standards.iteh.ai)
- [1] Radio Regulations (2004), appendix 18: "Table of transmitting frequencies in the VHF maritime mobile band".
- [2] 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".
<https://standards.iteh.ai/catalog/standards/sist/5bc55c97-c881-44a8-81c9-e71fda729563/sist-en-300-162-1-v1-4-1-2006>
- [3] ITU-R Recommendation M.493-11 (2004): "Digital selective-calling system for use in the maritime mobile service".
- [4] ITU-R Recommendation M.541-9 (2004): "Operational procedures for the use of digital selective-calling equipment in the maritime mobile service".
- [5] IMO Resolution A.803(19): "Performance Standards for Shipborne VHF Radio Installations capable of Voice Communication and Digital Selective Calling".
- [6] IMO Resolution A.524(13): "Performance Standards for VHF Multiple Watch facilities".
- [7] ITU-T Recommendation O.41 (1994): "Psophometer for use on telephone-type circuits".
- [8] IEC 61162-1 (2000): "Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 1: Single talker and multiple listeners".
- [9] ETSI TR 100 028-1 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1".
- [10] ETSI EN 300 338: "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] ITU-R Recommendation SM.332-4 (1978): "Selectivity of receivers".
- [12] ITU-R Recommendation M.1084-4 (2001): "Interim solutions for improved efficiency in the use of the band 156-174 MHz by stations in the maritime mobile service".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

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: check of:

- the transmitter carrier power and frequency; and
- receiver sensitivity (see clause 7.2)

3.2 Symbols

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

| | |
|-----------|--------------------------------------|
| dBa | dB relative to 2×10^{-5} Pa |
| emf | electromotive force |
| λ | lambda (wavelength) |

STANDARD PREVIEW
(standards.iteh.ai)

3.3 Abbreviations

SIST EN 300 162-1 V1.4.1:2006

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

| | |
|-------|--|
| ad | amplitude difference |
| DSC | Digital Selective Calling |
| EUT | Equipment Under Test |
| fd | frequency difference |
| FSI | Frequency Set Information |
| IMO | International Maritime Organization |
| RF | Radio Frequency |
| rms | root mean square |
| SINAD | Signal + Noise + Distortion/Noise + Distortion |
| VHF | Very High Frequency |

4 General and operational requirements

4.1 Construction

The manufacturer shall declare that compliance to the requirement of clause 4 is achieved and shall provide relevant documentation.

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 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.

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

Technical documentation 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 Radio Regulations [1]).

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 18 to the Radio Regulations [1] noting in particular footnotes m) and e) .

Additional VHF channels outside those defined by appendix 18 to the Radio Regulations [1] may also be provided.

If 12,5 kHz channels are implemented in the equipment it shall be in accordance with ITU-R Recommendation M.1084-4 [12].

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 Digital Selective Calling (DSC) is prevented (see ITU-R Recommendation M.493-11 [3] and ITU-R Recommendation M.541-9 [4]) 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 Controls and indicators

The equipment shall have a channel selector and shall indicate the designator, as shown in appendix 18 to the Radio Regulations [1], of the channel at which the installation is set. Equipment with 12,5 kHz channels shall also indicate the channel designator as shown in annex 4 of ITU-R Recommendation M.1084-4 [12]. 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). 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 an input panel on the equipment for entering the digits 0 to 9 is provided, this shall conform to ITU-T Recommendation E.161 [2].

The equipment shall have the following additional controls and indicators (see IMO Resolution A.803(19) [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;
- 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 consoles.

4.3 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. 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.

4.4 Safety precautions

Measures shall be taken to protect the equipment against the effects of overcurrent or overvoltage.

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 but this shall not cause any terminal of the source of electrical energy to be earthed.

All components and wiring in which the dc or ac 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 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 k Ω .

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

4.5 Labelling

All controls, instruments, indicators and terminals shall be clearly labelled (see IMO Resolution A.803(19) [5]).

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.

4.6 Warm up

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

5 Technical requirements

5.1 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.

5.2 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 channel separations of both 12,5 kHz and 25 kHz.

5.3 Multiple watch facilities

5.3.1 Additional performance standards

VHF radiotelephone equipment having multiple watch facilities shall comply with the following additional performance standards (see IMO Resolution A.524(13) [6]):

- 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.