



Radiotelephone transmitters and receivers for the maritime mobile service operating in VHF bands; Technical characteristics and methods of measurement

iTeh STANDARDS REVIEW
(Standards.iteh.ai)
Full standard
<https://standards.iteh.ai/catalog/standards/etsi-en-301-925-v1.5.1-2017-10>
4f5a-a273-ea066aec4691/etsi-en-301-925-v1.5.1-2017-10

Reference

REN/ERM-TG26-531

Keywords

EMC, GMDSS, maritime, radio, telephony, 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

Important notice

The present document can be downloaded from:
<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (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

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:
<https://portal.etsi.org/People/CommitteeSupportStaff.aspx>

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2017.
All rights reserved.

DECT™, PLUGTESTS™, UMTS™ and the ETSI logo are trademarks of ETSI registered for the benefit of its Members.
3GPP™ and **LTE™** are trademarks of ETSI registered for the benefit of its Members and
of the 3GPP Organizational Partners.

oneM2M logo is protected for the benefit of its Members.
GSM® and the GSM logo are trademarks registered and owned by the GSM Association.

Contents

| | |
|--|----|
| Intellectual Property Rights | 8 |
| Foreword..... | 8 |
| Modal verbs terminology..... | 8 |
| 1 Scope | 9 |
| 2 References | 9 |
| 2.1 Normative references | 9 |
| 2.2 Informative references..... | 10 |
| 3 Definitions, symbols and abbreviations | 11 |
| 3.1 Definitions..... | 11 |
| 3.2 Symbols..... | 12 |
| 3.3 Abbreviations | 12 |
| 4 General requirements | 13 |
| 4.1 Construction | 13 |
| 4.2 DSC operation..... | 13 |
| 4.3 Controls and indicators..... | 14 |
| 4.4 Handset and loudspeaker..... | 14 |
| 4.5 Safety precautions | 14 |
| 4.6 Labelling..... | 15 |
| 4.7 Warm up..... | 15 |
| 4.8 Audio Processing..... | 15 |
| 5 Technical requirements | 16 |
| 5.1 Switching time..... | 16 |
| 5.2 Class of emission and modulation characteristics..... | 16 |
| 5.3 Multiple watch facilities..... | 16 |
| 5.3.1 Additional performance standards | 16 |
| 5.3.2 Scanning characteristics..... | 17 |
| 5.4 Interfaces | 17 |
| 5.4.1 General..... | 17 |
| 5.4.2 Audio frequency | 17 |
| 5.4.3 Digital interfaces..... | 17 |
| 5.5 Voyage data recorder interface..... | 17 |
| 6 Test conditions, power sources and ambient temperatures | 18 |
| 6.1 Test conditions | 18 |
| 6.2 Test power source..... | 18 |
| 6.3 Normal test conditions..... | 18 |
| 6.3.1 Normal temperature and humidity | 18 |
| 6.3.2 Normal power source voltage | 18 |
| 6.3.2.1 Mains powered equipment | 18 |
| 6.3.2.2 Battery powered equipment | 18 |
| 6.3.2.3 Other power sources..... | 18 |
| 6.4 Extreme test conditions | 19 |
| 6.4.1 Extreme temperatures | 19 |
| 6.4.2 Extreme values of power source voltage | 19 |
| 6.4.2.1 Mains powered equipment | 19 |
| 6.4.2.2 Battery powered equipment | 19 |
| 6.4.2.3 Other power sources..... | 19 |
| 6.5 Procedure for tests at extreme temperatures..... | 19 |
| 7 General conditions of measurement..... | 19 |
| 7.1 Sequence of testing..... | 19 |
| 7.2 Test channels | 20 |
| 7.3 Squelch..... | 20 |
| 7.4 Arrangements for test signals applied to the receiver input..... | 20 |

| | | |
|----------|---|----|
| 7.5 | Normal test modulation of the receiver wanted signal | 20 |
| 7.6 | Arrangements for monitoring the receiver output | 20 |
| 7.7 | Arrangements for test signals applied to the transmitter input | 20 |
| 7.8 | Normal test modulation of the transmitter | 21 |
| 7.9 | Arrangements for monitoring the transmitter output | 21 |
| 7.10 | Arrangements for test of DSC | 21 |
| 7.11 | Standard test signals for DSC | 21 |
| 7.12 | Determination of symbol error ratio in the output of the receiver | 21 |
| 7.13 | Reference bandwidths for spurious measurements | 21 |
| 7.14 | Interpretation of the measurement results | 22 |
| 8 | Performance checks | 22 |
| 8.1 | Performance checks - introduction | 22 |
| 8.2 | Performance check - transmitter frequency error | 22 |
| 8.3 | Performance check - transmitter carrier power | 23 |
| 8.4 | Performance check - transmitter audio frequency harmonic distortion of the emission | 23 |
| 8.5 | Performance check - receiver sensitivity | 23 |
| 8.6 | Performance check of DSC | 23 |
| 9 | Environmental tests | 23 |
| 9.1 | Procedure | 23 |
| 9.2 | Vibration test | 24 |
| 9.2.1 | Definition | 24 |
| 9.2.2 | Method of measurement | 24 |
| 9.2.3 | Requirement | 24 |
| 9.3 | Temperature tests | 24 |
| 9.3.1 | Introduction | 24 |
| 9.3.2 | General procedure | 25 |
| 9.3.3 | Dry heat | 25 |
| 9.3.3.1 | Definition | 25 |
| 9.3.3.2 | Method of measurement | 25 |
| 9.3.3.3 | Requirement | 25 |
| 9.3.4 | Damp heat | 25 |
| 9.3.4.1 | Definition | 25 |
| 9.3.4.2 | Method of measurement | 25 |
| 9.3.4.3 | Requirement | 25 |
| 9.3.5 | Low temperature cycle | 25 |
| 9.3.5.1 | Definition | 25 |
| 9.3.5.2 | Method of measurement | 26 |
| 9.3.5.3 | Requirement | 26 |
| 10 | Transmitter | 26 |
| 10.1 | General conditions | 26 |
| 10.2 | Frequency error | 26 |
| 10.2.1 | Definition | 26 |
| 10.2.2 | Method of measurement | 26 |
| 10.2.3 | Limits | 26 |
| 10.3 | Carrier power | 26 |
| 10.3.1 | Definitions | 26 |
| 10.3.2 | Method of measurement | 27 |
| 10.3.3 | Limits | 27 |
| 10.3.3.1 | General | 27 |
| 10.3.3.2 | Normal test conditions limits | 27 |
| 10.3.3.3 | Extreme test conditions limits | 27 |
| 10.4 | Frequency deviation | 27 |
| 10.4.1 | Definition | 27 |
| 10.4.2 | Maximum permissible frequency deviation | 27 |
| 10.4.2.1 | Method of measurement | 27 |
| 10.4.2.2 | Limits | 28 |
| 10.4.3 | Reduction of frequency deviation at modulation frequencies above 3 kHz | 28 |
| 10.4.3.1 | Method of measurement | 28 |
| 10.4.3.2 | Limits | 28 |
| 10.5 | Sensitivity of the modulator including the microphone | 29 |

This STANDARD PREVIEW
Full standard:
<https://standards.etsi.org/catalog/standard/45a/223-ca068aec691/etsi-en-301-925-v1.5.1-2017-10>

| | | |
|----------|--|----|
| 10.5.1 | Definition..... | 29 |
| 10.5.2 | Method of measurement | 29 |
| 10.5.3 | Limits..... | 29 |
| 10.6 | Audio frequency response | 29 |
| 10.6.1 | Definition..... | 29 |
| 10.6.2 | Method of measurement | 30 |
| 10.6.3 | Limits..... | 30 |
| 10.7 | Audio frequency harmonic distortion of the emission..... | 30 |
| 10.7.1 | Definition..... | 30 |
| 10.7.2 | Method of measurement | 31 |
| 10.7.3 | Limits..... | 31 |
| 10.8 | Adjacent channel power | 31 |
| 10.8.1 | Definition..... | 31 |
| 10.8.2 | Method of measurement | 31 |
| 10.8.3 | Limits..... | 32 |
| 10.9 | Conducted spurious emissions conveyed to the antenna | 32 |
| 10.9.1 | Definition..... | 32 |
| 10.9.2 | Method of measurement | 32 |
| 10.9.3 | Limit | 32 |
| 10.10 | Residual modulation of the transmitter | 32 |
| 10.10.1 | Definition..... | 32 |
| 10.10.2 | Method of measurement | 32 |
| 10.10.3 | Limit | 33 |
| 10.11 | Transient frequency behaviour of the transmitter | 33 |
| 10.11.1 | Definition..... | 33 |
| 10.11.2 | Method of measurement | 33 |
| 10.11.3 | Limits..... | 34 |
| 10.12 | Radiated spurious emission | 36 |
| 10.12.1 | Definition..... | 36 |
| 10.12.2 | Method of measurement | 36 |
| 10.12.3 | Limits..... | 37 |
| 11 | Transmitter with integrated DSC encoder | 37 |
| 11.1 | General | 37 |
| 11.2 | Frequency error (carrier) | 37 |
| 11.2.1 | Definition..... | 37 |
| 11.2.2 | Method of measurement | 37 |
| 11.2.3 | Limits..... | 38 |
| 11.3 | Frequency error (demodulated signal) | 38 |
| 11.3.1 | Definition..... | 38 |
| 11.3.2 | Method of measurement | 38 |
| 11.3.3 | Limits..... | 38 |
| 11.4 | Carrier Power | 38 |
| 11.4.1 | Definition..... | 38 |
| 11.4.2 | Method of measurement | 38 |
| 11.4.3 | Limits..... | 38 |
| 11.4.3.1 | Normal test conditions | 38 |
| 11.4.3.2 | Extreme test conditions | 39 |
| 11.5 | Modulation index | 39 |
| 11.5.1 | Definition..... | 39 |
| 11.5.2 | Method of measurement | 39 |
| 11.5.3 | Limits..... | 39 |
| 11.6 | Modulation rate | 39 |
| 11.6.1 | Definition..... | 39 |
| 11.6.2 | Method of measurement | 39 |
| 11.6.3 | Limits..... | 39 |
| 11.7 | Residual modulation | 39 |
| 11.7.1 | Definition..... | 39 |
| 11.7.2 | Method of measurement | 39 |
| 11.7.3 | Limits..... | 40 |
| 11.8 | Modulator attack time | 40 |
| 11.8.1 | Definition..... | 40 |

| | | |
|----------|--|----|
| 11.8.2 | Method of measurement | 40 |
| 11.8.3 | Limit | 40 |
| 11.9 | Adjacent channel power | 40 |
| 11.9.1 | Definition | 40 |
| 11.9.2 | Method of measurement | 40 |
| 11.9.3 | Limits | 41 |
| 11.10 | Conducted spurious emissions | 41 |
| 11.11 | Testing of free channel transmission on DSC channel 70 | 41 |
| 11.11.1 | Definition | 41 |
| 11.11.2 | Method of measurement | 41 |
| 11.11.3 | Requirement | 41 |
| 11.12 | Generated DSC call sequences | 42 |
| 12 | Receiver | 42 |
| 12.1 | Harmonic distortion and rated audio output power | 42 |
| 12.1.1 | Definition | 42 |
| 12.1.2 | Methods of measurement | 42 |
| 12.1.3 | Limits | 42 |
| 12.2 | Audio frequency response | 42 |
| 12.2.1 | Definition | 42 |
| 12.2.2 | Method of measurement | 43 |
| 12.2.3 | Limits | 43 |
| 12.3 | Maximum usable sensitivity | 44 |
| 12.3.1 | Definition | 44 |
| 12.3.2 | Method of measurement | 44 |
| 12.3.3 | Limits | 44 |
| 12.4 | Amplitude characteristic of the receiver | 44 |
| 12.4.1 | Definition | 44 |
| 12.4.2 | Method of measurement | 44 |
| 12.4.3 | Limits | 44 |
| 12.5 | Co-channel rejection | 45 |
| 12.5.1 | Definition | 45 |
| 12.5.2 | Method of measurement | 45 |
| 12.5.3 | Limit | 45 |
| 12.6 | Adjacent channel selectivity | 45 |
| 12.6.1 | Definition | 45 |
| 12.6.2 | Method of measurement | 45 |
| 12.6.3 | Limits | 46 |
| 12.7 | Spurious response rejection | 46 |
| 12.7.1 | Definition | 46 |
| 12.7.2 | Method of measurement | 46 |
| 12.7.2.1 | Introduction to the method of measurement | 46 |
| 12.7.2.2 | Method of search over the "limited frequency range" | 47 |
| 12.7.2.3 | Method of measurement | 47 |
| 12.7.3 | Limit | 47 |
| 12.8 | Intermodulation response | 47 |
| 12.8.1 | Definition | 47 |
| 12.8.2 | Method of measurement | 48 |
| 12.8.3 | Limit | 48 |
| 12.9 | Blocking or desensitization | 48 |
| 12.9.1 | Definition | 48 |
| 12.9.2 | Method of measurement | 48 |
| 12.9.3 | Limit | 48 |
| 12.10 | Conducted spurious emissions | 49 |
| 12.10.1 | Definition | 49 |
| 12.10.2 | Method of measurement | 49 |
| 12.10.3 | Limit | 49 |
| 12.11 | Receiver noise and hum level | 49 |
| 12.11.1 | Definition | 49 |
| 12.11.2 | Method of measurement | 49 |
| 12.11.3 | Limit | 49 |
| 12.12 | Squelch operation | 50 |

*Rich STANDARD PREVIEW
https://standards.etsi.org/Full%20standard/
45a-273-ea066acfa91/etsi-en-301-925-v1.5.1-2017-10
45a-273-ea066acfa91/etsi-en-301-925-v1.5.1-2017-10*

| | | |
|-------------------------------|--|-----------|
| 12.12.1 | Description | 50 |
| 12.12.2 | Squelch audio muting | 50 |
| 12.12.2.1 | Definition | 50 |
| 12.12.2.2 | Method of measurement | 50 |
| 12.12.2.3 | Limits | 50 |
| 12.12.3 | Squelch operating level | 50 |
| 12.12.3.1 | Definition | 50 |
| 12.12.3.2 | Method of measurement | 50 |
| 12.12.3.3 | Limits | 50 |
| 12.12.4 | Squelch hysteresis | 51 |
| 12.12.4.1 | Definition | 51 |
| 12.12.4.2 | Method of measurement | 51 |
| 12.12.4.3 | Limit | 51 |
| 12.13 | Multiple watch characteristics | 51 |
| 12.13.1 | Definitions | 51 |
| 12.13.2 | Method of measurement | 51 |
| 12.13.3 | Limits | 52 |
| 12.14 | Radiated spurious emissions | 52 |
| 12.14.1 | Definition | 52 |
| 12.14.2 | Method of measurement | 52 |
| 12.14.3 | Limits | 53 |
| 13 | Receiver with integrated DSC decoder | 53 |
| 14 | Duplex operation | 53 |
| 14.1 | Introduction | 53 |
| 14.2 | Receiver desensitization with simultaneous transmission and reception | 54 |
| 14.2.1 | Definition | 54 |
| 14.2.2 | Method of measurement | 54 |
| 14.2.3 | Limits | 54 |
| 14.3 | Duplex transceiver internal mixing | 54 |
| 14.3.1 | Definition | 54 |
| 14.3.2 | Method of measurement | 54 |
| 14.3.3 | Limits | 55 |
| Annex A (normative): | Measuring receiver for adjacent channel power measurement | 56 |
| A.1 | General description of power measuring receiver | 56 |
| A.2 | IF filter | 56 |
| A.3 | Attenuation indicator | 57 |
| A.4 | RMS value indicator | 57 |
| A.5 | Oscillator and amplifier | 57 |
| Annex B (normative): | Protocol for the IEC 61162-1 commands Frequency Set Information (FSI) | 58 |
| B.1 | Frequency Set Information (FSI) | 58 |
| Annex C (informative): | DSC test calls | 59 |
| C.1 | Interoperability tests | 59 |
| History | 60 | |

Intellectual Property Rights

Essential patents

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 (<https://ipr.etsi.org/>).

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.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

Foreword

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

| National transposition dates | |
|--|-----------------|
| Date of adoption of this EN: | 16 October 2017 |
| Date of latest announcement of this EN (doa): | 31 January 2018 |
| Date of latest publication of new National Standard or endorsement of this EN (dop/e): | 31 July 2018 |
| Date of withdrawal of any conflicting National Standard (dow): | 31 July 2019 |

Modal verbs terminology

In the present document "shall", "shall not", "should", "should not", "may", "need not", "will", "will not", "can" and "cannot" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"must" and "must not" are NOT allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document specifies the minimum requirements for shipborne radio transmitters and receivers for fixed installations operating in the VHF frequency bands between 156 MHz and 174 MHz used by the maritime mobile service, using both 25 kHz and 12,5 kHz channels and capable of Radiotelephony and Digital Selective Calling communications within the Global Maritime Distress and Safety System. The present document incorporates the requirements of the relevant resolutions of the International Maritime Organization (IMO) and is primarily intended to specify equipment suitable for fitting to ships subject to the SOLAS Convention [i.2] and complying with the Council Directive 2014/90/EU [i.3] of 23 July 2014 on marine equipment (the European Marine Equipment Directive).

The present document does not address the testing of ancillary equipment on a stand-alone basis, i.e. separately from the radio equipment with which it is to be used.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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

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

The following referenced documents are necessary for the application of the present document.

- [1] Void.
- [2] Void.
- [3] IMO Resolution A.803(19) (as amended by MSC.68(68)): "Performance Standards for Shipborne VHF Radio Installations capable of Voice Communications and Digital Selective Calling".
- [4] ITU Radio Regulations (2016).
- [5] Recommendation ITU-R M.493-14 (2015): "Digital selective-calling system for use in the maritime mobile service".
- [6] Recommendation ITU-R M.541-10 (2015): "Operational procedures for the use of digital selective-calling equipment in the maritime mobile service".
- [7] Recommendation ITU-T O.41 (1994): "Psophometer for use on telephone-type circuits".
- [8] Void.
- [9] ETSI EN 300 338-2 (V1.4.1): "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; Part 2: Class A/B DSC".
- [10] IEC 61162-1 (2016): "Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 1: Single talker and multiple listeners".
- [11] Void.
- [12] ETSI TS 103 052 (V1.1.1) (03-2011): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Radiated measurement methods and general arrangements for test sites up to 100 GHz".
- [13] Void.

- [14] Recommendation ITU-R M.1084-5 (2012): "Interim solutions for improved efficiency in the use of the band 156-174 MHz by stations in the maritime mobile service".
- [15] Void.
- [16] IEC 61000-4-11 (Ed.2.0) (2004): "Electromagnetic compatibility (EMC) - Part 4-11: Testing and measuring techniques - Voltage dips, short interruptions and voltage variations immunity tests".
- [17] ETSI EN 301 033 (V1.4.1) (2013): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Technical characteristics and methods of measurement for shipborne watchkeeping receivers for reception of Digital Selective Calling (DSC) in the maritime MF, MF/HF and VHF bands".
- [18] Recommendation ITU-R M.489-2 (1995): "Technical characteristics of VHF radiotelephone equipment operating in the maritime mobile service in channels spaced by 25 kHz".
- [19] Recommendation ITU-R SM.329-12 (2012): "Unwanted emissions in the spurious domain".
- [20] Void.
- [21] Recommendation ITU-T 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".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] IMO Resolution A.524(13): "Performance Standards for VHF Multiple Watch Facilities".
- [i.2] IMO SOLAS 1974: "International Convention for the Safety of Life at Sea" as amended.
- [i.3] Council Directive 2014/90/EU of 23 July 2014 on marine equipment.
- [i.4] ETSI TR 100 028-1 (V1.4.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1".
- [i.5] ETSI TS 101 570-2 (V1.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Interoperability Testing for Maritime Digital Selective Calling (DSC) Radios; Part 2: Class A/B Test Descriptions".
- [i.6] CENELEC EN 60945 (2002): "Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results".
- [i.7] ETSI TR 100 028-2 (V1.4.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".
- [i.8] ETSI EN 301 843-2: "ElectroMagnetic Compatibility (EMC) standard for marine radio equipment and services; Harmonised Standard for electromagnetic compatibility; Part 2: Specific conditions for VHF radiotelephone transmitters and receivers".
- [i.9] Recommendation ITU-R SM.332-4 (1978): "Selectivity of receivers".
- [i.10] Recommendation ITU-R M.689-2 (1994): "International maritime VHF radiotelephone system with automatic facilities based on DSC signalling format".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

ancillary equipment: Equipment (apparatus) used in connection with a transmitter or receiver is considered to be an ancillary equipment if:

- the equipment is intended for use in conjunction with a transmitter or receiver to provide additional operational or control features to the radio equipment (e.g. to extend control to another position or location); and
- the equipment cannot be used on a standalone basis to provide user functions independently of the radio equipment; and
- the radio equipment to which it is connected is capable of providing some intended operation, such as transmitting or receiving, without the ancillary equipment (i.e. it is not a sub-unit of the radio equipment essential to the basic functions of the radio equipment).

duplex operation: operating method in which transmission is possible simultaneously in both directions of a telecommunications channel

enclosure port: physical boundary of the apparatus through which electromagnetic fields may radiate or impinge

NOTE: In the case of integral antenna equipment, this port is inseparable from the antenna port.

equipment: marine receiver, transmitter or transmitter/receiver (transceiver) intended for installation and use onboard ships, and powered by the ship's supply

NOTE: Such equipment may be operated with ancillary equipment but, if so, is not dependent upon it for basic functionality.

G2B: phase-modulation (frequency modulation with a pre-emphasis of 6 dB/octave) for Digital Selective Calling (DSC) operation

NOTE: The carrier is modulated by a sub-carrier which is FSK modulated by digital data.

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

integral antenna: antenna designed to be connected directly to the equipment with or without the use of an external connector and considered to be part of the equipment

NOTE: An integral antenna may be fitted internally or externally to the equipment.

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

performance check: check of the transmitter frequency error, carrier power, audio frequency harmonic distortion of emission; and receiver sensitivity

port: particular interface of the specified equipment (apparatus), with the electromagnetic environment

EXAMPLE: Any connection point on an equipment intended for connection of cables to or from that equipment is considered as a port (see Figure 1).

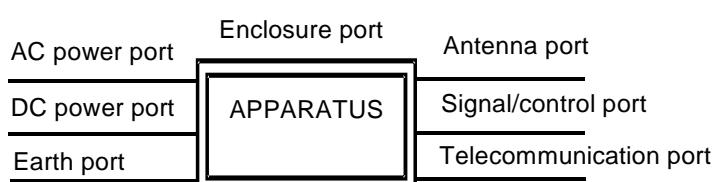


Figure 1: EUT Ports for EMC purposes

Q ratio: ratio of an observed magnitude of acceleration at the equipment to the magnitude of acceleration at the base of the vibration table

semi-duplex operation: operating method in which simplex operation is used at one end of the circuit and duplex operation at the other

simplex: operating method in which transmission is made possible alternately in each direction of a telecommunications channel, for example, by means of manual control

spurious emission: emission on a frequency, or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information

NOTE: Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out-of-band emissions (see ITU Radio Regulations [4]).

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

3.2 Symbols

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

| | |
|-----------------|--|
| dBA | sound pressure relative to 2×10^{-5} Pa |
| dBd | antenna gain relative to a half-wave dipole |
| f _{IF} | Intermediate Frequency |
| f _{lo} | frequency of the local oscillator signal |

3.3 Abbreviations

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

| | |
|-------|--|
| AC | Alternating Current |
| ad | amplitude difference |
| AIS | Automatic Identification System |
| ARQ | Automatic Response reQuest |
| DC | Direct Current |
| DSC | Digital Selective Calling |
| EMC | ElectroMagnetic Compatibility |
| emf | electromotive force |
| EUT | Equipment Under Test |
| FEC | Forward Error Correction |
| fd | frequency difference |
| FM | Frequency Modulation |
| FSI | Frequency Set Information |
| GMDSS | Global Maritime Distress and Safety System |
| IF | Intermediate Frequency |
| IMO | International Maritime Organization |
| MF/HF | Medium Frequency/High Frequency |
| MPFD | Maximum Permitted Frequency Deviation |
| MUS | Maximum Usable Sensitivity |
| NBDP | Narrow Band Direct Printing |
| pd | potential difference |
| PSTN | Public Switched Telephone Network |
| RBW | Reference Bandwidth |
| RF | Radio Frequency |
| rms | root mean square |
| SER | Symbol Error Rate |
| SINAD | Signal + Noise + Distortion/Noise + Distortion |
| sr | switching range |
| VDR | Voyage Data Recorder |
| VHF | Very High Frequency |

4 General requirements

4.1 Construction

The manufacturer shall declare compliance to the requirements of this clause (clause 4) 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 equipment, which may consist of more than one unit, shall be capable of operating on single frequency (simplex) and two-frequency (semi-duplex) channels with manual control. When operating on two-frequency channels there shall be a separation of 4,6 MHz between the transmitting frequency and the receiving frequency (see Radio Regulations Appendix 18 [4]). The equipment may also be capable of operating on two-frequency channels without manual control (duplex).

The equipment shall be able to operate on appropriate channels as defined in Appendix 18 to the Radio Regulations [4], noting in particular footnotes m) and e).

If 12,5 kHz channels are implemented in the equipment it shall be in accordance with Recommendation ITU-R M.1084-5 [14].

Additional VHF channels for maritime use outside those defined by Appendix 18 to the Radio Regulations [4] may also be provided where permitted by relevant administrations. These channels shall be clearly identified for use as relating to the relevant administration(s) and accessed through a positive action(s) for enabling use of these channel(s) but means shall be provided to block any or all of these additional channels if required by the relevant administration(s).

The equipment shall be so designed that use of channel 70 for purposes other than DSC is prevented (signalling on channel 70 shall conform with Recommendations ITU-R M.493-14 [5] and M.541-10 [6]), 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 DSC operation

Regarding DSC operation the present document only deals with equipment having integrated or associated DSC encoder/decoder.

If the radio equipment under test is intended for DSC operation in connection with an external DSC encoder/decoder, compliance with the present document can only be achieved, if the manufacturer supplies the test house with the specific stand-alone DSC encoder/decoder, intended for DSC operation, in connection with the radio equipment under test. The radio equipment and the external DSC encoder/decoder shall then be tested as fully integrated DSC equipment in accordance with clauses 11 and 13.

It shall be notified in the test report, that the tests carried out only secure compliance to the present document, if the specific radio equipment along with the specific DSC encoder/decoder is used together as integrated equipment.

Interfaces for external DSC encoder/decoder are not mandatory.

If interfaces for external DSC encoder / decoder are provided then they shall be in compliance with clauses 5.4.2 and 5.4.3.