



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

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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 Definition of terms, symbols and abbreviations.....	11
3.1 Terms.....	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	15
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 interfaces.....	18
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	19
6.3.2.3 Other power sources.....	19
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	21
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.....	22
7.14	Interpretation of the measurement results	22
8	Performance checks.....	23
8.1	Performance checks - introduction	23
8.2	Performance check - transmitter frequency error	23
8.3	Performance check - transmitter carrier power	23
8.4	Performance check - transmitter audio frequency harmonic distortion.....	23
8.5	Performance check - receiver sensitivity	23
8.6	Performance check of DSC	23
9	Environmental tests	24
9.1	Procedure.....	24
9.2	Vibration test.....	24
9.2.1	Definition.....	24
9.2.2	Method of measurement	24
9.2.3	Requirement.....	25
9.3	Temperature tests	25
9.3.1	Introduction.....	25
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.....	26
9.3.5	Low temperature cycle.....	26
9.3.5.1	Definition	26
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.....	27
10.3	Carrier power.....	27
10.3.1	Definitions	27
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.....	28
10.4.2.1	Method of measurement.....	28
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

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 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

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 a 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

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Foreword

This final draft European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the Vote phase of the ETSI standards EN Approval Procedure.

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

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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.

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

- [1] IMO Resolution A.694(17): "General Requirements for Shipborne Radio Equipment Forming Part of the Global Maritime Distress and Safety System (GMDSS) and for Electronic Navigational Aids".
- [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 (2020).
- [5] Recommendation ITU-R M.493-15 (2019): "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 (V1.5.1): "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 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.3.0) (2020): "Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase".
- [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

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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 (V1.2.1): "Interoperability Testing for Maritime Digital Selective Calling (DSC) Radios; Part 2: Class A/B Test Descriptions".
- [i.6] EN 60945 (2002): "Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results", produced by CENELEC.
- [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 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms 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).

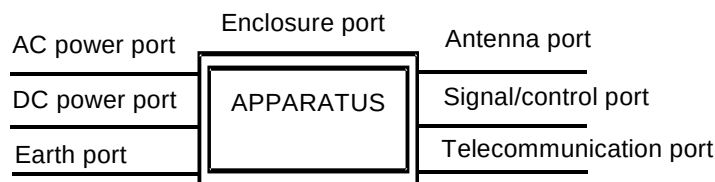


Figure 1: EUT Ports for EMC purposes

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
fd	frequency difference
FEC	Forward Error Correction
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 (receiving and transmitting channel separation of 4,6 MHz) as defined in the Radio Regulations, Appendix 18 [4]. The two-frequency operation may be implemented either with manual control (semi-duplex) or 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 a), m) and e). The usage of channels identified by footnote w), wa), ww) and x) analogue voice communication shall be selectable for operation.

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.493-15 [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.

In addition, the equipment shall comply with the applicable general requirements contained in IMO Resolution 694 (17) [1].

4.2 DSC operation

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