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VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC); Harmonised Standard covering the essential requirements of articles 3.2 and 3.3(g) of Directive 2014/53/EU

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Foreword

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

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.9] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.3].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in tables A.1 and A.2 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

National transposition dates	
Date of adoption of this EN:	27 February 2017
Date of latest announcement of this EN (doa):	31 May 2017
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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).

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

1 Scope

The present document covers the minimum requirements for general communication for shipborne fixed installations using a VHF radiotelephone operating in certain frequency bands allocated to the maritime mobile service using either 25 kHz or 25 kHz and 12,5 kHz channels and associated equipment for DSC - class D. The present document does not cover requirements for the integrated GNSS receiver providing locating function.

These requirements include the relevant provisions of the ITU Radio Regulations, appendix 18 [1], Recommendation ITU-R M.493-14 [3] (where class D is defined), Recommendation ITU-R M.825-3 [i.4] and incorporate the relevant guidelines of the IMO as detailed in IMO Circular MSC/Circ-803 [i.1].

The present document also specifies technical characteristics, methods of measurement and required test results.

The present document covers the essential requirements of article 3.2 and article 3.3(g) of Directive 2014/53/EU [i.3] under the conditions identified in annex A.

2 References

2.1 Normative references

References are specific, identified by date of publication and/or edition number or version number. Only the cited 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.

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] ITU Radio Regulations, appendix 18 (2016): "Table of transmitting frequencies in the VHF maritime mobile band".

[2] ETSI EN 300 338-3 (V1.2.1) (02-2017): "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 3: Class D DSC".

[3] Recommendation ITU-R M.493-14 (2015): "Digital selective-calling system for use in the maritime mobile service".

[4] 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".

[5] 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".

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 Circular MSC/Circ-803: "Participation of non-SOLAS ships in the Global Maritime Distress and Safety System (GMDSS)".

[i.2] Recommendation ITU-R SM.332-4: "Selectivity of receivers".

[i.3] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.

[i.4] Recommendation ITU-R 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".

[i.5] Recommendation ITU-T O.41 (1994): "Psophometer for use on telephone-type circuits".

[i.6] 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".

[i.7] ETSI TR 100 028-2 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".

[i.8] ETSI TS 101 570-3 (V1.1.1) (06-2012): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Interoperability Testing for Maritime Digital Selective Calling (DSC) Radios; Part 3: Class D Test Descriptions".

[i.9] Commission Implementing Decision C(2015) 5376 final of 4.8.2015 on a standardisation request to the European Committee for Electrotechnical Standardisation and to the European Telecommunications Standards Institute as regards radio equipment in support of Directive 2014/53/EU of the European Parliament and of the Council.

3 Definitions, symbols and abbreviations

3.1 Definitions

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

block: inhibit a function by making it inaccessible from the user interface

carrier frequency: frequency to which the transmitter or receiver is tuned

class D: class of DSC 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

NOTE: See Recommendation ITU-R M.493-14 [3].

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

frequency deviation: difference between the instantaneous frequency of the modulated RF signal and the carrier frequency

G2B: phase-modulation with digital information, with a sub-carrier for DSC operation

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

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

3.2 Symbols

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

λ lambda (wavelength)

3.3 Abbreviations

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

ad	amplitude difference
AIS	universal shipborne Automatic Identification System
CSP	Channel SPacing
d.c.	direct current
DSC	Digital Selective Calling
e.m.f.	electromotive force
EFTA	European Free Trade Association
EN	European Norm
EUT	Equipment Under Test
fd	frequency difference
FM	Frequency Modulation
FSK	Frequency Shift Keying
GNSS	Global Navigation Satellite System
IF	Intermediate Frequency
IMO	International Maritime Organization
ITU-R	International Telecommunication Union, Radiocommunications sector
ITU-T	International Telecommunication Union, Telecommunications sector
MPFD	Maximum Permissible Frequency Deviation
ppm	parts per million
r.m.s.	root mean square
RBW	Reference BandWidth
RF	Radio Frequency
SINAD	Signal + Noise + Distortion to Noise + Distortion
SOLAS	Safety Of Life And Sea
VHF	Very High Frequency

4 General and operational requirements

4.1 General

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

4.2 Composition

The equipment shall, as a minimum, include:

- a VHF radiotelephone transmitter;
- a VHF radiotelephone receiver;
- a GNSS receiver shall be integrated either into the radio telephone transceiver or its dedicated DSC encoder/decoder; and

either:

- a dedicated channel 70 watchkeeping receiver for DSC decoder;
- a DSC encoder; and
- a DSC decoder;

or:

- a dedicated DSC controller interface.

4.3 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 appropriate channels defined in appendix 18 to the Radio Regulations [1], noting in particular footnotes m) and e).

Additional VHF channels for maritime use outside those defined by appendix 18 to the Radio Regulations 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 this/these channel(s) but means shall be provided to block any or all of these additional channels if required by the relevant administration(s).

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

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.

4.4 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:

- 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 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 4.6);
- controls for multiple watch facilities, if provided (see clause 5.4).

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 [1], 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.

4.5 DSC interface for non-integrated controllers

The equipment shall have a dedicated interface for an external DSC controller compliant with ETSI EN 300 338-3 [2].

4.6 Display

Any display characters used for showing the channel designator, mode of operation etc. shall be additional to any display requirements specified in ETSI EN 300 338-3 [2] for DSC purposes.

4.7 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.

4.8 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.

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 4.4.

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.

Programmable information shall be stored in non-volatile memory devices.

4.9 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.

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

4.10 Warm up

After being switched on the product shall, as soon as possible and within 5 seconds clearly indicate that it has been turned on and is initializing. The channel indicator and/or idle display shall not indicate readiness until the product is fully operational. The product and any additional controller units shall be fully operational within 1 minute.

4.11 GNSS receiver antenna

The integrated GNSS receiver shall have the possibility to connect an external antenna.

5 Technical requirements

5.1 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.

5.2 Class of emission and modulation characteristics

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

The equipment shall be designed to operate with channel separations of 25 kHz or 25 kHz and 12,5 kHz.

5.3 DSC operation

5.3.1 General

The radio shall have either an integrated DSC controller or a dedicated interface for an external DSC controller.

In either case the operation of the DSC controller and radio combination shall comply with all the requirements of ETSI EN 300 338-3 [2].

5.4 Multiple watch facilities

5.4.1 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.

5.4.2 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.

5.4.3 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.

6 General conditions of measurement

6.1 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.

6.2 Squelch

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

6.3 Transmission time limitation

Unless otherwise specified, the transmitter push-to-talk timer shall be deactivated for test purposes.

6.4 Normal test modulation

For normal test modulation, the modulation frequency shall be:

- 25 kHz channels: 1 kHz and the frequency deviation shall be ±3 kHz.
- 12,5 kHz channels: 1 kHz and the frequency deviation shall be ±1,5 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.

6.5 Artificial antenna

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

6.6 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.

6.7 Test channels

Conformance tests for 25 kHz channel operation shall be made on channel 16.

Conformance tests for 12,5 kHz channel operation shall be made on channel 276.

Conformance tests for DSC operation shall be made on channel 70.

6.8 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.

6.9 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 as specified in tables A1-4.1 to A1-4.9 of Recommendation ITU-R M.493-14 [3].

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.

6.10 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 6.9). 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.

6.11 Void

6.12 Test conditions, power sources, and ambient temperatures

6.12.1 Normal and extreme test conditions

Conformance tests shall be made under normal test conditions and also, where stated, under extreme test conditions (see clauses 6.14.1 and 6.14.2 applied simultaneously).

6.12.2 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 6.13.2 and 6.14.2.

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.

6.13 Normal test conditions

6.13.1 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.

6.13.2 Normal power sources

6.13.2.1 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.).

6.13.2.2 Other power sources

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

6.14 Extreme test conditions

6.14.1 Extreme temperatures

For tests at extreme temperatures, measurements shall be made in accordance with clause 6.15, at a lower temperature of -15 °C and an upper temperature of +55 °C.

6.14.2 Extreme values of test power sources

6.14.2.1 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.).

6.14.2.2 Other power sources

For operation from other sources, the extreme test voltages shall be those declared by the manufacturer.

6.15 Procedure for tests at extreme temperatures

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.

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 in the high power transmit condition at the normal voltage until the transmit timeout timer is activated and the equipment is returned to standby mode. The equipment shall then meet the relevant clauses of the present document.

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

6.16 Reference Bandwidths for emission measurements

The reference bandwidths used shall be as stated in tables 1 and 2.

Table 1: Reference bandwidths to be used for the measurement of spurious emission

Frequency range	RBW
9 kHz to 150 kHz	1 kHz
150 kHz to 30 MHz	10 kHz
30 MHz to 1 GHz	100 kHz
1 GHz to 12,75 GHz	1 MHz

Table 2: Reference bandwidths to be used close to the wanted emission for equipment operating below 1 GHz

Frequency offset from carrier	RBW
250 % of the CSP to 100 kHz	1 kHz
100 kHz to 500 kHz	10 kHz

7 Environmental tests

7.1 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.

7.2 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 6.13.2).

7.3 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 6.5) 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 Radiotelephone receiver:

- A test signal at a carrier frequency equal to the nominal frequency of the receiver, modulated by the normal test modulation (see clause 6.4) 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 6.9) shall be applied to the receiver input. The symbol error ratio in the decoder output shall be determined as described in clause 6.10 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.

7.4 Vibration test

7.4.1 Definition

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

7.4.2 Method of measurement

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.

7.4.3 Requirement

The equipment shall meet the requirements of the performance check (see clause 7.3). There shall be no harmful deterioration of the equipment visible.

7.5 Temperature tests

7.5.1 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.

7.5.2 Dry heat

7.5.2.1 Definition

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

7.5.2.2 Method of measurement

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.

7.5.2.3 Requirement

The equipment shall meet the requirements of the performance check (see clause 7.3).

7.5.3 Damp heat

7.5.3.1 Definition

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

7.5.3.2 Method of measurement

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.

7.5.3.3 Requirement

The equipment shall meet the requirements of the performance check (see clause 7.3).

7.5.4 Low temperature

7.5.4.1 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.

7.5.4.2 Method of measurement

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.

7.5.4.3 Requirement

The equipment shall meet the requirements of the performance check.

8 Transmitter

8.1 Frequency error

8.1.1 Definition

The frequency error is the difference between the measured carrier frequency and its nominal value.

8.1.2 Method of measurement

The carrier frequency shall be measured in the absence of modulation, with the transmitter connected to an artificial antenna (see clause 6.5) and tuned to channel 16.

Measurements shall be made under normal test conditions (see clause 6.13) and under extreme test conditions (see clauses 6.14.1 and 6.14.2 applied simultaneously).

This test shall be carried out with the output power switch being set at both maximum and minimum.

8.1.3 Limits

The frequency error shall be within ±1,5 kHz.

8.2 Carrier power

8.2.1 Definition

The carrier power is the mean power delivered to the artificial antenna during one radio frequency cycle in the absence of modulation.

The rated output power is the carrier power declared by the manufacturer.

8.2.2 Method of measurement

The transmitter shall be connected to an artificial antenna (see clause 6.5) and the power delivered to this artificial antenna shall be measured. The measurements shall be made on channel 16, the highest frequency channel and the lowest frequency channel under normal test conditions (see clause 6.13) and channel 16 under extreme test conditions (see clauses 6.14.1 and 6.14.2 applied simultaneously).

During the test on channel 16, a check should be made that the power output falls to zero after the maximum continuous transmission time has elapsed (see clause 4.4).

8.2.3 Limits

8.2.3.1 Normal test conditions

The rated output power of the equipment shall be between 6 W and 25 W.

With the output power switch set at maximum, the carrier power shall be within ±1,5 dB of the rated output power under normal test conditions. The output power shall never however exceed 25 W.

With the output power switch set at minimum the carrier power shall remain between 0,1 W and 1 W.

The maximum continuous transmission time shall be between 5 min and 6 min.

8.2.3.2 Extreme test conditions

With the output power switch set at maximum, the carrier power shall remain between 6 W and 25 W and be within +2 dB, -3 dB of the rated output power under extreme conditions. The output power shall never however exceed 25 W.

With the output power switch set at minimum the carrier power shall remain between 0,1 W and 1 W.

The maximum continuous transmission time shall be between 5 min and 6 min.

8.3 Frequency deviation

8.3.1 Definition

For the purposes of the present document, the frequency deviation is the difference between the instantaneous frequency of the modulated radio frequency signal and the carrier frequency.

8.3.2 Maximum permissible frequency deviation

8.3.2.1 Method of measurement

The frequency deviation shall be measured at the output with the transmitter connected to an artificial antenna (see clause 6.5) and tuned to channel 16, by means of a deviation meter capable of measuring the maximum deviation, including that due to any harmonics and intermodulation products which may be generated in the transmitter.

The modulation frequency shall be varied between 100 Hz and 3 kHz. The level of this test signal shall be 20 dB above the level which produces normal test modulation (see clause 6.4). This test shall be carried out with the output power switch set at both maximum and minimum.

8.3.2.2 Limits

The maximum permissible frequency deviation shall be:

- 25 kHz channels: ±5 kHz.
- 12,5 kHz channels: ±2,5 kHz.

8.3.3 Reduction of frequency deviation at modulation frequencies above 3 kHz

8.3.3.1 Method of measurement

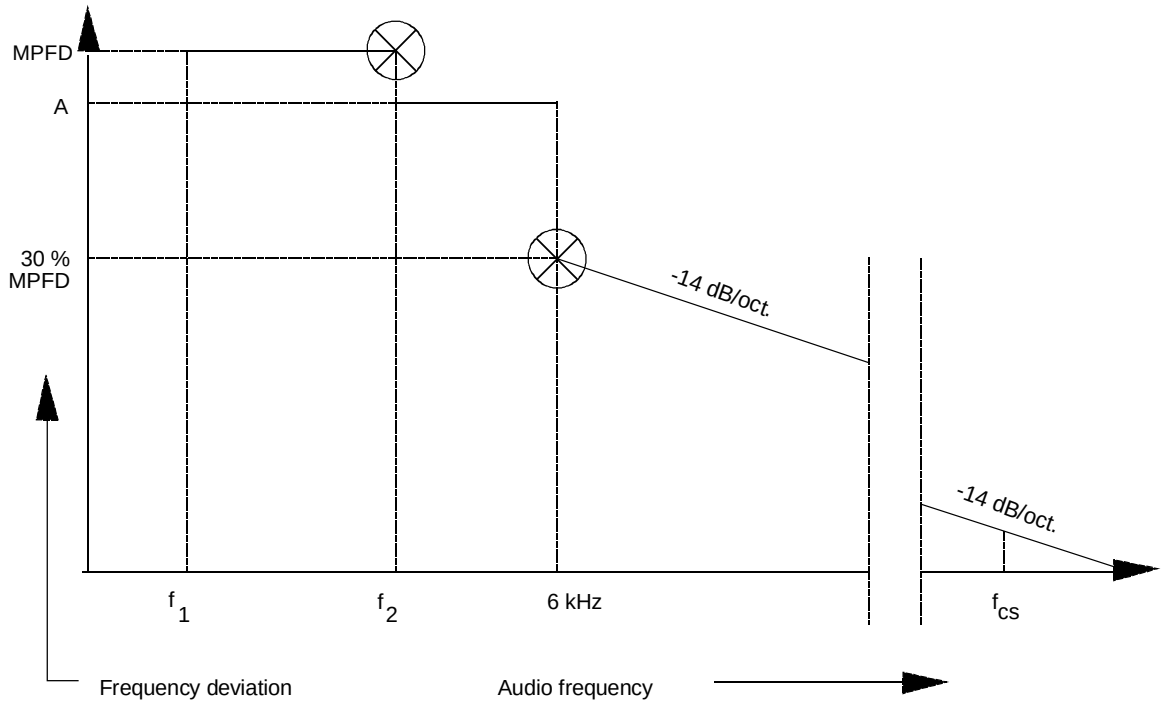
The transmitter shall operate under normal test conditions (see clause 6.13) connected to a load as specified in clause 6.5. The transmitter shall be modulated by the normal test modulation (see clause 6.4). With the input level of the modulation signal being kept constant, the modulation frequency shall be varied between 3 kHz (see note) and a frequency equal to the channel separation for which the equipment is intended and the frequency deviation shall be measured.

NOTE: 2,55 kHz for transmitters intended for 12,5 kHz channel separation.

8.3.3.2 Limits

The frequency deviation at modulation frequencies between 3,0 kHz (for equipment operating with 25 kHz channel separations) or 2,55 kHz (for equipment operating with 12,5 kHz channel separation) and 6,0 kHz shall not exceed the frequency deviation at a modulation frequency of 3,0 kHz/2,55 kHz. At 6,0 kHz the deviation shall be not more than 30,0 % of the maximum permissible frequency deviation.

The frequency deviation at modulation frequencies between 6,0 kHz and a frequency equal to the channel separation for which the equipment is intended shall not exceed that given by a linear representation of the frequency deviation (dB) relative to the modulation frequency, starting at the 6,0 kHz limit and having a slope of -14,0 dB per octave. These limits are illustrated in figure 1.



NOTE:
Abbreviations:

f_1	lowest appropriate frequency
f_2	3,0 kHz (for 25 kHz channel separation), or 2,55 kHz (for 12,5 kHz channel separation)
MPFD	maximum permissible frequency deviation, clause 8.3.2.1
A	measured frequency deviation at f_2
f_{cs}	frequency equal to channel separation

Figure 1: Frequency deviation

8.4 Sensitivity of the modulator, including microphone

8.4.1 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.

8.4.2 Method of measurement

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.

8.4.3 Limits

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

8.5 Audio frequency response

8.5.1 Definition

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

8.5.2 Method of measurement

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

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

NOTE: 2,55 kHz for transmitters intended for 12,5 kHz channel separation.

8.5.3 Limit

The audio frequency response shall be within +1 dB and -3 dB of a 6 dB/octave line passing through the reference point (see figure 2). The upper limit frequency shall be 2,55 kHz for 12,5 kHz channels.

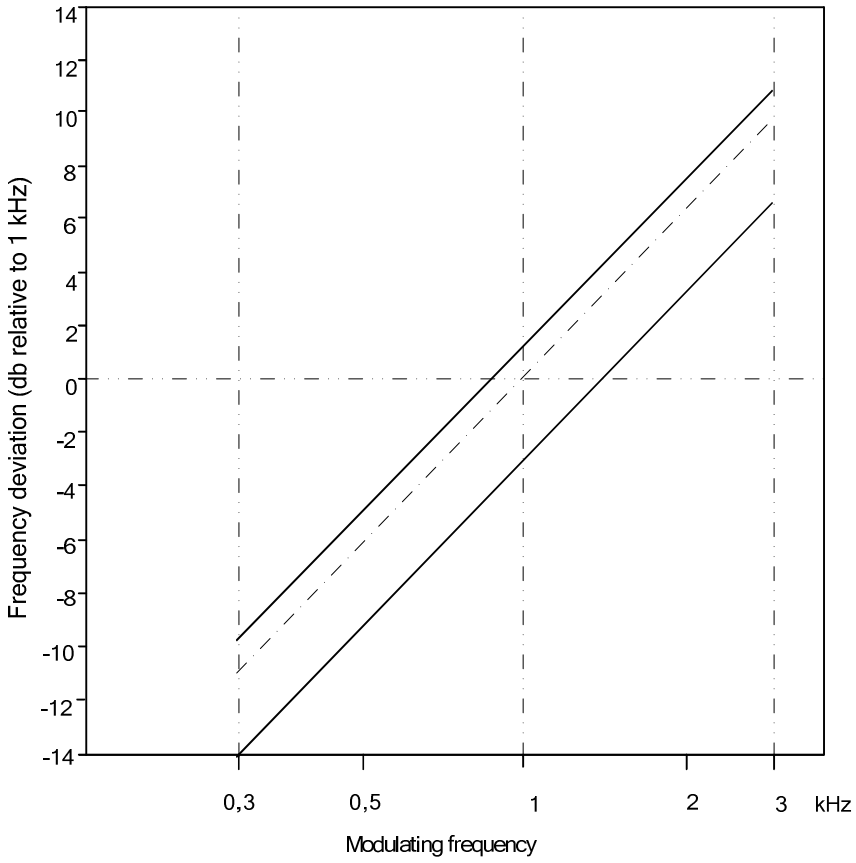


Figure 2: Audio frequency response

8.6 Audio frequency harmonic distortion of the emission

8.6.1 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.

8.6.2 Method of measurement

8.6.2.1 General

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 on a 25 kHz channel with the output power switch at both maximum and minimum.

8.6.2.2 Normal test conditions

Under normal test conditions (see clause 6.13) 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.

8.6.2.3 Extreme test conditions

Under extreme test conditions (see clauses 6.14.1 and 6.14.2 applied simultaneously), the measurements shall be carried out at 1 kHz with a frequency deviation of ±3 kHz.

8.6.3 Limits

The harmonic distortion shall not exceed 10 %.

8.7 Adjacent channel power

8.7.1 Definition

The adjacent channel power is that part of the total power output of a transmitter under defined conditions of modulation which falls within a specified passband centred on the nominal frequency of either of the adjacent channels. This power is the sum of the mean power produced by the modulation hum and noise of the transmitter.

8.7.2 Method of measurement

The adjacent channel power can be measured with a power measuring receiver which conforms to annex B (referred to in clause 8.7.2 and annex B as the "receiver"), in Recommendation ITU-R SM.332-4 [i.2]:

a) The transmitter shall be operated at the carrier power determined in clause 8.2 under normal test conditions. The output of the transmitter shall be linked to the input of the "receiver" by a connecting device such that the impedance presented to the transmitter is 50 Ω and the level at the "receiver" input is appropriate.

b) With the transmitter unmodulated, the tuning of the "receiver" shall be adjusted so that a maximum response is obtained. This is the 0 dB response point. The "receiver" attenuator setting and the reading of the meter shall be recorded.

   The measurement may be made with the transmitter modulated with normal test modulation, in which case this fact shall be recorded with the test results.

c) The tuning of the "receiver" shall be adjusted away from the carrier so that the "receiver" -6 dB response nearest to the transmitter carrier frequency is located at a displacement from the nominal carrier frequency of 17 kHz for 25 kHz channels or 8,25 kHz for 12,5 kHz channels.

d) The transmitter shall be modulated with 1,25 kHz at a level which is 20 dB higher than that required to produce ±3 kHz deviation for 25 kHz channels or ±1,5 kHz deviation for 12,5 kHz channels.

e) The "receiver" variable attenuator shall be adjusted to obtain the same meter reading as in step b) or a known relation to it.

f) The ratio of adjacent channel power to carrier power is the difference between the attenuator settings in steps b) and e), corrected for any differences in the reading of the meter.

g) The measurement shall be repeated with the "receiver" tuned to the other side of the carrier.

8.7.3 Limits

The adjacent channel power shall not exceed a value of:

- 25 kHz channel: 70 dB below the carrier power of the transmitter without any need to be below the spurious emission limit of 0,25 µW.
- 12,5 kHz channel: 60 dB below the carrier power of the transmitter without any need to be below the spurious emission limit of 0,25 µW.

8.8 Conducted spurious emissions conveyed to the antenna

8.8.1 Definition

Conducted spurious emissions are emissions 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. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out of band emissions.

8.8.2 Method of measurement

Conducted spurious emissions shall be measured with the unmodulated transmitter connected to the artificial antenna (see clause 6.5).

The measurements shall be made over a range from 9 kHz to 2 GHz, excluding the channel on which the transmitter is operating and its adjacent channels.

The measurements for each spurious emission shall be made using a tuned radio measuring instrument or a spectrum analyser.

8.8.3 Limit

The power of any conducted spurious emission on any discrete frequency shall not exceed 0,25 µW.

8.9 Cabinet radiation and conducted spurious emissions other than those conveyed to the antenna

8.9.1 Definitions

Cabinet radiation consists of emissions at frequency, radiated by the equipment cabinet and structures.

Conducted spurious emissions other than those conveyed to the antenna are emissions at frequencies, other than those of the carrier and the sideband components resulting from the wanted modulation process, which are produced by conduction in the wiring and accessories used with the equipment.

8.9.2 Method of measurement

On a test site, selected from clause 5 of ETSI TS 103 052 [5], the equipment shall be placed at the specified height on a non-conducting support and in position closest to normal use as declared by the manufacturer.

The transmitter antenna connector shall be connected to on artificial antenna, clause 6.5.

The test antenna shall be orientated for vertical polarization and the length of the test antenna shall be chosen to correspond to the instantaneous frequency of the measuring receiver.

The output of the test antenna shall be connected to a measuring receiver.

The transmitter shall be switched on without modulation, and measuring receiver shall be tuned over the frequency range 30 MHz to 2 GHz, except for the channel on which the transmitter is intended to operate and its adjacent channels.

At each frequency at which a spurious component is detected:

a) the test antenna shall be raised and lowered through the specified range of heights until a maximum signal level is detected on the measuring receiver;

b) the transmitter shall be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver;

c) the maximum signal level detected by the measuring receiver shall be noted;

d) the transmitter shall be replaced by a substitution antenna as defined in clause 5.3.2 of ETSI TS 103 052 [5];

e) the substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the spurious component detected;

f) the substitution antenna shall be connected to a calibrated signal generator;

g) the frequency of the calibrated signal generator shall be set to the frequency of the spurious component detected;

h) the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver, if necessary;

i) the test antenna shall be raised and lowered through the specified range of heights to ensure that the maximum signal is received;

j) the input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver that is equal to the level noted while the spurious component was measured, corrected for the change of input attenuator setting of the measuring receiver;

k) the input level to the substitution antenna shall be recorded as power level, corrected for the change of input attenuator setting of the measuring receiver;

l) the measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization;

m) the measure of the effective radiated power of the spurious components is larger of the two power levels recorded for spurious component at the input to the substitution antenna, corrected for the gain of the antenna if necessary;

n) the measurements shall be repeated with the transmitter on stand-by.

8.9.3 Limits

When the transmitter is in stand-by the cabinet radiation and spurious emissions shall not exceed 2 nW.

When the transmitter is in operation the cabinet radiation and spurious emissions shall not exceed 0,25 µW.

8.10 Transient frequency behaviour of the transmitter

8.10.1 Definitions

The transient frequency behaviour of the transmitter is the variation in time of the transmitter frequency difference from the nominal frequency of the transmitter when the RF output power is switched on and off.

t_{on}: according to the method of measurement described in clause 8.9.2 the switch-on instant t_{on} of a transmitter is defined by the condition when the output power, measured at the antenna terminal, exceeds 0,1 % of the nominal power;

t_1: period of time starting at t_{on} and finishing according to table 3;

t_2: period of time starting at the end of t_1 and finishing according to table 3;

t_{off}: switch-off instant defined by the condition when the nominal power falls below 0,1 % of the nominal power;

t_3: period of time that finishing at t_{off} and starting according to table 3.

Table 3: Time periods

t_1 (ms)	5,0
t_2 (ms)	20,0
t_3 (ms)	5,0

8.10.2 Method of measurement

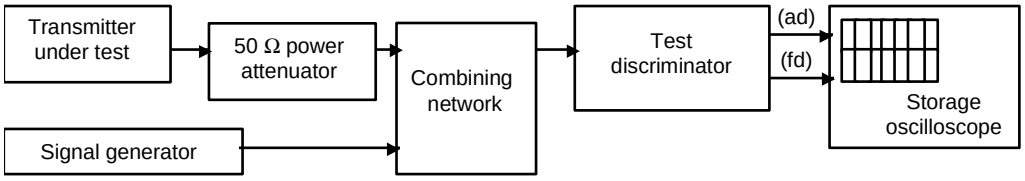


Figure 3: Measurement arrangement

Two signals shall be connected to the test discriminator via a combining network (see clause 6.1).

The transmitter shall be connected to a 50 Ω power attenuator.

A test signal generator shall be connected to the second input of the combining network.

The test signal shall be adjusted to the nominal frequency of the transmitter.

The test signal shall be modulated by a frequency of 1 kHz with a deviation of ±25 kHz.

The test signal level shall be adjusted to correspond to 0,1 % of the power of the transmitter under test measured at the input of the test discriminator. This level shall be maintained throughout the measurement.

The amplitude difference (ad) and the frequency difference (fd) output of the test discriminator shall be connected to a storage oscilloscope.

The storage oscilloscope shall be set to display the channel corresponding to the (fd) input up to ±25 kHz.

The storage oscilloscope shall be set to a sweep rate of 10 ms/division and set so that the triggering occurs at one division from the left edge of the display.

The display shall show the 1 kHz test signal continuously.

The storage oscilloscope shall then be set to trigger on the channel corresponding to the amplitude difference (ad) input at a low input level, rising.

The transmitter shall then be switched on, without modulation, to produce the trigger pulse and a picture on the display.

The result of the change in the ratio of power between the test signal and the transmitter output will, due to the capture ratio of the test discriminator, produce two separate sides on the picture, one showing the 1 kHz test signal, the other the frequency difference of the transmitter versus time.

The moment when the 1 kHz test signal is completely suppressed is considered to provide t_{on}.

The periods of time t_1 and t_2 as defined in table 3 shall be used to define the appropriate template.

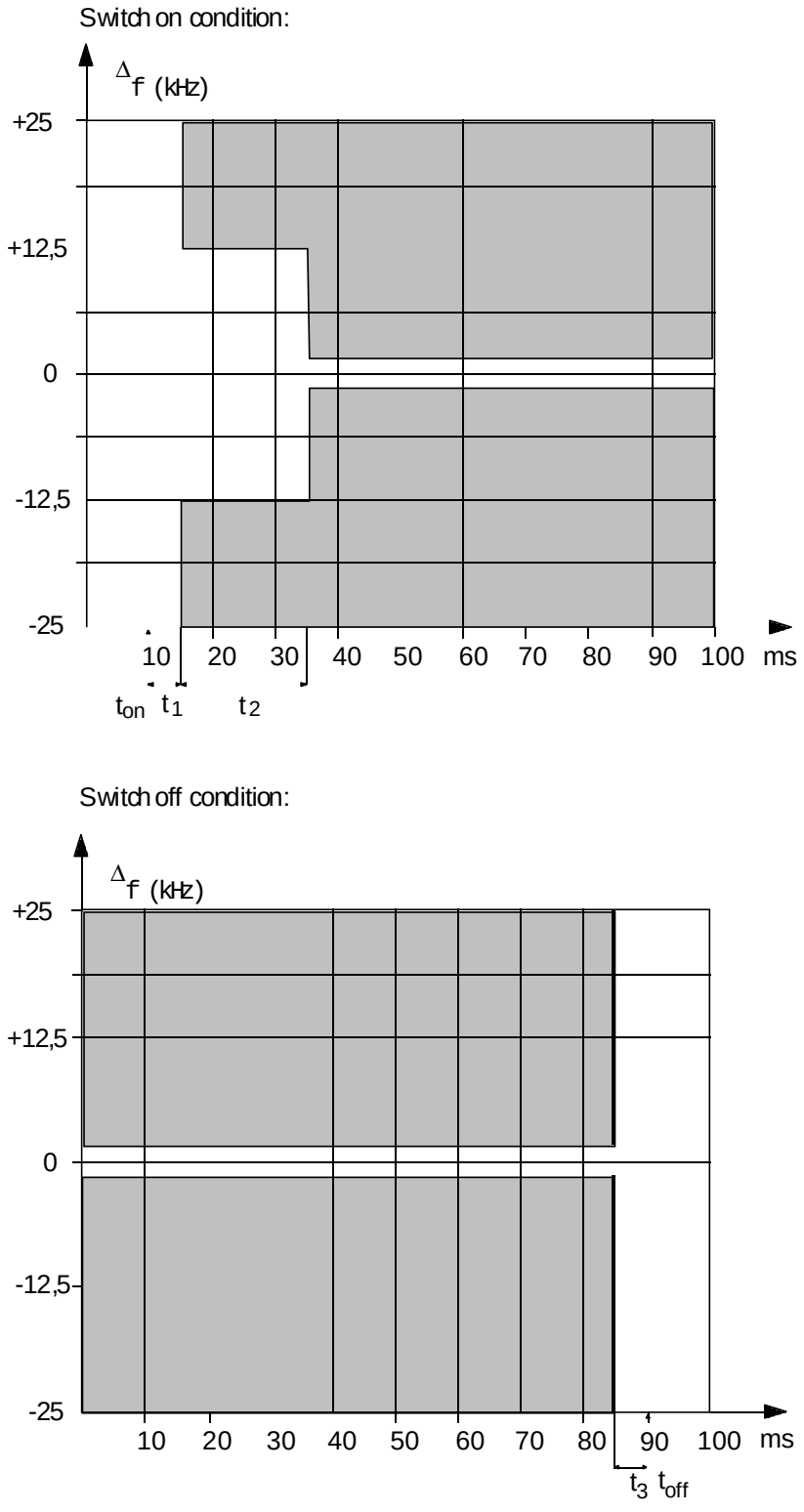


Figure 4: Storage oscilloscope view t_1, t_2 and t_3

The result shall be recorded as frequency difference versus time.

The transmitter shall remain switched on.

The storage oscilloscope shall be set to trigger on the channel corresponding to the amplitude difference (ad) input at a high input level, decaying and set so that the triggering occurs at 1 division from the right edge of the display.

The transmitter shall then be switched off.

The moment when the 1 kHz test signal starts to rise is considered to provide t_{off}.

The period of time t_3 as defined in table 3 shall be used to define the appropriate template.

The result shall be recorded as frequency difference versus time.

8.10.3 Limits

During the periods of time t_1 and t_3 the frequency difference shall not exceed ±25 kHz.

The frequency difference after the end of t_2 shall be within the limit of the frequency error given in clause 8.1.

During the period of time t_2 the frequency difference shall not exceed ±12,5 kHz.

Before the start of t_3 the frequency difference shall be within the limit of the frequency error given in clause 8.1.

8.11 Residual modulation of the transmitter

8.11.1 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.

8.11.2 Method of measurement

The normal test modulation defined in clause 6.4 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.

8.11.3 Limit

The residual modulation shall not exceed -40 dB on either 12,5 kHz or 25 kHz channels.

8.12 Frequency error (demodulated DSC signal)

8.12.1 Definition

The frequency error for the B- and the Y-state is the difference between the measured frequency from the demodulator and the nominal values.

8.12.2 Method of measurement

The transmitter shall be connected to the artificial antenna as specified in clause 6.5 and a suitable FM demodulator. The transmitter shall be set to channel 70.

The transmitter shall be set to transmit a continuous B- or Y- state.

The measurement shall be performed by measuring the demodulated output, for both the continuous B- and Y-state.

The measurements shall be carried out under normal test conditions (see clause 6.13) and extreme test conditions (see clauses 6.14.1 and 6.14.2 applied simultaneously).

8.12.3 Limits

The measured frequency from the demodulator at any time for the B-state shall be within 2 100 Hz ± 10 Hz and for the Y-state within 1 300 Hz ± 10 Hz.

8.13 Modulation index for DSC

8.13.1 Definition

This test measures the modulation index in the B and Y states.

8.13.2 Method of measurement

The transmitter shall be set to transmit continuous B and then Y signals. The frequency deviations shall be measured.

8.13.3 Limits

The modulation index shall be 2,0 ± 10 %.

8.14 Modulation rate for DSC

8.14.1 Definition

The modulation rate is the bit stream speed measured in bit/s.

8.14.2 Method of measurement

The transmitter shall be set to transmit continuous dot pattern.

The RF output terminal of the transmitter, suitably attenuated, shall be connected via a linear FM demodulator to a calibrated FSK demodulator. The output of the FSK demodulator shall be limited in bandwidth by a low pass filter with a cut-off frequency of 1 kHz and a slope of 12 dB/octave.

The frequency of the output shall be measured.

8.14.3 Limits

The frequency shall be 600 Hz ± 30 ppm corresponding to a modulation rate of 1 200 baud.

8.15 Testing of free channel transmission on DSC channel 70

8.15.1 Definition

This test verifies that the transmitter has a facility to prevent transmission of DSC calls if channel 70 is busy, except in case of distress and safety calls.

8.15.2 Method of measurement

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 receiver input is connected to a signal generator. The signal generator is set to the frequency of channel 70 (156,525 MHz) and the RF signal shall be modulated by a standard DSC signal, see clause 6.9. The test is performed at an RF level; of +6 dBµV (e.m.f).

If the receiver input and transmitter output are combined in the same port it is necessary to combine the calibrated apparatus for decoding and printing out the information content of the call sequences and the signal generator through a suitable combining network, see clause 6.1. It may be necessary to protect the signal generator against the power output from the equipment through an attenuator.

The signal generator output shall be turned on. The transmitter shall be set to transmit DSC calls as specified in annex B.

Then the signal generator output shall be turned off.

8.15.3 Requirement

If the format specifier is distress or the category is either distress, urgency or safety in the transmitted DSC call, the call shall be transmitted while the signal generator output is still on.

Otherwise the call shall not be transmitted until the signal generator output has been turned off.

9 Radiotelephone receiver

9.1 Harmonic distortion and rated audio-frequency output power

9.1.1 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.

9.1.2 Methods of measurement

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 6.4) shall be applied in succession to the receiver input under the conditions specified in clause 6.1.

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

Under normal test conditions (see clause 6.13) 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.

9.1.3 Limits

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 %.

9.2 Audio frequency response

9.2.1 Definition

The 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.

9.2.2 Method of measurement

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 6.4) shall be applied to the receiver antenna port under the conditions specified in clause 6.1.

The receiver's audiofrequency power control shall be set so as to produce a power level equal to 50 % of the rated output power (see clause 9.1). This setting shall remain unchanged during the test.

The frequency deviation shall then be reduced to ±1 kHz and the audio output is the reference point in figure 5 (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.

9.2.3 Limits

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 (see figure 5).

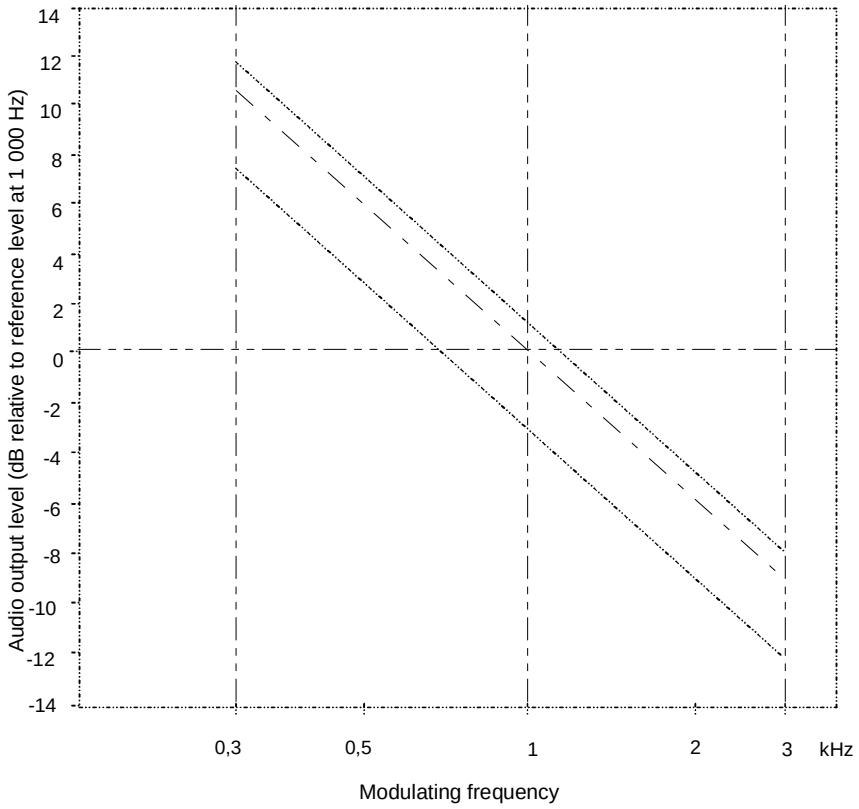


Figure 5: Audio frequency response

9.3 Maximum usable sensitivity

9.3.1 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 6.4), will produce:

- in all cases, an audio frequency output power equal to 50 % of the rated output power (see clause 9.1); 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 Recommendation ITU-T O.41 [i.5].

9.3.2 Method of measurement

A test signal at a carrier frequency equal to the nominal frequency of the receiver, modulated by the normal test modulation (see clause 6.4) 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 9.3.1) 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 6.13) and under extreme test conditions (see clauses 6.14.1 and 6.14.2 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.

9.3.3 Limits

The maximum usable sensitivity for either 25 kHz or 12,5 kHz channels shall not exceed +6 dBµV (e.m.f.) under normal test conditions and +12 dBµV (e.m.f.) under extreme test conditions.

9.4 Co-channel rejection

9.4.1 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.

9.4.2 Method of measurement

The two input signals shall be connected to the receiver via a combining network (see clause 6.1). The wanted signal shall have normal test modulation (see clause 6.4). The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz (see note). 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 (see note).

The wanted input signal shall be set to the value corresponding to the measured maximum usable sensitivity (see clause 9.3). 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.

NOTE: For 12,5 kHz channels the frequency deviation and the displacement of the unwanted signal is ±1,5 kHz.

9.4.3 Limit

The co-channel rejection ratio, at any frequency of the unwanted signal within the specified range, shall be between:

- -10 dB and 0 dB for 25 kHz channels;
- -12 dB and 0 dB for 12,5 kHz channels.

9.5 Adjacent channel selectivity

9.5.1 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 the nominal channel spacing.

9.5.2 Method of measurement

The two input signals shall be applied to the receiver input via a combining network (see clause 6.1). The wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation (see clause 6.4). The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz for 25 kHz channels or ±1,5 kHz for 12,5 kHz channels, 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 6.14.1 and 6.14.2 applied simultaneously) with the wanted signal set to the value corresponding to the maximum usable sensitivity under these conditions.

9.5.3 Limits

25 kHz channels: 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.

12,5 kHz channels: the adjacent channel selectivity shall be not less than 60 dB under normal test conditions and not less than 50 dB under extreme test conditions.

9.6 Spurious response rejection

9.6.1 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.

9.6.2 Method of measurement

Two input signals shall be applied to the receiver input via a combining network (see clause 6.1). The wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation (see clause 6.4).

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.

9.6.3 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.

9.7 Intermodulation response

9.7.1 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.

9.7.2 Method of measurement

Three signal generators, A, B and C shall be connected to the receiver via a combining network (see clause 6.1). 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 6.4). 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.

9.7.3 Limit

The intermodulation response ratio shall be greater than 68 dB.

9.8 Blocking or desensitization

9.8.1 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.

9.8.2 Method of measurement

Two input signals shall be applied to the receiver via a combining network (see clause 6.1). The modulated wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation (see clause 6.4). 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. For practical reasons the measurements will be carried out at frequency offsets of the unwanted signal at approximately 1 MHz, 2 MHz, 5 MHz and 10 MHz.

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 Recommendation ITU-T O.41 [i.5] whichever occurs first. This level shall be noted.

9.8.3 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 9.6).

9.9 Spurious emissions

9.9.1 Definition

Spurious emissions from the receiver are components at any frequency, present at the receiver input port.

The level of spurious emissions shall be measured as the power level at the antenna.

9.9.2 Method of measuring the power level

Spurious emissions shall be measured as the power level of any discrete signal at the input terminals of the receiver. The receiver input terminals are connected to a spectrum analyser or selective voltmeter having an input impedance of 50 Ω and the receiver is switched on.

If the detecting device is not calibrated in terms of power input, the level of any detected components shall be determined by a substitution method using a signal generator.

The measurements shall extend over the frequency range of 9 kHz to 2 GHz.

9.9.3 Limit

The power of any spurious emission shall not exceed 2 nW at any frequency in the range between 9 kHz and 2 GHz.

9.10 Receiver radiated spurious emissions

9.10.1 Definition

Radiated spurious emissions from the receiver are components at any frequency radiated by the equipment cabinet and the structure. This test is performed for both the telephony receiver and the DSC receiver.

9.10.2 Method of measurements

On a test site, selected from clause 5 of ETSI TS 103 052 [5], the equipment shall be placed at the specified height on a non-conducting support and in position closest to normal use as declared by the manufacturer.

The test antenna shall be orientated for vertical polarization and the length of the test antenna shall be chosen to correspond to the instantaneous frequency of the measuring receiver.

The output of the test antenna shall be connected to a measuring receiver.

The receiver shall be switched on without modulation, and measuring receiver shall be tuned over the frequency range 30 MHz to 2 GHz.

At each frequency at which a spurious component is detected:

a) the test antenna shall be raised and lowered through the specified range of heights until a maximum signal level is detected on the measuring receiver;

b) the receiver shall be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver;

c) the maximum signal level detected by the measuring receiver shall be noted;

d) the receiver shall be replaced by a substitution antenna as defined in clause 5.3.2 of ETSI TS 103 052 [5];

e) the substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the spurious component detected;

f) the substitution antenna shall be connected to a calibrated signal generator;

g) the frequency of the calibrated signal generator shall be set to the frequency of the spurious component detected;

h) the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver, if necessary;

i) the test antenna shall be raised and lowered through the specified range of heights to ensure that the maximum signal is received;

j) the input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver that is equal to the level noted while the spurious component was measured, corrected for the change of input attenuator setting of the measuring receiver;

k) the input level to the substitution antenna shall be recorded as power level, corrected for the change of input attenuator setting of the measuring receiver;

l) the measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization;

m) the measure of the effective radiated power of the spurious components is larger of the two power levels recorded for spurious component at the input to the substitution antenna, corrected for the gain of the antenna if necessary.

9.10.3 Limit

The power of any spurious radiation shall not exceed 2 nW at any frequency in the range between 30 MHz and 2 GHz.

9.11 Receiver residual noise level

9.11.1 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.

9.11.2 Method of measurement

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 6.4, 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 9.1.

The output signal shall be measured by a 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.

9.11.3 Limit

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

9.12 Squelch operation

9.12.1 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.

9.12.2 Method of measurement

a) All equipment:

With the squelch facility switched off, a test signal of +30 dBµV, at a carrier frequency equal to the nominal frequency of the receiver and modulated by the normal test modulation specified in clause 6.4, shall be applied to the input terminals of the receiver. An audio frequency load and a psophometric filtering network (clause 9.3.1) 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 9.1.

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) Equipment with a preset or automatic squelch:

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 at least 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) Equipment with a user operated continuously variable squelch:

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 set to produce at least 50 % of the rated audio output power. The level of the input signal shall then be reduced and the squelch facility shall be switched on. The squelch shall then be at its maximum position and the level of the input signal increased until the output power returns to at least 50 % of the rated audio output power.

9.12.3 Limits

Under the conditions specified in a) clause 9.12.2, the audio frequency output power shall not exceed -40 dB relative to the rated output power.

Under the conditions specified in b) clause 9.12.2, 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 9.12.2, the input signal shall not exceed +6 dBµV (e.m.f.) when the control is set at maximum.

9.13 Squelch hysteresis

9.13.1 Definition

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

9.13.2 Method of measurement

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.

9.13.3 Limit

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

9.14 Multiple watch characteristic

9.14.1 Definition

The scanning period is the time between the start of two successive samples of the priority channel in the absence of a signal on that channel.

The dwell time on the priority channel is the time between the start and finish of any sample of the priority channel in the absence of a signal on that channel.

The dwell time on the additional channel is the time between the start and finish of any sample of the additional channel.

9.14.2 Method of measurement

The equipment shall be adjusted to scan the priority channel and one additional channel.

The squelch shall be operational and so adjusted that the receiver just mutes on both the channels.

A test signal at the carrier frequency equal to the nominal frequency of the additional channel of the receiver, modulated by the normal test modulation (see clause 6.4) shall be connected to the receiver via a combining network (see clause 6.1). A second test signal with a frequency equal to the nominal frequency of the priority channel having no modulation shall be connected to the receiver via the other input of the combining network. The level of the two test signals shall be +12 dBµV (e.m.f.) at the receiver input.

A storage oscilloscope shall be connected to the audio output. Initially the output of the test signal on the priority channel shall be switched off. The scanning process is started and the output observed on the oscilloscope. The gap between and the duration of the audio bursts shall be measured. Now the test signal on the priority channel shall be switched on and the scanning shall stop on the priority channel after the last burst and within the dwell time on the priority channel. The measurement shall be carried out where the additional channel is a simplex channel and repeated where it is a duplex channel.

The measurements shall be made under normal and under extreme test conditions.

9.14.3 Limits

The scanning period shall not exceed 2 s.

The dwell time on the priority channel shall not exceed 150 ms.

The dwell time on the additional channel shall be between 850 ms and 2 s as indicated by the time of the gap between two output bursts.

10 Receiver for DSC decoder

10.1 Maximum usable sensitivity

10.1.1 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 a test modulation will produce a bit error ratio of 10^{-2}.

10.1.2 Method of measurement

DSC standard test signal (see clause 6.9) containing DSC calls shall be applied to the receiver input. The input level shall be 0 dBµV under normal test conditions (see clause 6.13) and +6 dBµV under extreme test conditions (see clauses 6.14.1 and 6.14.2 applied simultaneously).

The measurement shall be repeated under normal test conditions at the nominal carrier frequency ±1,5 kHz.

The bit error ratio in the decoder output shall be determined as described in clause 6.10.

10.1.3 Limits

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

10.2 Co-channel rejection

10.2.1 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.

10.2.2 Method of measurement

The two input signals shall be connected to the receiver input terminal via a combining network (see clause 6.1). The wanted signal shall be the DSC standard test signal (see clause 6.9) containing DSC calls. The level of the wanted signal shall be +3 dBµV. 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 shall be repeated for displacements of the unwanted signal of up to ±3 kHz.

The input level of the unwanted signal shall be -5 dBµV.

The bit error ratio in the decoder output shall be determined as described in clause 6.10.

10.2.3 Limits

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

10.3 Adjacent channel selectivity

10.3.1 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.

10.3.2 Method of measurement

The two input signals shall be connected to the receiver input terminal via a combining network (see clause 6.1).

The wanted signal shall be the DSC standard test signal (see clause 6.9) containing DSC calls. The level of the wanted signal shall be +3 dBµV under normal test conditions and +9 dBµV under extreme test conditions.

The unwanted signal shall be modulated to 400 Hz with a deviation of ±3 kHz. The unwanted signal shall be tuned to the centre frequency of the upper adjacent channel. The input level of the unwanted signal shall be 73 dBµV under normal test conditions and 63 dBµV under extreme test conditions.

The bit error ratio in the decoder output shall be determined as described in clause 6.10.

The measurement shall be repeated with the unwanted signal tuned to the centre frequency of the lower adjacent channel.

The measurement shall be carried out under normal test conditions (see clause 6.13) and under extreme test conditions (see clauses 6.14.1 and 6.14.2 applied simultaneously).

10.3.3 Limits

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

10.4 Spurious response and blocking immunity

10.4.1 Definition

The spurious response and blocking immunity 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 with frequencies outside the pass band of the receiver.

10.4.2 Method of measurement

The two input signals shall be connected to the receiver input terminal via a combining network (see clause 6.1).

The wanted signal shall be the DSC standard test signal (see clause 6.9) containing DSC calls. The level of the wanted signal shall be +3 dBµV.

For the spurious response test the unwanted signal shall be unmodulated. The frequency shall be varied over the range 9 kHz to 2 GHz with the exception of the channel of the wanted signal and its adjacent channels. The unwanted signal level shall be 73 dBµV. Where spurious response occurs, the bit error ratio shall be determined.

For the blocking test the unwanted signal shall be unmodulated. The frequency shall be varied between -10 MHz and -1 MHz and also between +1 MHz and +10 MHz relative to the nominal frequency of the wanted signal. The unwanted signal shall be at a level of 93 dBµV. Where blocking occurs, the bit error ratio shall be determined.

The bit error ratio in the decoder output shall be determined as described in clause 6.10.

10.4.3 Limits

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

10.5 Intermodulation response

10.5.1 Definition

The intermodulation response 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 two or more unwanted signals with a specific frequency relationship to the wanted signal frequency.

10.5.2 Method of measurement

The three input signals shall be connected to the receiver input terminal via a combining network (see clause 6.1).

The wanted signal represented by signal generator A shall be at the nominal frequency of the receiver and shall be the DSC standard test signal (see clause 6.9) containing DSC calls. The level of the wanted signal shall be +3 dBµV.

The unwanted signals shall be applied, both at the same level. The unwanted signal from signal generator B shall be unmodulated and adjusted to a 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 input level of the unwanted signals shall be 68 dBµV.

The bit error ratio in the decoder output shall be determined as described in clause 6.10.

10.5.3 Limits

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

10.6 Dynamic range

10.6.1 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.

10.6.2 Method of measurement

A test signal in accordance with the DSC standard test signal (see clause 6.9) 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 6.10.

10.6.3 Limit

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

10.7 Spurious emissions

10.7.1 Definition

Spurious emissions from the receiver are components at any frequency, present at the receiver input port.

The level of spurious emissions shall be measured as the power level at the antenna.

10.7.2 Method of measuring the power level

Spurious emissions shall be measured as the power level of any discrete signal at the input terminals of the receiver. The receiver input terminals are connected to a spectrum analyser or selective voltmeter having an input impedance of 50 Ω and the receiver is switched on.

If the detecting device is not calibrated in terms of power input, the level of any detected components shall be determined by a substitution method using a signal generator.

The measurements shall extend over the frequency range of 9 kHz to 2 GHz.

10.7.3 Limit

The power of any spurious emission shall not exceed 2 nW at any frequency in the range between 9 kHz and 2 GHz.

10.8 Simultaneous reception

10.8.1 Definition

Simultaneous reception is the ability of the unit to correctly receive DSC traffic and radiotelephony traffic at the same time.

10.8.2 Method of measurement

The radiotelephone shall be set for operation on channel 16.

Two input signals shall be connected to the receiver input terminal via combining network (see clause 6.1).

The radiotelephone test signal shall be at a carrier frequency equal to the nominal frequency of the receiver, modulated by the normal test modulation (see clause 6.4) shall be applied to the receiver input.

An audiofrequency load and a measuring instrument for measuring SINAD ratio (through a psophometric network as specified in clause 9.3.1) shall be connected to the receiver output terminals.

The radiotelephone test signal level shall be set for +20 dBµV.

The SINAD shall be measured with and without the presence of the DSC test signal.

The DSC standard test signal input level shall be 0 dBµV (see clause 6.9) containing DSC calls.

The bit error ratio in the decoder output shall be determined as described in clause 6.10.

10.8.3 Limits

For radiotelephony operation the SINAD ratio shall be no less than 20 dB in the presence of the DSC test signal.

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

10.9 DSC Signalling

10.9.1 Display

The radio shall comply with the display requirements given in clause 4.1 of ETSI EN 300 338-3 [2].

10.9.2 Watchkeeping receiver

The radio shall comply with the watchkeeping receiver requirements given in clause 5.1.1 of ETSI EN 300 338-3 [2].

10.9.3 Individual DSC calls

The radio shall comply with the individual calls requirements given in clause 5.2.2 of ETSI EN 300 338-3 [2].

10.9.4 All ships calls

The radio shall comply with the all ships calls requirements given in clause 5.2.3 of ETSI EN 300 338-3 [2].

10.9.5 DSC call functionality

The radio shall comply with the DSC call functionality requirements given in clause 5.2.4 of ETSI EN 300 338-3 [2].

10.9.6 DSC message composition

The radio shall comply with the DSC message composition requirements given in clause 6.2.1 of ETSI EN 300 338-3 [2].

10.9.7 Prioritized wait

The radio shall comply with the prioritized wait requirements given in clause 6.2.2 of ETSI EN 300 338-3 [2].

10.9.8 Alarms

The radio shall comply with the alarms requirements given in clause 6.2.3 of ETSI EN 300 338-3 [2].

10.9.9 Standby

The radio shall comply with the standby requirements given in clause 6.3 of ETSI EN 300 338-3 [2].

10.9.10 Sending distress automated requirements

The radio shall comply with the sending distress automated requirements given in clause 6.4.2 of ETSI EN 300 338-3 [2] except that the "Sending distress" procedure shown in figure 1 of ETSI EN 300 338-3 [2] should be treated as an example and not as a mandatory requirement.

10.9.11 Display- sending distress

The radio shall comply with the display requirements given in clause 6.4.3 of ETSI EN 300 338-3 [2].

10.9.12 Distress button sub procedure

The radio shall comply with the dedicated distress button sub procedure requirements given in clause 6.4.4 of ETSI EN 300 338-3 [2] except for the following requirement (bullet c) of ETSI EN 300 338-3 [2]): "*when releasing the button the radio shall return to its previous state*", which shall be optional.

10.9.13 Transmission of the alert attempt

The radio shall comply with the transmission of the alert attempt requirements given in clause 6.4.5 of ETSI EN 300 338-3 [2].

10.9.14 Updating position

The radio shall comply with the updating position requirements given in clause 6.4.6 of ETSI EN 300 338-3 [2].

10.9.15 Handling received DSC messages - sending distress

The radio shall comply with the requirements for handling received DSC messages given in clause 6.4.7 of ETSI EN 300 338-3 [2].

10.9.16 Alarms - sending distress

The radio shall comply with the alarms requirements given in clause 6.4.8 of ETSI EN 300 338-3 [2].

10.9.17 Determining subsequent communications - sending distress

The radio shall comply with the requirements given in clause 6.4.9 of ETSI EN 300 338-3 [2].

10.9.18 Automated tuning - sending distress

The radio shall comply with the requirements given in clause 6.4.10 of ETSI EN 300 338-3 [2].

10.9.19 Cancelling the distress alert

The radio shall comply with the distress cancel requirements given in clause 6.4.11 of ETSI EN 300 338-3 [2].

10.9.20 Acknowledgements - sending distress

The radio shall comply with the acknowledgements requirements given in clause 6.4.12 of ETSI EN 300 338-3 [2].

10.9.21 Termination - sending distress

The radio shall comply with the termination requirements given in clause 6.4.13 of ETSI EN 300 338-3 [2].

10.9.22 Warnings - sending distress

The radio shall comply with the warnings requirements given in clause 6.4.14 of ETSI EN 300 338-3 [2].

10.9.23 Tasks - receiving distress

The radio shall comply with the task requirements given in clause 6.5.2 of ETSI EN 300 338-3 [2] except that the "received distress automated" procedure shown in figure 2 of ETSI EN 300 338-3 [2] should be treated as an example and not as a mandatory requirement.

10.9.24 Display - receiving distress

The radio shall comply with the display requirements given in clause 6.5.3 of ETSI EN 300 338-3 [2].

10.9.25 Handling received DSC messages - receiving distress

The radio shall comply with the requirements for handling received DSC messages given in clause 6.5.4 of ETSI EN 300 338-3 [2].

10.9.26 Alarms - receiving distress

The radio shall comply with the alarms requirements given in clause 6.5.5 of ETSI EN 300 338-3 [2].

10.9.27 Determining subsequent communications - receiving distress

The radio shall comply with the requirements given in clause 6.5.6 of ETSI EN 300 338-3 [2].

10.9.28 Automated tuning - receiving distress

The radio shall comply with the requirements given in clause 6.5.7 of ETSI EN 300 338-3 [2].

10.9.29 Acknowledgements - receiving distress

The radio shall comply with the acknowledgements requirements given in clause 6.5.8 of ETSI EN 300 338-3 [2].

10.9.30 Termination - receiving distress

The radio shall comply with the termination requirements given in clause 6.5.9 of ETSI EN 300 338-3 [2].

10.9.31 Warnings - receiving distress

The radio shall comply with the warnings requirements given in clause 6.5.10 of ETSI EN 300 338-3 [2].

10.9.32 Tasks - sending non distress

The radio shall comply with the task requirements given in clause 6.6.2 of ETSI EN 300 338-3 [2] except that the "Sending non distress automated" procedure shown in figure 3 of ETSI EN 300 338-3 [2] should be treated as an example and not as a mandatory requirement.

10.9.33 Display - sending non distress

The radio shall comply with the display requirements given in clause 6.6.3 of ETSI EN 300 338-3 [2].

10.9.34 Handling received DSC messages - sending non distress

The radio shall comply with the requirements for handling received DSC messages given in clause 6.6.4 of ETSI EN 300 338-3 [2].

10.9.35 Alarms - sending non distress

The radio shall comply with the alarms requirements given in clause 6.6.5 of ETSI EN 300 338-3 [2].

10.9.36 Automated tuning - sending non distress

The radio shall comply with the requirements given in clause 6.6.6 of ETSI EN 300 338-3 [2].

10.9.37 Delayed acknowledgements - sending non distress

The radio shall comply with the acknowledgements requirements given in clause 6.6.7 of ETSI EN 300 338-3 [2].

10.9.38 Termination - sending non distress

The radio shall comply with the termination requirements given in clause 6.6.8 of ETSI EN 300 338-3 [2].

10.9.39 Warnings - sending non distress

The radio shall comply with the warnings requirements given in clause 6.6.9 of ETSI EN 300 338-3 [2].

10.9.40 Tasks - receiving non distress

The radio shall comply with the task requirements given in clause 6.7.2 of ETSI EN 300 338-3 [2] except that the "Receiving non distress" procedure shown in figure 4 of ETSI EN 300 338-3 [2] should be treated as an example and not as a mandatory requirement.

10.9.41 Display - receiving non distress

The radio shall comply with the display requirements given in clause 6.7.3 of ETSI EN 300 338-3 [2].

10.9.42 Handling received DSC messages - receiving non distress

The radio shall comply with the requirements for handling received DSC messages given in clause 6.7.4 of ETSI EN 300 338-3 [2].

10.9.43 Alarms - receiving non distress

The radio shall comply with the alarms requirements given in clause 6.7.5 of ETSI EN 300 338-3 [2].

10.9.44 Automated tuning - receiving non distress

The radio shall comply with the requirements given in clause 6.7.6 of ETSI EN 300 338-3 [2].

10.9.45 Acknowledgements - receiving non distress

The radio shall comply with the acknowledgements requirements given in clause 6.7.7 of ETSI EN 300 338-3 [2].

10.9.46 Termination - receiving non distress

The radio shall comply with the termination requirements given in clause 6.7.8 of ETSI EN 300 338-3 [2].

10.9.47 Warnings - receiving non distress

The radio shall comply with the warnings requirements given in clause 6.7.9 of ETSI EN 300 338-3 [2].

10.9.48 Communication automated procedure

The radio shall comply with the requirements given in clause 6.8.1 of ETSI EN 300 338-3 [2] except that the bullets (i) - (iii) describing which specific events should result in the communication automated procedure shall be optional.

10.9.49 Tasks - communication

The radio shall comply with the task requirements given in clause 6.8.2 of ETSI EN 300 338-3 [2].

10.9.50 Display - communication

The radio shall comply with the display requirements given in clause 6.8.3 of ETSI EN 300 338-3 [2].

10.9.51 Handling received DSC messages - communication

The radio shall comply with the requirements for handling received DSC messages given in clause 6.8.4 of ETSI EN 300 338-3 [2].

10.9.52 Tuning of the receiver and transmitter - communication

The radio shall comply with the requirements given in clause 6.8.5 of ETSI EN 300 338-3 [2].

10.9.53 Termination - communication

The procedure shall be able to be terminated either by the user or automatic timeout.

10.9.54 Tasks of handling incoming calls while engaged

The radio shall comply with the task requirements given in clause 6.9.2 of ETSI EN 300 338-3 [2], except that clauses 6.9.2.1 and 6.9.2.2 shall be optional.

10.9.55 Termination of automated procedures

The radio shall comply with the requirements given in clause 6.9.2.3 of ETSI EN 300 338-3 [2].

10.9.56 Actions after termination of an automated procedure

The radio shall comply with the requirements given in clause 6.9.2.4 of ETSI EN 300 338-3 [2] except that bullet (b) need not apply.

10.9.57 Putting automated procedures on hold

The radio may comply with the requirements given in clause 6.9.2.5 of ETSI EN 300 338-3 [2].

10.9.58 Controlling non-terminated automated procedures on hold

The radio may comply with the requirements given in clause 6.9.2.6 of ETSI EN 300 338-3 [2].

11 Testing for compliance with technical requirements

11.1 Test conditions, power supply and ambient temperatures

Tests defined in the present document shall be carried out at representative points within the boundary limits of the declared operational environmental profile which, as a minimum, shall be that specified in the test conditions contained in the present document.

As technical performance varies subject to environmental conditions, tests shall be carried out under a sufficient variety of environmental conditions as specified in the present document to give confidence of compliance for the affected technical requirements.

11.2 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 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 4.

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated 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)). Principles for the calculation of measurement uncertainty are contained in ETSI TR 100 028-1 [i.6], in particular in annex D of the ETSI TR 100 028-2 [i.7].

Table 4 is based on such expansion factors.

Table 4: Maximum measurement uncertainty

Parameter	Maximum uncertainty
Radio Frequency (RF)	$\pm 1 \times 10^{-7}$
RF power/level	±0,75 dB
Maximum frequency deviation: - within 300 Hz to 6 kHz of modulation frequency - within 6 kHz to 25 kHz of modulation frequency	 ±5 % ±3 dB
Deviation limitation	±5 %
Adjacent channel power	±5 dB
Conducted spurious emission of transmitter	±4 dB
Audio output power	±0,5 dB
Amplitude characteristics of receiver limiter	±1,5 dB
Sensitivity at 20 dB SINAD	±3 dB
Conducted emission of receiver	±3 dB
Two-signal measurement	±4 dB
Three-signal measurement	±3 dB
Transmitter transient time	±20 %
Transmitter transient frequency	±250 Hz

Annex A (informative): Relationship between the present document and the essential requirements of Directive 2014/53/EU

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.9] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.3].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in tables A.1 and A.2 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table A.1: Relationship between the present document and the essential requirements of article 3.2 of Directive 2014/53/EU

Harmonised Standard ETSI EN 301 025				
Requirement			Requirement Conditionality	
No	Description	Reference: Clause No	U/C	Condition
1	Transmitter frequency error	8.1	U	
2	Transmitter adjacent channel power	8.7	U	
3	Transmitter conducted spurious emissions conveyed to the antenna	8.8	U	
4	Transmitter cabinet radiation and conducted spurious emissions other than those conveyed to the antenna	8.9	U	
5	Transient frequency behaviour of the transmitter	8.10	U	
6	Transmitter carrier power	8.2	U	
7	Transmitter frequency deviation	8.3	U	
8	Receiver maximum useable sensitivity	9.3	U	
9	Receiver co-channel rejection	9.4	U	
10	Receiver adjacent channel selectivity	9.5	U	
11	Receiver spurious response rejection	9.6	U	
12	Receiver inter-modulation response	9.7	U	
13	Receiver blocking or desensitization	9.8	U	
14	Receiver spurious emissions at the antenna	9.9	U	
15	Receiver cabinet radiated spurious emissions	9.10	U	
16	DSC receiver maximum useable sensitivity	10.1	U	
17	DSC receiver co-channel rejection	10.2	U	
18	DSC receiver spurious response and blocking immunity	10.4	U	
19	DSC Receiver Adjacent channel selectivity	10.3	U	
20	DSC receiver intermodulation response	10.5	U	
21	DSC receiver spurious emissions	10.7	U	
22	DSC receiver simultaneous reception	10.8	U	
NOTE: N/A stands for Not/Applicable.				

Table A.2: Relationship between the present document and the essential requirements of article 3.3(g) of Directive 2014/53/EU

Harmonised Standard ETSI EN 301 025				
Requirement			Requirement Conditionality	
No	Description	Reference: Clause No	U/C	Condition
1	General and operational requirements	4	U	
2	Technical requirements	5	U	
3	Vibration test	7.4	U	
4	Dry heat	7.5.2	U	
5	Damp heat	7.5.3	U	
6	Low temperature	7.5.4	U	
7	Sensitivity of the modulator, including microphone	8.4	U	
8	Audio frequency response	8.5	U	
9	Audio frequency harmonic distortion of the emission	8.6	U	
10	Residual modulation of the transmitter	8.11	U	
11	Frequency error (demodulated DSC signal)	8.12	U	
12	Modulation index for DSC	8.13	U	
13	Modulation rate for DSC	8.14	U	
14	Harmonic distortion and rated audio-frequency output power	9.1	U	
15	Receiver audio frequency response	9.2	U	
16	Receiver residual noise level	9.11	U	
17	Squelch operation	9.12	U	
18	Squelch hysteresis	9.13	U	
19	Dynamic range	10.6	U	
20	Display	10.9.1	U	
21	Watchkeeping receiver	10.9.2	U	
22	Individual DSC calls	10.9.3	U	Note 2
23	All ships calls	10.9.4	U	Note 2
24	DSC call functionality	10.9.5	U	Note 2
25	DSC message composition	10.9.6	U	Note 2
26	Prioritized wait	10.9.7	U	Note 2
27	Alarms	10.9.8	U	Note 2
28	Standby	10.9.9	U	Note 2
29	Tasks - sending distress	10.9.10	U	Note 2
30	Display - sending distress	10.9.11	U	Note 2
31	Distress button sub-procedure	10.9.12	U	Note 2
32	Transmission of alert attempt	10.9.13	U	Note 2
33	Updating position	10.9.14	U	Note 2
34	Handling received DSC messages - sending distress	10.9.15	U	Note 2
35	Alarms - sending distress	10.9.16	U	Note 2
36	Determining subsequent communication - sending distress	10.9.17	U	Note 2
37	Automated tuning - sending distress	10.9.18	U	Note 2
38	Cancelling the distress alert	10.9.19	U	Note 2
39	Acknowledgement - sending distress	10.9.20	U	Note 2
40	Terminating - sending distress	10.9.21	U	Note 2
41	Warnings - sending distress	10.9.22	U	Note 2
42	Tasks - receiving distress	10.9.23	U	Note 2
43	Display - receiving distress	10.9.24	U	Note 2
44	Handling received DSC messages - receiving distress	10.9.25	U	Note 2
45	Alarms - receiving distress	10.9.26	U	Note 2
46	Determining subsequent communication - receiving distress	10.9.27	U	Note 2
47	Automated tuning - receiving distress	10.9.28	U	Note 2
48	Acknowledgement - receiving distress	10.9.29	U	Note 2
49	Terminating - receiving distress	10.9.30	U	Note 2
50	Warnings - receiving distress	10.9.31	U	Note 2
51	Tasks - sending non distress	10.9.32	U	Note 2
52	Display - sending non distress	10.9.33	U	Note 2
53	Handling received DSC messages - sending non distress	10.9.34	U	Note 2
54	Alarms - sending non distress	10.9.35	U	Note 2
55	Automated tuning - sending non distress	10.9.36	U	Note 2

Harmonised Standard ETSI EN 301 025				
Requirement			Requirement Conditionality	
No	Description	Reference: Clause No	U/C	Condition
56	Delayed acknowledgement - sending non distress	10.9.37	U	Note 2
57	Terminating - sending non distress	10.9.38	U	Note 2
58	Warnings - sending non distress	10.9.39	U	Note 2
59	Tasks - receiving non distress	10.9.40	U	Note 2
60	Display - receiving non distress	10.9.41	U	Note 2
61	Handling received DSC messages - receiving non distress	10.9.42	U	Note 2
62	Alarms - receiving non distress	10.9.43	U	Note 2
63	Automated tuning - receiving non distress	10.9.44	U	Note 2
64	Acknowledgement - receiving non distress	10.9.45	U	Note 2
65	Terminating - receiving non distress	10.9.46	U	Note 2
66	Warnings - receiving non distress	10.9.47	U	Note 2
67	Communication automated procedure	10.9.48	U	Note 2
68	Tasks - communication	10.9.49	U	Note 2
69	Display - communication	10.9.50	U	Note 2
70	Handling received DSC messages - communication	10.9.51	U	Note 2
71	Tuning of the receiver and transmitter - communication	10.9.52	U	Note 2
72	Termination - communication	10.9.53	U	Note 2
73	Handling incoming calls while engaged	10.9.54	U	Note 2
74	Termination of automated procedures	10.9.55	U	Note 2
75	Actions after termination of an automated procedure	10.9.56	U	Note 2
76	Putting automated procedures on hold	10.9.57	C	If the equipment is designed for handling procedures on hold
77	Controlling non-terminated automatic procedures	10.9.58	C	
78	Multiple watch characteristic	9.14	U	
NOTE 1: N/A stands for Not/Applicable. NOTE 2: The ETSI TS 101 570-3 [i.8] interoperability standard for Class D DSC may be used to evaluate this functionality.				

Key to columns:

Requirement:

No A unique identifier for one row of the table which may be used to identify a requirement.

Description A textual reference to the requirement.

Clause Number Identification of clause(s) defining the requirement in the present document unless another document is referenced explicitly.

Requirement Conditionality:

U/C Indicates whether the requirement is unconditionally applicable (U) or is conditional upon the manufacturer's claimed functionality of the equipment (C).

Condition Explains the conditions when the requirement is or is not applicable for a requirement which is classified "conditional".

Presumption of conformity stays valid only as long as a reference to the present document is maintained in the list published in the Official Journal of the European Union. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union.

Other Union legislation may be applicable to the product(s) falling within the scope of the present document.

Annex B (normative): Measuring receiver for adjacent channel power measurement

B.1 Power measuring receiver specification

B.1.1 General

The power measuring receiver consists of a mixer, an IF filter, an oscillator, an amplifier, a variable attenuator and an r.m.s. value indicator. Instead of the variable attenuator with the r.m.s. value indicator it is also possible to use an r.m.s. voltmeter calibrated in dB. The technical characteristics of the power measuring receiver are given below (see also Recommendation ITU-R SM.332-4 [i.2]).

B.1.2 IF filter

The IF filter shall be within the limits of the following selectivity characteristics.

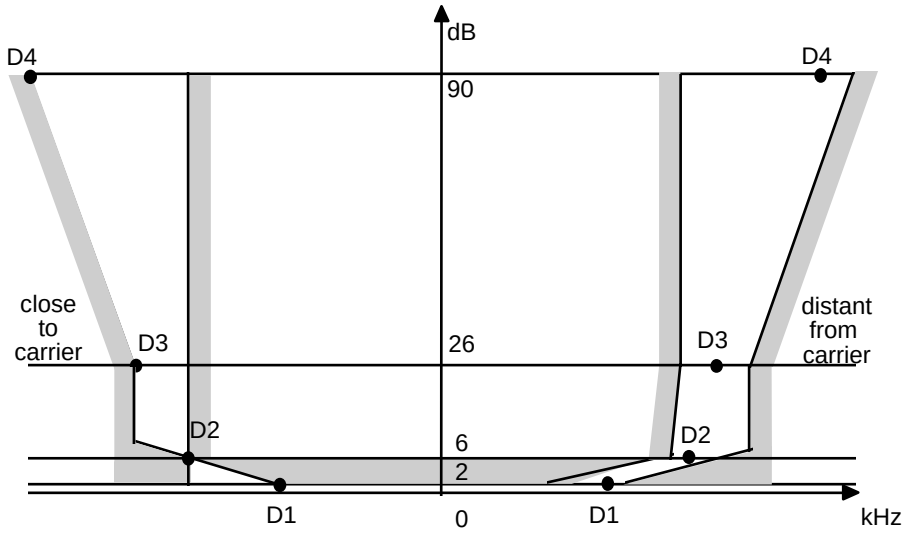


Figure B.1: IF filter characteristics

The selectivity characteristics shall keep the frequency separations shown in table B.1 from the nominal centre frequency of the adjacent channel.

Table B.1: Selectivity characteristic

Channel separation (kHz)	Frequency separation of filter curve from nominal centre frequency of adjacent channel (kHz)			
	D1	D2	D3	D4
12,5	3	4,25	5,5	9,5
25	5	8,0	9,25	13,25

The attenuation points shall not exceed following tolerances shown in table B.2.

Table B.2: Tolerance of attenuation points close to carrier

Channel separation (kHz)	Tolerance range (kHz)			
	D1	D2	D3	D4
12,5	+1,35	±0,1	-1,35	-5,35
25	+3,1	±0,1	-1,35	-5,35

Table B.3: Tolerance of attenuation points distant from the carrier

Channel separation (kHz)	Tolerance range (kHz)			
	D1	D2	D3	D4
12,5	±2,0	±2,0	±2,0	+2,0 -6,0
25	±3,5	±3,5	±3,5	+3,5 -7,5

The minimum attenuation of the filter outside the 90 dB attenuation points shall be equal to or greater than 90 dB.

B.1.3 Attenuation indicator

The attenuation indicator shall have a minimum range of 80 dB and a reading accuracy of 1 dB. With a view to future regulations an attenuation of 90 dB or more is recommended.

B.1.4 r.m.s. value indicator

The instrument shall accurately indicate non-sinusoidal signals in ratio of up to 10:1 between peak value and r.m.s. value.

B.1.5 Oscillator and amplifier

The oscillator and the amplifier shall be designed in such a way that the measurement of the adjacent channel power of a low-noise unmodulated transmitter, whose self-noise has a negligible influence on the measurement result, yields a measured value of less than -90 dB.

Annex C (informative): Bibliography

Regulation (EU) No 1025/2012 of the European Parliament and of the Council of 25 October 2012 on European standardisation, amending Council Directives 89/686/EEC and 93/15/EEC and Directives 94/9/EC, 94/25/EC, 95/16/EC, 97/23/EC, 98/34/EC, 2004/22/EC, 2007/23/EC, 2009/23/EC and 2009/105/EC of the European Parliament and of the Council and repealing Council Decision 87/95/EEC and Decision No 1673/2006/EC of the European Parliament and of the Council.

Annex D (informative): Change History

Version	Information about changes
2.1.1	First version aligned with the Radio Equipment Directive for articles 3.2 and 3.3(g)
2.2.1	Update of the standard in order to align it with ITU-R M.493-14; a few editorial corrections

History

Document history		
V1.1.1	August 1998	Publication
V1.1.2/1.1.1	August 2000	Publication as ETSI EN 301 025 part 1 and part 2
V1.1.1	May 2001	Publication as ETSI EN 301 025-3
V1.2.1	September 2004	Publication as ETSI EN 301 025 part 1, part 2 and part 3
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V1.4.1	March 2010	Publication as ETSI EN 301 025-1
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