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**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
Narrow-band direct-printing telegraph equipment
for receiving meteorological or navigational
information (NAVTEX);
Part 1: Technical characteristics and methods of measurement**



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Foreword

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

The present document is part 1 of a multi-part deliverable covering the Narrow-band direct-printing telegraph equipment for receiving meteorological or navigational information (NAVTEX), as identified below:

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

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

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

The present document sets out the minimum requirements for a Narrow-Band Direct-Printing (NBDP) maritime receiver operating in the NAVTEX system, consisting of a radio-frequency receiver incorporating a signal processor and a printing device.

The operational arrangements applying to the NAVTEX system are laid down in ITU-R Recommendation 540-2 [2]. The message format is given in ITU-R Recommendation 625-3 [1], collective B-mode. The NAVTEX system operates on a frequency of 518 kHz.

Environmental tests are in accordance with the standard laid down in Annex VI to CEPT Recommendation T/R 34-01 [3]. Tests on conducted spurious emissions are in accordance with the arrangements described in CISPR 16 [4] sections 1 and 2 [4].

Every EN prepared by ETSI is a voluntary standard. The present document contains text concerning type approval of the equipment to which it relates. This text should be considered only as guidance and does not make the present document mandatory.

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1 Scope

The present document states the minimum requirements for a Narrow-Band Direct-Printing (NBDP) maritime receiver operating in the NAVTEX system.

The equipment's function is to receive and print automatically and continuously, meteorological and navigational messages and Search And Rescue (SAR) messages transmitted by coast stations participating in the NAVTEX system.

The equipment shall consist of a radio-frequency receiver incorporating a signal processor and a printing device.

The message format shall conform to ITU-R Recommendation 625-3 [1], collective B-mode. The system shall conform to ITU-R Recommendation 540-2 [2].

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
 - For a specific reference, subsequent revisions do not apply.
 - For a non-specific reference, the latest version applies.
- [1] ITU-R Recommendation M.625-3: "Direct-printing telegraph equipment employing automatic identification in the maritime mobile service".
- [2] ITU-R Recommendation M.540-2: "Operational and technical characteristics for an automated direct-printing telegraph system for promulgation of navigational and meteorological warnings and urgent information to ships".
- [3] CEPT Recommendation T/R 34-01: "Specifications for maritime mobile radio equipment".
- [4] CISPR 16: "Specification for radio disturbance and immunity measuring apparatus and methods". Second Edition 1986.
- [5] Solas Convention: "The International Convention for the Safety of Life at Sea, 1974".

3 General requirements

3.1 Construction

- 3.1.1 The mechanical and electrical design and the construction and finish of the equipment shall accord with good engineering practice and the equipment shall be designed for use on board ships at sea.
- 3.1.2 All controls, instruments and terminals shall be clearly identified. Details concerning the power source with which the equipment is to be used shall be clearly indicated. A label indicating the type designation under which the equipment is being submitted for the type approval tests shall be affixed to the equipment in a place where it is clearly visible in the normal operating position.
- 3.1.3 It shall be possible to reduce to zero the intensity of any equipment light source other than visual alarms.
- 3.1.4 The radio-frequency receiver shall operate on a frequency of 518 kHz.
- 3.1.4.1 Where a second or third frequency is provided for the reception of maritime safety information, it shall only be possible to select these frequencies manually.

- 3.1.5 The equipment shall comprise a device for performing tests to verify whether the radio-frequency receiver, signal processor or printing device are working correctly.
- 3.1.5.1 The test shall at least provide verification of the signal's path from the antenna to the loudspeaker or to an audio-frequency output delivering sufficient power to operate a loudspeaker or earphones.
- 3.1.5.2 A self-return switch shall be used if a loudspeaker is used.
- 3.1.5.3 The signal processing unit and the printing device shall contain an integrated system for verifying their operation.
- 3.1.6 To limit the number of messages printed, it shall be possible to select the coast stations which it is wanted to print, by detecting the B1 characters identifying them. Messages of coast stations not selected shall not be printed.
- 3.1.7 The equipment shall display information indicating that the B1 characters have been selected or excluded, or this information shall be easily accessible, e.g. in printed form using the printing device.
- 3.1.8 It shall be possible to inhibit the printing of message categories (defined by the B2 characters), transmitted by the coast stations selected, other than navigational warnings, gale warnings and SAR messages. It shall be possible to exclude at least four different message categories.
- 3.1.9 The equipment shall provide a clear indication of the message categories that are excluded.
- 3.1.10 Means shall be provided to avoid the printing of messages which are not correctly received or which have already been correctly received.
- 3.1.10.1 A message is considered to have been correctly received if the character error rate is less than 4×10^{-2} . The message identification of each such message shall be stored in memory until erased.
- 3.1.10.2 When the received character error rate exceeds 33×10^{-2} for more than 5 seconds, the printing of the message shall be inhibited, the message shall be considered as not correctly received, and the message identification shall not be stored in memory.
- 3.1.10.3 The equipment shall not print any message (except as defined in the following paragraph), the identification of which is already stored in memory.
- 3.1.11 A message shall always be printed if $B3B4 = 00$.
- 3.1.12 The equipment shall be capable of storing at least 100 message identifications in its memory.
- 3.1.12.1 If the number of message identifications received exceeds the memory capacity, the oldest message identification shall be erased.
- 3.1.12.2 However, after a period of 60 to 72 hours, a message identification shall automatically be erased from the memory.
- 3.1.13 An alarm indicating the reception of SAR messages shall be provided, whether incorporated in the equipment or remote from it. This alarm shall only be able to be stopped manually but without inhibiting receipt of further other alarms.
- 3.1.13.1 If an additional alarm is used to indicate the reception of navigational and gale warnings, it shall be capable of being suppressed.
- 3.1.14 The equipment may be provided with facilities to store complete messages without being printed directly, with the exception of messages with the message identity $B3B4 = 00$ and/or $B2 = A, B, D$ or L , which shall always be printed upon receipt. Where such storage facilities are provided, it shall be possible at least to print out, on request, stored messages in the sequential order: last stored - first printed.
- 3.1.15 An alarm shall be provided to indicate that the paper has nearly run out or has run out.

- 3.1.15.1 If any message is incompletely printed because the paper has run out, the message identification for that message shall not be stored in the memory. Memory storage of new message identifications shall be inhibited if there is no paper available in the printing device.
- 3.1.16 The equipment shall print an asterisk for each invalid character detected.
- 3.1.17 The equipment may be provided with additional facilities to print messages in a second language using an alphabet different from the Latin alphabet.

3.2 Safety precautions

- 3.2.1 Measures shall be taken to protect the equipment against the effects of excessive current or voltage and against an excessive temperature increase in any part of the equipment as a result of any defect in the cooling system.
- 3.2.2 Measures shall be taken to protect the equipment from damage as a result of transient changes of voltage or an accidental reversal of polarity at the power source.
- 3.2.3 Means shall be provided for earthing the equipment's metal parts which are accessible from the outside, but the equipment shall not cause any terminal of the electrical power source to be earthed.
- 3.2.4 All parts and all wiring in which the dc or ac voltage (except radio-frequency voltage) produce, singly or in combination, a peak voltage in excess of 50 volts, shall be protected against accidental access and shall automatically be isolated from all electrical power sources when the protective covers are removed.
- 3.2.5 Alternatively, the equipment shall be constructed in such a way as to prevent access to such voltages unless an appropriate tool is used such as a nut-spanner or screwdriver, and conspicuous warning labels shall be affixed both inside the equipment and on the protective covers.
- 3.2.6 The information in memories, programmed by the user, (see clauses 3.1.6 and 3.1.8), shall not be erased by power source interruptions of less than 6 hours.

4 Test conditions, power supply and ambient temperatures

4.1 General

Type approval tests shall be made under normal test conditions and also, where stated, under extreme test conditions.

Where such conditions are applicable, the equipment shall meet the requirements of the present document for any combination of voltages and temperatures within the extremes specified.

4.1.1 Artificial antennas

Where specified, the tests shall be carried out with the receiver connected, as appropriate, to the following artificial antennas, although this shall not in any way imply that the receiver shall only operate satisfactorily with antennas possessing these impedance characteristics:

- a) a non-reactive resistance of 50 Ω ;
- b) a resistance of 10 Ω in series with a capacitance of 150 pF.

4.1.2 Normal test signal

The normal test signal shall be an F1B radio-frequency signal modulated with a frequency shift of ± 85 Hz centred on 518 kHz.

It shall contain signals providing the following traffic information:

1 2 3 4 5 6 7 8 9 0 A B C D E F G H I J K L M N O P Q R S T U - Carriage return - Line feed.

For tests with the normal test signal, the above information shall be transmitted at least 35 times continuously.

Where other receive frequencies are provided in addition to the international NAVTEX frequency of 518 kHz, the test signal described above shall be duplicated but centred on each of the additional frequencies in turn.

4.1.3 Test signals applied to the receiver input

Sources of test signals to be applied to the equipment input shall be connected via a network such that the impedance presented to the equipment is equal to the impedance of the artificial antenna (see clause 4.1.1), whether one or more test signals are applied to the equipment simultaneously. If there are two or more test signals, measures shall be taken to prevent any undesirable effects resulting from interactions between the signals in the generators or other sources.

The levels of the test signals at the receiver input shall be expressed in terms of the electro-motive force (emf) at the output terminals of the source including the associated network.

4.2 Test power source

During type approval tests, the equipment's power supply shall be provided by a test power source capable of producing normal and extreme voltages as specified in clauses 4.3.2 and 4.4. The internal impedance of the test power source shall be low enough to have only a negligible effect on the test results. For the purpose of the tests, the power source voltage shall be measured at the input terminals of the equipment.

During the tests, the power source voltage shall be maintained within a tolerance of ± 3 % relative to its level at the beginning of each test.

4.3 Normal test conditions

4.3.1 Normal temperature and humidity

The normal temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges:

- temperature: $+15^{\circ}\text{C}$ to $+35^{\circ}\text{C}$;
- relative humidity: 20 % to 75 %.

4.3.2 Normal test power supply

4.3.2.1 Mains voltage and frequency

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage or any of the declared voltages for which the equipment is indicated as having been designed for.

The frequency of the test power source, corresponding to the mains, shall be $50\text{ Hz} \pm 1\text{ Hz}$.

4.3.2.2 Power source from a battery

Where the equipment is designed to operate from a battery, the normal test voltage shall be the nominal voltage of the battery (12 volts, 24 volts, etc).

4.3.2.3 Other power sources

For operation from other power sources, the normal test voltage shall be fixed by agreement between the equipment manufacturer and the authority conducting the tests.

4.4 Extreme test conditions

4.4.1 Extreme temperatures

For tests at extreme temperatures, measurements shall be made in accordance with the procedures specified in clause 4.5 at the lower and upper temperatures of 0°C and 40°C.

4.4.2 Extreme test power supply values

4.4.2.1 Extreme mains voltage and frequency

The extreme test voltages for equipment to be connected to the mains shall be the nominal mains voltage $\pm 10\%$.

The frequency of the test power source corresponding to the mains shall be $50\text{ Hz} \pm 1\text{ Hz}$.

4.4.2.2 Power source from a battery

Where the equipment is designed to operate from a battery, the extreme test voltages shall be 1,3 and 0,9 multiplied by the nominal voltage of the battery (12 volts, 24 volts, etc).

4.4.2.3 Other power sources

For equipment using other test power sources, the extreme voltages shall be fixed by agreement between the manufacturer and the authority conducting the tests.

4.5 Procedures for tests at extreme temperatures

Before measurements are made, the equipment shall have reached thermal equilibrium in the test chamber. The equipment shall be switched off during the temperature stabilising period. The sequence of measurements shall be chosen and the humidity in the test chamber shall be controlled so that excessive condensation does not occur.

4.6 Environmental tests

Before starting the environmental tests, the equipment shall be tested under the other clauses in the present document. Where electrical tests have to be made, they shall be carried out at the normal test voltage.

The expression "performance check" used in the present document means a sensitivity test of the receiver as described in clause 5.1, with the test signal at a level 6 dB higher than the normal test signal mentioned.

The following tests shall be conducted under the environmental conditions as detailed in the following clauses of annex VI of CEPT Recommendation T/R 34-01 [3]:

- vibration, clause 4;
- dry-heat cycle, clause 5.2;
- damp-heat cycle, clause 6;
- low-temperature cycle, clause 7.2.

5 Receiver and signal processor

5.1 Call sensitivity

5.1.1 Definition

The call sensitivity of the receiver is a defined level of the radio-frequency signal at which the receiver gives a character error ratio better than a defined value.

5.1.2 Method of measurement

The receiver shall be connected to the artificial antenna specified in a) in clause 4.1.1, and a normal test signal (see clause 4.1.2) at a level of 2 μ V shall be applied.

The receiver shall then be connected to the artificial antenna specified in b) in clause 4.1.1, and a normal test signal at a level of 5 μ V shall be applied.

Measurements shall be made under normal test conditions and under extreme test conditions (clauses 4.4.1 and 4.4.2 applied simultaneously).

Where additional receive frequencies are provided, the procedure shall be repeated at each of the additional frequencies in turn.

5.1.3 Limit

The character error ratio shall be less than 4×10^{-2} .

5.2 Interference rejection and blocking immunity

5.2.1 Definition

Interference rejection and blocking immunity is the receiver's ability to discriminate between the wanted signal and unwanted signals on frequencies outside the receiver's passband.

5.2.2 Method of measurement

Two signals shall be applied to the receiver as specified in clause 4.1.3.

The receiver shall be connected to the artificial antenna specified in b) in clause 4.1.1.

The wanted signal shall be the normal test signal at a level of 20 dB μ V.

The unwanted signal shall be unmodulated.

For the frequency ranges 517 kHz to 517,5 kHz and 518,5 kHz to 519 kHz, the level shall be 40 dB μ V.

For the frequency ranges 515 kHz to 517 kHz and 519 kHz to 521 kHz, the level shall be 60 dB μ V.

For the frequency ranges 100 kHz to 515 kHz, 521 kHz to 30 MHz, 156 MHz to 174 MHz and 450 MHz to 470 MHz, the level shall be 90 dB μ V.

An audio-frequency output shall be used to search for responses to interference.

Measurements shall be made under normal test conditions and under extreme test conditions (clauses 4.4.1 and 4.4.2 applied simultaneously).

Where additional receive frequencies are provided, the procedure shall be repeated at each of the additional frequencies in turn.

5.2.3 Limit

The unwanted signal shall not induce a character error ratio of more than 4×10^{-2} .

5.3 Co-channel rejection

5.3.1 Definition

The co-channel rejection is the receiver's ability to receive a wanted signal in the presence of an unwanted signal, with both signals being at the nominal frequency of the wanted channel.

5.3.2 Method of measurement

Two signals shall be applied to the receiver as specified in clause 4.1.3.

The receiver shall be connected to the artificial antenna specified in b) in clause 4.1.1.

The wanted signal shall be the normal test signal at a level of 20 dB μ V.

The unwanted signal shall be unmodulated at a level of 14 dB μ V at the nominal receiver frequency.

Where additional receive frequencies are provided, the procedure shall be repeated at each of the additional frequencies in turn.

5.3.3 Limit

The unwanted signal shall not induce a character error ratio of more than 4×10^{-2} .

5.4 Intermodulation

5.4.1 Definition

Intermodulation is a process whereby signals are produced from two or more signals simultaneously present in a non-linear circuit.

5.4.2 Method of measurement

Three signals shall be applied to the receiver as specified in clause 4.1.3.

The receiver shall be connected to the artificial antenna specified in b) in clause 4.1.1.

The wanted signal shall be the normal test signal at a level of 20 dB μ V.

The two unwanted signals shall be unmodulated at equal levels of 70 dB μ V, with neither signal at a frequency in the frequency band 516 kHz to 520 kHz.

Where additional receive frequencies are provided, the procedure shall be repeated at each of the additional frequencies in turn, but with neither signal on a frequency within the band of the additional receive frequency under test.

5.4.3 Limit

Intermodulation shall not induce a character error ratio of more than 4×10^{-2} .

5.5 Spurious emissions

5.5.1 Definition

Spurious emissions are any radio-frequency emissions generated in the receiver and radiated by conduction from the antenna or from other conductors connected to the receiver or radiated by the receiver.

5.5.2 Method of measurement

The receiver shall be connected to the artificial antenna specified in a) in clause 4.1.1 and the spurious emissions shall be measured using a selective measuring instrument. The root mean squared (r.m.s.) value of any component of the spurious emissions shall be measured.

The measurements shall cover the frequency range from 9 kHz to 2 000 MHz.

Where additional receive frequencies are provided, the procedure shall be repeated at each of the additional frequencies in turn.

5.5.3 Limit

The power of any discrete component shall not exceed 1 nW (1×10^{-9} watt).

5.6 Protection of input circuits

The receiver shall not be damaged when an unmodulated signal at a level of 30 volts (r.m.s.) is applied to the receiver input as specified in clause 4.1.3 for a period of 15 minutes on any frequency in the range from 100 kHz to 28 MHz.

The receiver shall operate normally without further intervention after the test.

Where additional receive frequencies are provided, the procedure shall be repeated at each of the additional frequencies in turn.

In order to provide protection against damage due to electrostatic voltage which may occur at the receiver input, the resistance to direct current between the antenna terminal and the casing shall not exceed 100 k Ω .

6 Printing device

6.1 General

If the printing device operates from ac power supply, it shall meet all the following requirements on the two main frequencies 50 Hz and 60 Hz.

The printing device shall print the message received on paper. Changing the paper shall be a simple operation. The paper capacity shall be sufficient to enable at least 200 000 characters to be printed.

6.2 Printing

The printing device shall print easily legible signs and produce a low level of noise.

The printing device shall be capable of printing at least 32 characters per line.

7 Interference

7.1 General

All reasonable and practicable steps should be taken to ensure electromagnetic compatibility between the equipment concerned and other radio communication and navigational equipment carried on board in compliance with the relevant requirements of Chapter IV and Chapter V of the 1974 SOLAS Convention [5] as amended.

History

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