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colour inside

Maritime navigation and radiocommunication equipment and systems – VHF data exchange system – Requirements and methods of testing for stations including ASM functionality

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MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – VHF DATA EXCHANGE SYSTEM – REQUIREMENTS AND METHODS OF TESTING FOR STATIONS INCLUDING ASM FUNCTIONALITY

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IEC PAS 63343 has been processed by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

The text of this PAS is based on the following document:	This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document
Draft PAS	**Report on voting**
80/975/DPAS	80/982/RVDPAS

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned may transform it into an International Standard.

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MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – VHF DATA EXCHANGE SYSTEM – REQUIREMENTS AND METHODS OF TESTING FOR STATIONS INCLUDING ASM FUNCTIONALITY

1 Scope

This document specifies technical requirements, methods of test and required test results for equipment implementing ASM part of the VHF Data exchange system (VDES) as defined in ITU-R M.2092.

This document is intended to be the first step of development of standard(s) describing equipment that implement functions of VDES in any combination.

NOTE All text of this document whose wording is identical to applicable external references such as ITU Recommendations is printed in *italics*, and the reference and associated paragraph numbers are indicated in brackets.

NOTE The intention of text written in notation [Future: text] in this document is to include future placeholder for topics that are considered important even for the first implementations that may comply with this document.

Requirements set in this document provide means to mitigate adverse interference to Automatic Identification System (AIS).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60945:2002, *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results*

IEC 61108 (all parts), *Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS)*

IEC 61162-1:2016, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1 Single talker and multiple listeners*

IEC 61162-450, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 450: Multiple talkers and multiple listeners – Ethernet interconnection*

IEC 61193-2:2007, *Quality assessment systems – Part 2: Selection and use of sampling plans for inspection of electronic components and packages*

IEC 61993-2:2018, *Maritime navigation and radiocommunication equipment and systems – Automatic identification systems (AIS) – Part 2: Class A shipborne equipment of the automatic identification system (AIS) – Operational and performance requirements, methods of test and required test results*

IEC 62320-1:2015, *Maritime navigation and radiocommunication equipment and systems – Automatic identification system (AIS) – Part 1: AIS Base Stations – Minimum operational and performance requirements, methods of testing and required test results*

ITU-R Recommendation M.1371-5:2014, *Technical characteristics for an automatic identification system using time division multiple access in the VHF maritime mobile frequency band*

ITU-R M.2092-0:2015, *Technical characteristics for a VHF data exchange system in the VHF maritime mobile band*

ITU-T O.151:1992, *Error performance measuring equipment operating at the primary rate and above*

IALA G1139 Edition 3, 2019, *The Technical Specification of VDES*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1 Terms and definitions

3.1.1 Input [verb]

input [verb]
used for data transaction towards the equipment in its Presentation Interface

3.1.2 Output [verb]

output [verb]
used for data transaction from the equipment at its Presentation Interface

3.1.3 Transmit [verb]

transmit [verb]
used when equipment transmits by using VHF radio

3.1.4 Receive [verb]

Receive [verb]
used when equipment receives a radio signal

3.1.5 VDES VDL

VDES VDL
AIS VDL, ASM VDL, VDE TER VDL and VDE SAT VDL

3.2 Abbreviated terms

AIS	Automatic Identification System
ASM	Application Specific Message
BW	Bandwidth
DAC	Designated Area Code
EMC	Electromagnetic Compatibility
EUT	Equipment Under Test
EVM	Error Vector Magnitude
FATDMA	Fixed Access Time Division Multiple Access
FI	Function Identifier

GLONASS	Globalnaya Navigazionnaya Sputnikovaya Sistema
GMSK	Gaussian Minimum Shift Keying
GNSS	Global Navigation Satellite System
HMI	Human Machine Interface
IF	Intermediate Frequency (of modulator)
MITDMA	Multiple Incremental Time Division Multiple Access
PAPR	Peak to Average Power Ratio
PEP	Peak Envelope Power
PER	Packet Error Rate
PI	Presentation Interface
RATDMA	Random Access Time Division Multiple Access
RF	Radio Frequency
RMS	Root Mean Square
SAR	Search and Rescue
SI	Selection Interval
UTC	Coordinated Universal Time
VDE	VHF Data Exchange
VDES	VHF Data Exchange System
VDE SAT	VDE Satellite
VDE TER	VDE Terrestrial
VDL	VHF Data Link
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio
QPSK	Quadrature Phase Shift Keying

4 General requirements and tests of equipment

4.1 Requirements (placeholder)

4.2 Methods of tests for general requirements

5 Performance requirements

5.1 Mobile station

5.1.1 Overview

This part specifies the minimum operational and performance requirements, methods of testing and required test results for ASM Mobile station.

It takes into consideration the technical characteristics of shipborne AIS equipment, included in recommendation ITU-R M.1371 and IEC 61993-2 (see 5.1.3.11).

ASM mobile station is intended to be used onboard any marine vessel that may operate globally or regionally anywhere in the world. The main high-level functions of the ASM mobile station are:

a) transmit through ASM VHF Data Link (ASM VDL) information which is input to ASM mobile station by other onboard equipment through Presentation Interface (PI);

b) output all information received from ASM VDL applicable to own station, through PI so that this information is available to other onboard equipment;

c) handle applicable ASM radio station duties.

In following text, term "Equipment" is used to refer to ASM mobile station.

5.1.2 General requirements

An ASM mobile station shall as a minimum fulfil requirements set in IEC 61193-2, with exceptions as detailed in this document for interoperability between AIS and ASM transmission and reception.

5.1.2.1 Marking and identification

Equipment shall be marked as required by IEC 60945:2002, Clause 15. In addition, the markings shall include:

- details of the power supply from which the equipment is intended to be operated; and,
- if applicable, the date by which batteries need to be replaced.

5.1.2.2 Manuals

Manuals for Equipment shall comply with requirements set in IEC 60945:2002, Clause 14, as applicable. In addition the manuals shall include:

- the type and details of all external connectors;
- the needed information for correct siting of the antennas;
- description for each alert that may be released by the equipment. The description shall briefly explain the root causes for each alert, give guidance for users on what implications the alert has for safe operation of ship and what actions may be necessary to rectify the alert condition.

5.1.2.3 Quality assurance

The Administration shall require that the manufacturers have a quality control system audited by a competent authority to ensure continuous compliance with the conditions of conformance assessment. Alternatively, the Administration may use final product verification procedures where a competent authority verifies conformance with the certificate of conformance before the product is installed on board ships.

NOTE The ISO 9000 family standards, as applicable, meets this requirement.

5.1.2.4 Source of UTC

The Equipment shall be provided with a source of UTC, such as GNSS receiver, which is required for synchronisation purposes.

The internal GNSS receiver shall meet the following requirements of IEC 61108 (all parts): acquisition, re-acquisition, receiver sensitivity, RF dynamic range, effects of specific interfering signals, status indications.

5.1.2.5 Human Machine Interface (HMI)

Means shall be provided to allow user to observe operational status of the equipment.

NOTE This requirement can be fulfilled by providing an indicator capable of signalling three states: power off, power on – operating as intended, power on – not operating as intended.

5.1.2.6 Environmental, power supply, special purpose and safety requirements

Equipment shall as minimum comply with the requirements set for equipment category "protected" as stated in IEC 60945:2002.

5.1.2.7 EMC

Requirements applicable for Equipment are stated in IEC 60945:2002, Table 6, equipment category "protected".

5.1.2.8 Compass safe distance

Requirements stated in IEC 60945:2002, 4.5.3, apply to Equipment.

5.1.2.9 Power supply

Manufacturer shall specify the properties of power supply. The power supply shall conform to applicable requirements in IEC 60945:2002.

5.1.2.10 Update of software

The Equipment shall provide means for updating software of the equipment and to report, on demand, the current applicable software version.

5.1.3 Technical requirements

5.1.3.1 Transmitter shutdown procedure

(M.1371-5/A2-2.13) *An automatic transmitter hardware shutdown procedure and indication* shall *be provided in case a transmitter continues to transmit for more than 2 s. This shutdown procedure* shall *be independent of software control.*

5.1.3.2 Permissible initialization period

The Equipment shall be operational within 2 min of switching on.

5.1.3.3 Transceiver protection

The Equipment shall tolerate failure conditions of disconnected antenna and short circuit of antenna connector for minimum duration of 60 s. The equipment shall be capable to continue normal operation within 2 min after either of the failure conditions are rectified.

5.1.3.4 TX malfunction

The Equipment shall be able to detect malfunction of transmitter and signal this condition through Presentation Interface (see 5.1.3.8.3) and HMI (see 5.1.2.5).

5.1.3.5 Antenna VSWR

Equipment shall be able to detect excess VSWR at antenna and signal this condition through Presentation Interface (see 5.1.3.8.3) and HMI (see 5.1.2.5).

5.1.3.6 RX malfunction

Equipment shall be able to detect malfunction of receiver and signal this condition through Presentation Interface (see 5.1.3.8.3) and HMI (see 5.1.2.5).

5.1.3.7 Physical layer

5.1.3.7.1 TDMA transmitter

The transmitter shall comply with following requirements in addition to IEC 61193-2.

Transmission characteristics as described in Table 1 and Figure 1 shall apply for transmission of ASM messages.

Table 1 – Slotted transmission spectrum for ASM

Transmitter parameters	Requirements	Condition
Frequency error	±1,5 ppm	Normal
	±3 ppm	Extreme
Transmit power capability	Transmit average power should be 1 W at low power setting and 12,5 W at high power setting. ±1,5 dB normal, $^{+2}_{-6}$ dB extreme	Conducted
Slotted modulation mask	Δfc < ±8 kHz: 0 dBc (PEP of transmitted signal) ±8 kHz < Δfc < ±16 kHz: below the straight line between −25 dBc at ±8 kHz and –60 dBc at ±16 kHz ±16 kHz < Δfc < ±25 kHz: below the straight line between −60 dBc at ±16 kHz and –70 dBc at ±25 kHz ±25 kHz < Δfc < ±62,5 kHz: −70 dBc	
Spurious emissions	−36 dBm −30 dBm	9 kHz to 1 GHz 1 GHz to 4 GHz

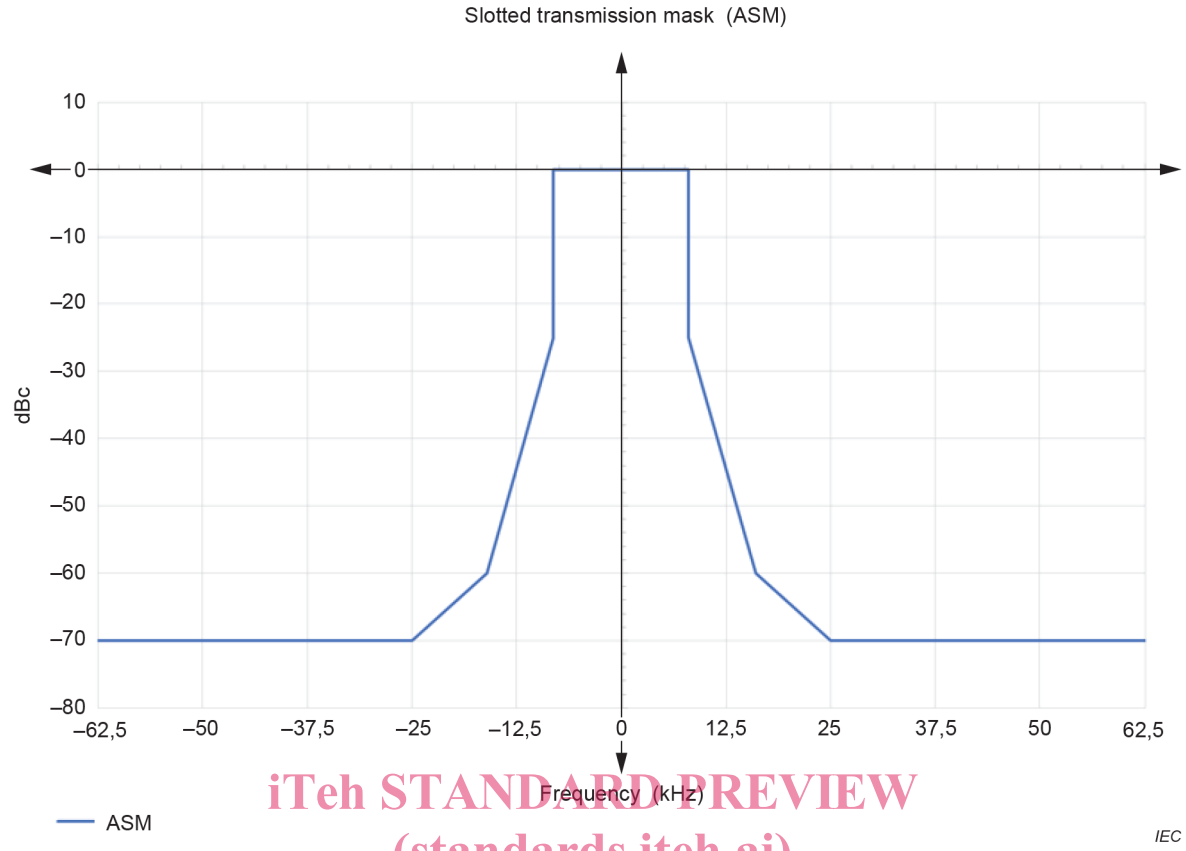

Figure 1 – Slotted transmission spectrum for ASM

For output power less than 1 W, the maximum transmission power level outside ±16 kHz shall not exceed –36 dBm.

The modulation accuracy shall give an RMS vector error in any burst less than [0,1] and the peak vector error magnitude shall be less than [0,3] for any symbol.

Requirements on transmitter power versus time characteristics are given in Table 2 and Figure 2. Blue line in Figure 2 is an example of transmitter power during ramp up and ramp down. For multi-slot transmissions the ramp down and guard periods (from T_E via T_G to T_0) take place at the end of the last transmission slot and sync sequence and payload period (T_B … T_E) extends through all transmission slots.