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Electromagnetic compatibility and Radio spectrum Matters (ERM); Maritime low power personal locating beacons employing AIS Part 1: Technical characteristics and methods of measurement

Reference

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Foreword

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

The present document is part 1 of a multi-part deliverable covering the Electromagnetic compatibility and Radio spectrum Matters (ERM); Maritime low power personal locating beacons employing AIS, as identified below:

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

Part 2: "Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive";

Part 3: "Harmonized EN covering the essential requirements of article 3.3 (e) of the R&TTE Directive".

The present document lays down the minimum requirements for "Maritime low power personal locating beacons employing AIS", and incorporates the relevant provisions of the International Telecommunication Union (ITU) radio regulations.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

Introduction

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [i.4] laying down a procedure for the provision of information in the field of technical standards and regulations.

1 Scope

The present document lays down the minimum requirements for low power maritime personal locating beacons employing AIS and an integrated GNSS receiver to provide the locating function. The present document incorporates the relevant provisions of the International Telecommunication Union (ITU) radio regulations included in Recommendation ITU-R M.1371-4 [1]

For this application, both the radiated power and the length of time of operation are limited to enable the equipment to be sufficiently small and light to be worn comfortably at all times and to limit the operating range to a local area.

2 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 reference document (including any amendments) applies.

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

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2.1 Normative references

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

[1] Recommendation ITU-R M.1371-4 (04/2010): "Technical characteristics for an automatic identification system using time-division multiple access in the VHF maritime mobile band".

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

[3] ETSI TR 102 273-7 (2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 7: Artificial human beings".

[4] CENELEC EN 61108-1 (2003): "Maritime navigation and radiocommunication equipment and systems - Global navigation satellite systems (GNSS) - Part 1: Global positioning system (GPS) - Receiver equipment - Performance standards, methods of testing and required test results".

[5] CENELEC EN 61108-2 (1998): "Maritime navigation and radiocommunication equipment and systems - Global navigation satellite systems (GNSS) - Part 2: Global navigation satellite system (GLONASS) - Receiver equipment - Performance standards, methods of testing and required test results".

[6] CENELEC EN 61108-3 (2010): "Maritime navigation and radiocommunication equipment and systems - Global navigation satellite systems (GNSS) - Part 3: Galileo receiver equipment - Receiver equipment - Performance standards, methods of testing and required test results".

[7] Recommendation ITU-T O.153 (10/92): "Basic parameters for the measurement of error performance at bit rates below the primary rate".

2.2 Informative references

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] ETSI TR 102 273 (Parts 2, 3 and 4) (V1.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties".

[i.2] ANSI C63.5-2006: "American National Standard for Calibration of Antennas Used for Radiated Emission Measurements in Electro Magnetic Interference".

[i.3] IEC 60489-3 (edition 2.0) (Appendix F of Amendment 1): "Methods of measurement for radio equipment used in the mobile services. Part 3: Receivers for A3E or F3E emissions".

[i.4] Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.

3 Definitions, symbols and abbreviations

3.1 Definitions

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

active mode: activated mode, transmitting in an emergency situation

test mode: self testing mode, not involved in a genuine emergency

training mode: activated mode for training purposes only

UTC lock: GNSS has precisely locked to UTC time so that it can determine SOTDMA slot timing correctly, including leap second corrections

3.2 Symbols

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

ε	permittivity
σ	Conductivity
λ	wavelength
cSt	centi-Stokes
dB	decibel
div	division
S	Siemens
µT	microtesla

3.3 Abbreviations

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

AIS	Automatic Identification System
ASTM	American Society for Testing and Materials
COG	Course Over Ground
CRC	Cyclic Redundancy Check
CSP	Channel Spacing
CW	Continuous Wave
ERP	Effective Radiated Power
EUT	Equipment Under Test

GLONASS	Globalnaya Navigatsionnaya Sputnikovaya Sistema
GMSK	Gaussian Minimum Shift Keying
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GTRF	Galileo Terrestrial Reference Frame System
ITRF	International Terrestrial Reference Frame
MOB	Man Over-Board
NRZI	Non Return to Zero, Inverted
OATS	Open Area Test Site
PPS	Pulses Per Second
RAIM	Receiver Autonomous Integrity Monitoring
RF	Radio Frequency
SINAD	(Signal+Noise+Distortion) to (Noise + Distortion)
SOG	Speed Over Ground
SOTDMA	Self-Organised Time Division Multiple Access
TDMA	Time Division Multiple Access
UTC	Coordinated Universal Time
VDL	AIS VHF data link
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio

4 General requirements

4.1 Construction

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

In all respects, the mechanical and electrical design and the construction and finish of the equipment shall conform with good engineering practice.

The equipment shall be designed to minimize the risk of internal and external damage during use or stowage.

The exterior of the equipment shall have no sharp edges or projections that could easily damage inflatable rafts or injure personnel.

The general construction and method of operation shall provide a high degree of proof against inadvertent operation due to magnetic influences, handling, stowage and transit, whilst still providing a simple means of operation in an emergency.

The equipment shall be portable, lightweight, compact and be designed as one integral unit. The locating beacon shall derive its energy from a battery forming a part of the equipment and incorporate a permanently attached antenna which may be either fixed length or extendible.

The locating beacon may be fitted with a test facility by which the functioning of the transmitter and battery can be easily tested without the use of any external equipment.

The equipment shall be capable of being used by an unskilled person.

The locating beacon shall be watertight and buoyant.

A substantial part of the equipment shall be of highly visible yellow or orange colour to assist visual location.

The equipment shall not be unduly affected by sea water or oil and shall be resistant to deterioration by prolonged exposure to sunlight.

4.1.1 Categories of equipment

Two categories are defined:

- Category 1 radio beacons shall have sufficient positive buoyancy to float in fresh water.

- Category 2 radio beacons intended to be incorporated into or attached to a buoyancy device are not required to float.

The user manual or instructions for Category 2 beacons shall include necessary information to allow the user to fit or attach the beacon.

4.2 Controls

The equipment shall be initially activated by the use of two simple, but independent mechanical actions, neither of which on its own shall activate the equipment. The second mechanical action may be replaced by an immersion sensor.

It shall only be possible to activate the equipment after a seal or other mechanical restraint has been removed from the first mechanical action. After activation it shall be simple to de-activate the equipment and the means to deactivate the equipment shall be clearly marked.

The switch that operates any test facility (clause 4.1) shall be so designed that it returns automatically to the off-position when released.

4.3 Indicators

The equipment shall be provided with a visual and/or audible indication that signals are being emitted. The indicator shall be sufficiently bright to be seen in bright sunlight. Except when operating in test mode the indicator shall not be green in colour.

The indicator shall clearly distinguish the following states:

(i) The locating beacon has been activated and is waiting for GNSS data.

(ii) The locating beacon has GNSS data and is transmitting in active mode.

(iii) The locating beacon has GNSS data and is transmitting in training mode.

(iv) The locating beacon is undergoing test and is transmitting in test mode.

(v) The locating beacon has completed a test or has been de-activated.

4.4 Identifier (user ID)

The locating beacon shall have an identifier to distinguish it from other AIS devices.

The User ID for a personal search and rescue locating beacon is 972xxyyyy, where xx = manufacturer ID 01 to 99; yyyy = the sequence number 0000 to 9999. Manufacturers IDs are issued by CIRM (www.cirm.org).

After being programmed by the manufacturer, it shall not be possible for the user to change the identifier of the locating beacon.

The user ID shall be held in non-volatile memory.

4.5 Labelling

The equipment shall be provided with a label, or labels, permanently affixed to the exterior of the equipment, containing the following information:

- user ID of the equipment (see clause 4.4) and manufacturer serial number;
- type designation of the equipment with prefix AIS-MOB;
- adequate instructions to enable the equipment to be activated and de-activated;
- the type of battery as specified by the manufacturer of the locating beacon;

- the date on which the battery will need to be replaced. Simple means shall be provided for changing this date when the battery is replaced. The battery replacement date marked on the locating beacon should be the date of battery installation in the locating beacon plus no more than 50 % of the rated life of the battery, provided that the battery cells are no older than 25 % of the rated life of the battery;
- a warning to the effect that the locating beacon should not be operated except in an emergency;
- a warning to not block the GNSS antenna;
- the compass safe distance as measured in clause 7.10.

4.6 Instructions

Necessary operating instructions shall be provided with the equipment. These should include the following warnings:

- "WARNING - An AIS-MOB Man overboard device is only intended for short range signalling to an AIS receiver installed onboard your own vessel. It will not directly alert the emergency services."
- "WARNING - This equipment is not intended for routine tracking of persons or property. This includes tracking of divers."
- "WARNING - If self-test is performed more frequently than once a month, then battery life may be reduced."

4.7 Power source

4.7.1 Battery requirements

The type of battery and designation specified by the manufacturer for use in the equipment shall be clearly and indelibly marked on the equipment.

The manufacturer should establish a useful life and an expiry date for primary (non-rechargeable) batteries. The useful life is the period of time after the date of battery manufacture that the battery will continue to meet the input power requirements of the locating beacon, over the entire specified operating temperature range. The following losses shall be included (at a temperature of +20 °C ± 5 °C):

a) self-testing monthly with GNSS data available;

b) self-discharge of the battery;

c) stand-by loads.

The expiry date of the battery shall be the battery manufacturing date plus no more than half the useful life of the battery. The battery shall have a minimum useful life of at least two years. The battery shall be clearly and durably marked with its expiry date.

4.7.2 Safety precautions

Provisions shall be made for protecting the equipment from damage due to the accidental reversal of polarity of the battery.

5 Technical requirements

5.1 General

When activated the locating beacon shall be capable of transmitting messages that indicate the position of a person in the water. The transmitted messages shall be compatible with existing AIS installations. The transmitted messages shall be recognized and displayed by AIS receivers in the reception range of the transmitter, and clearly distinguish the transmitter as a personal Man Over-Board (MOB) locating beacon. AIS TDMA Synchronization shall be UTC direct; the locating beacon does not require an AIS receiver.

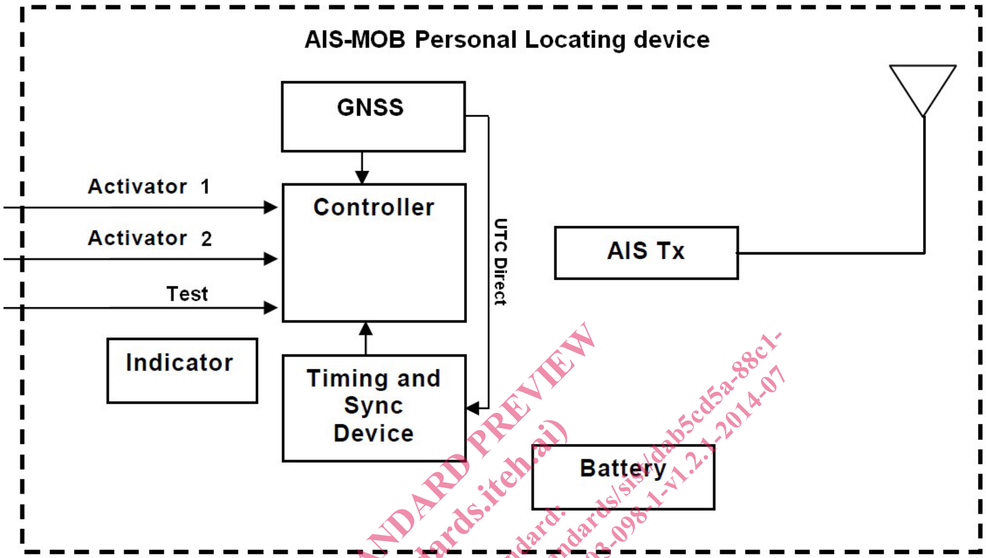

Figure 1: Functional block diagram of personal locating beacon

5.2 AIS transmission characteristics

The AIS Tx transmits using modified SOTDMA on two channels AIS1 and AIS2. The GNSS receiver, e.g. a GPS receiver, determines the current position of the locating beacon and facilitates TDMA synchronization in the UTC direct mode.

The locating beacon shall shutdown automatically if, under a fault condition, the transmitter remains permanently keyed for more than 2 seconds. This shutdown shall be independent of the operating software.

5.2.1 AIS messages

The locating beacon shall broadcast Message 1 and Message 14, as defined in Recommendation ITU-R M.1371-4 [1]. The content of the messages differs for active transmissions (active and training modes) and test transmissions (test mode). The combination of these messages in burst sequences is detailed in annex B.

5.2.1.1 Active mode

For Message 1 the Navigational status shall be set to "14". For message 14 the safety related text shall be set to "MOB ACTIVE" (see clause B.1 for details).

5.2.1.2 Training mode

For Message 1 the Navigational status shall be set to "15". For message 14 the safety related text shall be set to "MOB TEST" (see clause B.2 for details).