INTERNATIONAL STANDARD

IEC 61097-5

First edition
1997-12

Global maritime distress and safety system (GMDSS) –

Part 5: Inmarsat-E – Emergency position indicating radio beacon (EPIRB) operating through the Inmarsat system – Operational and performance requirements, methods of testing and required test results

Système mondial de détresse et de sécurité en mer (SMDSM) –

Partie 5: Inmarsat-E – Balises radioélectriques de position de détresse du système Inmarsat – Exigences d'exploitation et de fonctionnement, méthodes d'essai et résultats d'essai exigés

Reference number
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GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –

Part 5: Inmarsat-E – Emergency position indicating radio beacon (EPIRB) operating through the Inmarsat system – Operational and performance requirements, methods of testing and required test results

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FOREWORD

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International Standard IEC 61097-5 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

The text of this standard is based on the following documents:

FDIS	Report on voting
80/146/FDIS	80/163/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

Annexes A, B and C form an integral part of this standard.

The French version of this standard will be issued separately.

GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –

Part 5: Inmarsat-E – Emergency position indicating radio beacon (EPIRB) operating through the Inmarsat system – Operational and performance requirements, methods of testing and required test results

1 Scope

This part of IEC 61097 specifies the minimum operational and performance requirements, technical characteristics, methods of testing and required test results of the satellite emergency position indicating radio beacon used in the Inmarsat-E satellite system (satellite EPIRB), as required by Regulation IV/7.1.6 of the 1988 amendments to the 1974 International Convention for Safety of Life at Sea (SOLAS), and which is associated with IEC 60945. When a requirement in this standard is different from IEC 60945, the requirement in this standard shall take precedence.

This standard incorporates the performance standards of IMO Resolutions A.662(16) and A.812(19). It also incorporates the relevant ITU Radio-Regulations and the technical characteristics for satellite EPIRBs as contained in Recommendation ITU-R M 632-2 (formerly CCIR Recommendation 632), and takes account of the general requirements contained in IMO Resolution A.694(17), as detailed in IEC 60945.

This standard does not incorporate the Inmarsat system requirements needed for Inmarsat type approval and for which the latest edition of the Inmarsat-E System definition manual should be consulted. When a requirement in this standard is different from that in the Inmarsat-E System definition manual, reference shall be made to the most recent IMO and ITU applicable documents to resolve the difficulty.

This standard covers the following categories of satellite EPIRB:

Category 1 – Satellite EPIRB with position updating from the ship's navigational installation and 9 GHz SART.

Category 2 – Satellite EPIRB with position updating from an integral facility for automatic position updating.

Category 1 or 2 with the addition of a 121,5 MHz homing transmitter.

Category 1 or 2 with remote control meeting the requirements of Regulation IV subclauses 10.1.4.3 and 10.2.3.2.2 of the 1988 amendments to the 1974 SOLAS Convention.[1)]

Both categories of EPIRBs are to be considered as "portable", as defined in IEC 60945 except as required in 5.18.2 for the release mechanism. The remote control unit, if included, shall be considered as "protected" equipment.

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1) To meet the requirements for remote activation, a remote control unit is required which is capable of remote activation and deactivation and feeding "nature of distress" information to the satellite EPIRB.

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This standard also includes minimum performance standards for a manually activated satellite EPIRB without float-free release mechanism (see annex C).

Preconditioning as defined in IEC 60945 is not required before beginning the type testing procedure.

All text of this standard, the wording of which is identical to that in the IMO SOLAS Convention as amended and IMO Resolutions A.658(16), A.662(16), A.694(17), A.702(17) and A.812(19), and Recommendation ITU-R M.632-2 (formerly CCIR Recommendation 632) will be printed in italics and the resolution or recommendation and paragraph number indicated between brackets.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61097. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 61097 are encouraged to investigate the possibility of applying the most recent edition of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050:1970, *International Electrotechnical Vocabulary (IEV)*

IEC 60086-4:1996, *Primary batteries – Part 4: Safety standard for lithium batteries*

IEC 60945:1996, *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results*

IEC 61097-1:1992, *Global maritime distress and safety system (GMDSS) – Part 1: Radar Transponder – Marine search and rescue (SART) – Operational and performance requirements, methods of testing and required test results*

IEC 61108-1:1996, *Global navigational satellite systems (GNSS) – Part 1: Global positioning system (GPS) – Receiver equipment – Performance standards, methods of testing, and required test results*

International Convention on Safety of Life at Sea (SOLAS): 1974 as amended – *Chapter IV: Radiocommunications*

IMO Resolution A.658(16):1989, *Use and fitting of retro-reflective materials on life-saving appliances*

IMO Resolution A.662(16):1989, *Performance standards for float-free release and activation arrangements for emergency radio equipment*

IMO Resolution A.689(17):1991, *Testing of life-saving appliances*

IMO Resolution A.694(17):1991, *General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids*

IMO Resolution A.702(17):1991, *Radio maintenance guidelines for the GMDSS related to sea areas A3 and A4*

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IMO Resolution A.802(19):1995, *Performance standards for survival craft radar transponders for use in search and rescue operations*

IMO Resolution A.812(19):1995, *Performance standards for float-free satellite EPIRBs operating through the geostationary Inmarsat satellite system on 1,6 GHz*

IMO Resolution A.819(19):1995, *Performance standards for shipborne Global positioning system (GPS) receiver equipment*

International Telecommunication Union (ITU) Radio Regulations:1996

Recommendation ITU-R M.632-3 (formerly CCIR Recommendation 632):1997, *Transmission characteristics of a satellite emergency indicating radio beacon (Satellite EPIRB) system operating through geostationary satellites in the 1,6 GHz band*

Recommendation ITU-R M.690-1 (formerly CCIR Recommendation 690):1995, *Transmission characteristics of emergency position indicating radio beacons (EPIRBs) operating on the carrier frequencies of 121,5 MHz and 243 MHz*

Report ITU-R M.1178 (formerly report CCIR 1178) – *Efficient use of the band 1 544 MHz – 1 545 MHz and 1 645,5 MHz – 1 646,5 MHz*

Inmarsat:1997, *Inmarsat-E System Definition Manual (SDM)*

3 Definitions and abbreviations

Definitions, abbreviations and symbols listed hereunder are taken from IEC 60050: *International Electrotechnical Vocabulary (IEV)* or specially defined for use in this standard.

3.1 Definitions

For the purpose of this part of IEC 61097, the following definitions apply:

3.1.1
activation
a specific action or event which causes the satellite EPIRB to transmit distress alerts according to the specified time schedule

3.1.2
deactivation
a specific action or event which causes the transmitting satellite EPIRB to cease its activated mode until reactivated

3.1.3
equipment
a satellite EPIRB, its release mechanism and any remote control unit which may be associated with it

3.1.4
externally mounted equipment
units of the equipment intended for external (outside) mounting, namely the satellite EPIRB and its release mechanism

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3.1.5
frequency (message content test)
the frequency allocated to the message content test facility, namely 1 645 600 000 Hz (Channel 000) used for checking the message content by suitably qualified personnel equipped with a test receiver

3.1.6
frequency (operational)
early models of Inmarsat-E EPIRBs were required to transmit alternately in the frequency bands 1 644,3 MHz to 1 644,5 MHz and 1 645,6 MHz to 1 645,8 MHz to allow compatibility with the first and second generations of Inmarsat space segments. Inmarsat has now declared (1997-03-19) that the Inmarsat first generation space segment (spare and operational) has been completely replaced and that henceforth, all Inmarsat-E EPIRBs submitted to Inmarsat for type approval will be permitted to transmit in the frequency band from 1 645,6 MHz to 1 645,8 MHz only. With effect from June 1 1997, it will be mandatory for Inmarsat-E EPIRBs submitted for type approval to transmit in the band 1 645,6 MHz to 1 645,8 MHz only

3.1.7
frequency (type testing)
until further notice by Inmarsat, the operational frequency allocated for transmission during type testing shall be 1 645 799 800 Hz. Where the EPIRB transmits in both the 1st and 2nd generation space segment frequency bands, this frequency shall be used for type testing in both bands

3.1.8
internally mounted equipment
units of the equipment, e.g. remote control unit, intended for internal mounting (below deck)

3.1.9
Inmarsat-E SDM
Inmarsat-E System definition manual. A document produced and maintained by Inmarsat which gives all system technical requirements for the 1,6 GHz EPIRB and for its approval for utilisation of the space segment. It also reflects the applicable IMO performance requirements

3.1.10
peak effective power (PEP)
the average power during one radio frequency cycle at the crest of the modulation envelope (see annex B)

3.1.11
radiated power
the power supplied to the antenna by the transmitter (measured at the highest crest of the modulation envelope) multiplied by the gain of the antenna in a given direction

3.1.12
release mechanism
a fixture which allows the satellite EPIRB to float free automatically

3.1.13
remote control unit
a unit which allows the satellite EPIRB, while mounted in the release mechanism, to be activated from a position other than its installation point

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3.1.14
satellite EPIRB
an earth station in the mobile satellite service (MSS) the emissions of which are intended to facilitate search and rescue (SAR) operations

3.1.15
standby mode
the satellite EPIRB is ready to be activated, manually or automatically and thus capable of subsequent manual or automatic activation when floating free of its release mechanism

3.2 Abbreviations

eirp	equivalent isotropically radiated power
EPFD	Electronic Position Fixing Device
EPIRB	Emergency Position Indicating Radio Beacon
FSK	Frequency Shift Keying
GMDSS	Global Maritime Distress and Safety System
GPS	Global Positioning System
IMO	International Maritime Organization
Inmarsat	International Mobile Satellite Organisation
MMSI	Maritime Mobile Service Identity
nm	nautical mile
PEP	Peak Effective Power
RHCP	Right Hand Circular Polarised
SAR	Search And Rescue
SART	Search and Rescue Radar Transponder
SOLAS	International Convention on Safety of Life at Sea

4 General and operational requirements

4.1 Purpose

This clause includes the requirements for which no repeatable or verifiable test can be specified or for which the test is limited to the verification of the documentation presented by the manufacturer. It contains all operational tests, particularly those involving subjective judgement and which shall be conducted by qualified personnel.

The requirements listed in this clause are in addition to the relevant requirements of 4.2 of IEC 60945.

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4.2 General

4.2.1 (SOLAS IV/7.1.6.3) The satellite EPIRB shall be *ready to be manually released, be capable of being carried by one person into a survival craft,* incorporate a permanently attached antenna, and be designed as one integral unit. No part of it shall be detachable without the use of tools.

4.2.2 The manufacturer shall present evidence to show that transmission only occurs if battery voltage is sufficient to ensure correct operation (see 5.17.6), frequency lock is achieved and transmitter output power sufficient to generate an eirp of at least –3 dBW is detected.

4.3 Operational

The satellite EPIRB shall*:*

4.3.1 (A.812(19)/2.4.1) *be fitted with adequate means to prevent inadvertent activation* and deactivation. The satellite EPIRB shall not be activated when water washes over it while it is in its release mechanism.

4.3.2 (A.812(19)/A.2.4.6) *be capable of manual activation and manual deactivation.*

4.3.3 (A.812(19)/A.2.4.7) *be provided with means to indicate that signals are being emitted*. (See also 5.3.6.)

The satellite EPIRB shall be provided with either an audible or a visual indication or both to show that signals are being emitted.

An indication shall be given also at all places from which EPIRB activation is possible.

4.3.4 (A.662(16)/5*) be capable of being released manually from the float-free mechanism* without tools.

4.3.5 (A.812(19)/A.2.4.11) *be of highly visible yellow/orange colour and be fitted with retro-reflective material.*

A band of retro-reflective material, at least 25 mm wide, encircling that part of the satellite EPIRB body which is normally above the waterline, shall be acceptable.

Documentation shall also be provided to show that the retro-reflective material meets the performance requirements of A.658(16) Annex 2 for type II material.

4.3.6 (SOLAS III/33.2.3) *have all controls of sufficient size for simple and satisfactory operation and also be capable of being operated by a person wearing a survival suit.*

4.3.7 (A.812(19)/A.2.7.1) *have local manual activation, remote activation may also be provided from the navigating bridge, while the device is installed in the float-free mounting.*

4.3.8 (A.812(19)/2.8) *Any connection to the EPIRB, e.g. for the purpose of supply of data or power, shall be corrosion resistant and protected against accidental disconnection.*

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4.4 Float-free release

The float-free arrangement shall:

4.4.1 (A.662(16)/2.3) *be constructed of non-corrosive compatible materials, so as to prevent deterioration which may cause any malfunction of the unit. Galvanizing or other forms of metallic coating on parts of the float-free release mechanism* shall *not be accepted*. (See 7.1.3).

4.4.2 (A.662(16)/2.5) including the label *not be unduly affected by seawater or oil* or both *or prolonged exposure to sunlight*.

4.4.3 have its release mechanism fitted with adequate means to prevent inadvertent activation.

4.4.4 (A.662(16)/4*) It shall be possible to assess the proper functioning of the automatic release mechanism by a simple method without activation of the* satellite EPIRB.

4.5 (A.702(17)/3.2) Maintenance

It shall *be recognised that despite the use of other methods, some reliance on shore based maintenance to ensure the availability of the functional requirements of the GMDSS will always be necessary.*

As defined in 4.2 the satellite EPIRB is a single integral unit which is not suited for on-board repairs. As a consequence, the equipment shall be so constructed that it is readily accessible for inspection and testing purposes only.

Documentation shall be presented to show that provision is made for detection of fault conditions to the extent compatible with the above paragraph.

4.6 Safety precautions

4.6.1 All practicable steps shall be taken to ensure that the equipment is in accordance with A.694(17)/(7.1 and 7.2) as detailed in 4.8.1 of IEC 60945.

4.6.2 The exterior of the satellite EPIRB shall have no sharp edges or projections which might damage inflatable liferafts or injure personnel.

4.6.3 Documentation shall be provided to show compliance with IEC 60086-4 (see also 7.14).

4.6.4 It shall not be possible to connect the battery with reverse polarity.

4.7 Safety from electromagnetic RF radiation

Documentation shall be submitted by the manufacturer to demonstrate that in no case can the power level exceed the required safety limits[2)] during operation of the equipment.

4.8 Equipment handbook

Adequate information, as needed to comply with 4.5, shall be provided to enable the equipment to be properly installed, operated, and tested.

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2) If a maximum eirp of +3 dBW is assumed, a power density level of 100 W/m^2 can be expected at a distance of 40 mm from the antenna centre.

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Instructions shall also be included concerning:

– limitation of self-testing to the minimum necessary to ensure confidence in the operation of the satellite EPIRB;

– battery replacement; and

– the avoidance of false alarms.

4.9 Labelling

4.9.1 Labelling for the satellite EPIRB

(A.694(17)/9) *Each unit of equipment* shall *be marked externally with the following information which,* where practicable*, shall be clearly visible in the normal installed position:*

a) *identification of the manufacturer;*

b) *equipment type number or model identification under which it was type tested;*

c) *serial number of the unit* (see 4.11 of IEC 60945).

(A.812(19)/4) *In addition to the items specified in IMO Resolution A.694(17) on general requirements the following* shall *be clearly indicated on the exterior of the equipment*. (see also Inmarsat-E SDM Module 2A Part 1);

1 (A.812(19)/A.4.1) *brief operating instructions* in English, to provide for manual activation and deactivation and self test*;*

2 a warning to the effect that the satellite EPIRB shall not be operated except in an emergency;

3 (A.812(19)/A.4.2) type and *expiry date for the primary* power source (*batteries*) *used.* (see 5.17). Simple means shall be provided for changing this date when the battery is replaced;

4 compass safe distance (see clause 10)

5 in addition, space for name, call sign or MMSI of the ship, and any other nationally required item.

4.9.2 (A.662(16)/2.9) Labelling for the float-free release mechanism

The float-free release mechanism shall *carry a label* or labels affixed in such a position as to be visible when it is installed and *indicating clearly* in English*:*

1 *the operating instructions for manual release;*

2 the type designation;

3 maintenance and/or replacement dates (as applicable);

4 compass safe distance.

4.9.3 Labelling for the remote control panel

If a remote control panel is fitted, the following shall be clearly indicated in English on the exterior of the equipment:

a) brief operating instructions to provide for activation, deactivation and self-test of the EPIRB; and

b) a warning to the effect that “the satellite EPIRB shall not be operated except in an emergency”;

c) compass safe distance.

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4.10 Installation

Instructions shall be included in the equipment manual to ensure that the installed satellite EPIRB shall:

4.10.1 (SOLAS IV/7.1.6.2) be *installed in an easily accessible position;*

4.10.2 (A.694(17)/2) be *installed in such a manner that it is capable of meeting the requirements* of this standard;

4.10.3 (A.662(16)/2.8) *be mounted in such a way that the* satellite EPIRB, *after being released, is not obstructed by the structure of the sinking ship.*

5 Technical characteristics

5.1 Purpose

This clause includes all IMO/ITU requirements for which a repeatable method of measurement has been specified. The related test methods and required test results can be found in clause 6 and the following.

5.2 General

5.2.1 (A.812(19)/A.1) *The satellite emergency position-indicating radio beacon (EPIRB)* shall, *in addition to meeting the requirements of the Radio Regulations, the relevant ITU-R Recommendations, the relevant Inmarsat technical requirements* (Inmarsat-E SDM), *and the general requirements set out in resolution A.694(17),* which is linked with IEC 60945, *comply with the performance standards* set out in A.812(19).

5.2.2 (A.812(19)/A.2.1) *The satellite EPIRB* shall *be capable of transmitting a distress alert to a geostationary satellite,* (Inmarsat space segment) when floating and shall also be capable of operation on board a ship and on a survival craft.

5.2.3 The satellite EPIRB shall meet all requirements of this standard, except for those in 8.3.1 (radiated power), under any condition of antenna mismatch, such as that caused by immersion, without being damaged in any way.

5.3 Operational

The *satellite EPIRB* shall*:*

5.3.1 (A.812(19)/A.2.4.2) *be so designed that the electrical portions are watertight at a depth of 10 m for at least 5 min. Consideration* shall *be given to a temperature variation of 45 °C during transitions from the mounted position to immersion. The harmful effects of a marine environment, condensation and water leakage* shall *not affect the performance of the beacon.*

5.3.2 (A.812(19)/A.2.4.3) *be automatically activated after floating free,* or when floating irrespective of the setting of any control. Manual deactivation shall cause the EPIRB to revert to standby mode.

5.3.3 (A.812(19)/A.2.4.5) *be equipped with a search and rescue radar transponder unless integral facilities are included for automatic position updating after activation*. The EPIRB shall include a 9 GHz search and rescue radar transponder (SART) to enable it to be located by interrogation and/or an integrated navigation receiver (EPFD) capable of updating the distress alerts with the actual position of the EPIRB whilst it is afloat.

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A SART, if fitted, shall comply with IMO Resolution A.802(19) and clauses 3, 4, 5 and 6 of IEC 61097-1.

A GPS receiver used as an EPFD, if fitted, shall comply with IMO Resolution A.819(19) as applicable, and clauses 4 and 5 of IEC 61108-1.

5.3.4 (A.812(19)/A.2.4.8) *be capable of floating upright in calm water and have positive stability and sufficient buoyancy in all sea conditions*.

5.3.5 (A.812(19)/A.2.4.12) *be equipped with a buoyant captive lanyard*, firmly attached to it suitable for use as a tether for survivors or from a survival craft in the water. *It shall be so arranged as to prevent its being trapped in the ship's structure when floating free*.

The buoyant lanyard shall have a length of between 5 m and 8 m and a breaking strength of at least five times the weight of the satellite EPIRB.

5.3.6 (A.812(19)/A.2.4.13) *be provided with a low duty cycle light* (of at least an effective luminous intensity of 0,75 cd) activated by darkness or operating continually, and flashing at a rate not less than 20 times per minute, with a flash duration of between 10^{-6} to 1 second *to indicate its position* when activated *for the survivors nearby and rescue units*. If the low duty cycle light is operating continuously, it may also be used to satisfy the requirements of 4.3.3 by, for example, use of a higher flash rate when signals are being emitted.

The light shall be mounted so that it is visible over as great a portion of the upper hemisphere as is practical.

5.3.7 (A.812(19)/A.2.4.10) *be capable of being tested without using the satellite system, to determine that the EPIRB is capable of operating properly.*

5.3.8 (A.812(19)/A.2.4.4) *be continuously provided with the ship's position data for automatic inclusion in the distress message when activated.*

5.3.9 (A.812(19)/A.2.2) *The satellite EPIRB shall be an automatic float-free type.*

5.3.10 (A.694(17)/1.2) *Where a unit of equipment provides a facility which is additional to the minimum requirements of this* standard such as a homing function, *the operation, and as far as is reasonably practicable, the malfunction of such additional facility* shall not degrade the requirements of this standard. Such an additional facility shall, as a minimum, meet the requirements of 4.1 of IEC 60945 as applicable. If the additional facility is a homing device on 121,5 MHz, it shall meet the requirements of annex B.

Where such an additional facility exists it shall not prevent the satellite EPIRB from fully conforming to the requirements of this standard during normal combined operation.

Any and all such additional facilities where fitted shall be simultaneously activated at the same time as the EPIRB is activated.

5.4 Manual distress alert initiation

5.4.1 (A.812(19)/A.3.1) *When the satellite EPIRB is manually operated, a distress alert shall be initiated only by means of a dedicated distress alert activator.*

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(A.812(19)/A.3.2) *The dedicated activator shall:*

1 be clearly identified; and

2 be protected against inadvertent operation.

5.4.2 (A.812(19)/A.3.3) Both the *manual distress alert activation* and the deactivation shall *require at least two independent actions.*

5.4.3 (A.812(19)/A.3.4) *The satellite EPIRB* shall *not be automatically activated after being manually removed from the release mechanism.*

5.4.4 (A.812(19)/A.2.7.1) Where *remote activation is provided from the navigating bridge, while the satellite EPIRB is installed in the float-free mounting, a distress alert* shall *be initiated only by means of a dedicated distress button. This button* shall *not be any key of an ITU-T digital input panel or an ISO keyboard provided on the equipment.* (A.807(19)/3.3)

1 (A.807(19)/A.3.4) The remote activation *dedicated distress button* shall*:*

   a) *be clearly identified; and*

   b) *be protected against inadvertent operation.*

2 (A.807(19)/A.3.5) The distress alert initiation by the remote activator shall require at least two independent actions.

3 (A.807(19)/A.3.6) The remote activator shall indicate the status of the distress alert transmission.

4 (A.807(19)/A.3.7) It shall be possible to interrupt and initiate distress messages at any time.

5 It shall also be possible to check the satellite EPIRB from the remote initiator (see 5.3.7).

5.5 Float-free arrangements

5.5.1 (A.812(19)/A.2.3) The performance of the float-free arrangements shall be in accordance with the requirements of the performance standards for float-free release and activation arrangements for emergency radio equipment set out in resolution A.662(16).

5.5.2 (A.812(19)/A.2.7.3) (A.662(16)/A.2.1) *The float-free arrangement* shall *be designed so that the release mechanism shall operate before reaching a depth of 4 m in any orientation.*

5.5.3 (A.662(16)/A.2.4) *The float-free arrangement* shall *be constructed to prevent release when seas wash over the unit.*

5.5.4 (A.662(16)/A.3) *For* a satellite EPIRB *requiring an external power or data connection, or both, the means of connection* shall not inhibit the release from the release mechanism *or activation* of the satellite EPIRB.

5.6 Transmission delay on activation

Transmission shall not occur until the requirements of this standard and especially the short term frequency stability requirements have been met. Moreover, the first transmission shall not start until at least 2 min after activation (to allow for manual deactivation in the event of inadvertent activation). The indication of activation on the EPIRB shall begin immediately on activation. The first transmission shall occur no later than 8 min after activation.

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5.7 Satellite signal frequency

5.7.1 (R M.632-2) *Until all satellites of the Inmarsat first generation space segment (spare and operational) are completely replaced, all types of L-Band satellite EPIRBs shall transmit sequentially in both the frequency bands:*

– *1 645,6 MHz – 1 645,8 MHz, the Inmarsat 2nd and future generation space segment; and*

– *1 644,3 MHz – 1 644,5 MHz, the Inmarsat 1st generation space segment.*

The order of transmission shall *be, first the 2nd generation frequency band and next the 1st generation frequency band.*

After complete replacement of the 1st generation Inmarsat space segment (as notified by Inmarsat), all new designs of L-Band satellite EPIRBs shall *be limited to transmissions between 1 645,6 MHz – 1 645,8 MHz.*

(A.812(19)/B.1) *The satellite EPIRB shall include facilities to transmit in the 1 644,3 – 1 644,5 MHz frequency band and after full implementation of the second generation Inmarsat space segment, in the frequency band 1 645,5 – 1 646,5 MHz only. Alternatively, the satellite EPIRB distress alert may be transmitted sequentially in the 1 644,3 – 1 644,5 MHz frequency band and the 1 645,5 – 1 646,5 MHz frequency band. After full implementation of the second generation Inmarsat space segment, the emission shall be limited to the frequency band 1 645,5 – 1 646,5 MHz only.*

(R M.632-2/appendix 3.1) *The duration of each transmission period* shall *initially be 10 minutes. However, when all satellites of the Inmarsat first generation (spare and operational) have been completely replaced, the minimum overall transmission duration for each burst can be reduced to 5 minutes in the distress and safety band 1 645,5 to 1 646,5 MHz.*

(Report ITU-R 1178/2.2) *In order to efficiently utilize the spectrum and to provide for future distress and safety applications in this band, the 1,6 GHz satellite EPIRB system* shall *be implemented in a 200 kHz sub-band, preferably near the lower band edge, allowing a maximum contiguous spectrum availability for growth and new future applications.*

NOTE 1 – Inmarsat has now declared (1997-03-10) that the Inmarsat first generation space segment (spare and operational) has been completely replaced and that henceforth, all Inmarsat-E EPIRBs submitted to Inmarsat for type approval will be permitted to transmit in the frequency band from 1 645,6 MHz to 1 645,8 MHz only. With effect from 1 June 1997, it will be mandatory for Inmarsat-E EPIRBs submitted for type approval to transmit in the band 1 645,6 MHz to 1 645,8 MHz only.

NOTE 2 – The duration of each transmission period in the band from 1 645,6 MHz to 1 645,8 MHz shall be 5 min.

5.7.2 The radio frequency of operation of the equipment shall at all times be within the limits defined by the Radio Regulations and R M. 632/Annex 1. These are:

Long term accuracy (1 year):	better than $\pm 3 \times 10^{-6}$
Short term stability (1 min):	2×10^{-8}

5.8 (A.812(19)/B.2) Technical characteristics and message format

The technical characteristics of the transmitted signal and the message format shall *be in accordance with R M.632* and the Inmarsat-E SDM.

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5.9 Distress message

The system code shall be stored in such a way that it will not be affected by removal of all power sources.

5.10 (A.812(19)/B.3) Ship station identity

For the 9 digit ship station identity part of the distress message, the Inmarsat-E EPIRB system code shall be used. *The system code* shall *be made part of all messages.*

(A.812(19)/B.2) *The binary system codes on the satellite radio path and its decimal representations are used for in-system control, commissioning and registration. The system code is fixed into the Inmarsat-E EPIRB and protected through its entire life against any unauthorised change.*

5.11 Test facilities

The equipment under test (EUT) shall include the following test facilities:

5.11.1 Distress alert transmitter minimum test facility

The satellite EPIRB shall include a manually activated test facility (see 5.3.7). This test facility shall, as a minimum, activate a normal distress alert transmission but of less than 5 s duration to ensure that no distress alert can be processed at the receiving site. The transmission shall be on the allocated initial operational frequency. For the purpose of type testing, and until further notice by Inmarsat, the operational frequency shall be 1 645 799 800 Hz (channel 666). During this transmission, the battery voltage, transmitter output power and frequency lock shall be verified.

5.11.2 Distress alert transmitter message content test facility

Optionally, an additional test facility may be incorporated in the satellite EPIRB but which is not readily accessible to the operator, whereby, as a minimum, the system code and message content can be verified by use of an external receiver. As this test is, of necessity, of a duration longer than 5 s, it shall be on the test frequency to avoid processing a distress alert at the receiving site. The test frequency shall be 1 645 600 000 Hz (channel 000).

5.11.3 Homing transmitter test facility

If the satellite EPIRB includes a homing transmitter operating on 121,5 MHz, test facilities to verify the correct functioning of this homing transmitter shall be provided.

5.11.4 SART test facility

If the satellite EPIRB includes a 9 GHz SART, test facilities to verify the correct functioning of this SART shall be provided, e.g. by using the ship's radar.

5.11.5 Low duty cycle light test facility

The satellite EPIRB shall include test facilities so that the correct functioning of the low duty cycle flashing light can be verified.

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5.11.6 EPFD test facility

If the satellite EPIRB includes an integral facility for automatic updating of the position, test facilities to verify the position information shall be provided. An output shall be provided to permit this.

5.11.7 The test facilities in 5.11.1 to 5.11.6 may be combined or not.

5.12 Modulation, frequency shift and coding

(R M.632-2/Annex 1) *The carrier frequency* shall *be modulated with NRZ-L data coding at a modulation rate of 32 baud with a frequency shift of ±120 Hz in non-coherent binary frequency shift keying (FSK). The FSK switching time* shall *be 80 % transmit power within 1,5 ms.*

5.13 (R M.632-2 Annex 1) Antenna characteristics

1 *Gain : 0 dBi nominal*

2 *Pattern : hemispherical*

3 *Axial ratio : ≤5 dB for ±90° from zenith and 0° to 360° in azimuth.*

4 *Polarization : right-hand circular.*

5.14 (R M.632-2 Annex 1) Radiated and output power

Transmit power (eirp) – 0 dBW with tolerance +2 to –3 dB.

5.15 (R M.632-2 Annex 1) Total transmission duration

Total transmission duration: 40 min (20) for category I, namely 4 × 10 (5) min. *150* (75) *min* for category II, namely 15 × 10 (5) min.

NOTE – The figures in brackets, above, are for the second generation space segment.

5.16 (R M.632-2 Annex 1) Duty cycle

(Appendix 3/1-2) *The duration of each transmission period shall initially be 10 min. However, when all satellites of the Inmarsat first generation (spare and operational) have been completely replaced, the minimum overall transmission duration for each burst can be reduced to 5 min in the distress and safety band 1 645,5 to 1 646,5 MHz. Once all first generation satellites have been retired, EPIRBs will only be required to transmit in the distress and safety band (1 645,5 – 1 646,5 MHz). Until that time satellite EPIRBs shall transmit sequentially for 5 min on each of the frequency bands 1 645,5 MHz to 1 646,5 MHz and 1 644,3 MHz to 1 644,5 MHz in that order.*

(Appendix 3/7) *Where an EPIRB contains integral facilities for position updating the total transmission duration may be extended to 150 (75) min by means of a further ten 10 (5) min transmission every four hours resulting in a total operational period of 48 h and 10 (5) min; the first of these additional bursts commencing 480 min after the commencement of transmission from the EPIRB.*

NOTE 1 – Inmarsat has now declared (1997-03-10) that the Inmarsat first generation space segment (spare and operational) has been completely replaced and that henceforth, all Inmarsat-E EPIRBs submitted to Inmarsat for type approval will be permitted to transmit in the frequency band from 1 645,6 MHz to 1 645,8 MHz only. With effect from 1 June 1997, it will be mandatory for Inmarsat-E EPIRBs submitted for type approval to transmit in the band 1 645,6 MHz to 1 645,8 MHz only.

NOTE 2 – The duration of each transmission period in the band from 1 645,6 MHz to 1 645,8 MHz shall be 5 min.

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5.17 Power source

5.17.1 (A.812(19)/A.2.5) The *battery* shall *have sufficient capacity to operate:*

(A.812(19)/A.2.5.1) *the distress alerting transmitter for 4 h in accordance with Recommendation ITU-R M.632-2 where no facilities for automatic updating are included, or for at least a nominal 48 h if integral facilities are included for automatic position updating,* and:-

(A.812(19)/A.2.5.2) *any other facilities (e.g. SART or homing device if fitted, and flashing light) for at least 48 h.*

5.17.2 The life of the battery as defined by its expiry date shall be at least three years.

The expiry date of the battery shall be the battery manufacturing date plus no more than half the useful life of the battery.

5.17.3 The useful life of the battery is defined as the period of time after the date of battery manufacture that the battery will continue to meet the input power requirements of the satellite EPIRB (see 5.17.1).

To define the useful life of the battery, the following losses at a temperature of 20 °C ± 5 °C shall be included:

a) self discharge of the battery;

b) standby loads;

c) self testing, as recommended by the manufacturer or as required by the Administration, whichever is more demanding.

5.17.4 If the EPIRB is designed to be powered from the ship's power supply when activated whilst still in the release mechanism, there shall be an automatic switch-over to the internal battery if the ship's power supply fails. After release the EPIRB shall derive its energy from the battery forming part of the equipment.

5.17.5 Switch-over between ship's power supply and internal battery shall not generate any spurious activation or deactivation.

5.17.6 Provision shall be made so that once the power source capacity (ship's power supply or internal battery) is insufficient to support operation of the EPIRB within the specified performance limits all transmissions shall be inhibited or stopped. An indication that this has occurred shall be given.

5.18 Environment

5.18.1 (A.812(19)/A.2.2) *The equipment* shall *be reliable even under extreme conditions*.

(A.812(19)/A.2.6) *The satellite EPIRB* shall *be so designed as to operate under any of the following environmental conditions:*

1 *ambient temperatures of –20 °C to +55 °C*;

2 *icing* (see 5.18.4);

3 *relative wind speeds up to 100 knots;*

4 *after stowage at temperatures between –30 °C and +70 °C*;

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5 (A.812(19)/A.2.4.9) *be capable of being dropped into the water without damage from a height of 20 m;*

6 (A.812(19)/A.2.7.2) *be capable, while mounted on board a ship, of operating properly over the ranges of shock and vibration and other environmental conditions normally encountered above deck on sea-going vessels;*

7 (A.812(19)/A.2.4.14) *including the labelling, not be unduly affected by seawater or oil or both; and*

8 (A.812(19)/A.2.4.15) *be resistant to deterioration caused by prolonged exposure to sunlight.*

5.18.2 (A.662(16)/2.2) The float-free arrangement shall *be capable of operating manually throughout the temperature range of –30 °C to +65 °C.*

5.18.3 (A.662(16)/2.6) The float-free arrangement shall *be capable of operating properly after exposure to shock and vibration and other severe environmental conditions encountered above deck on seagoing vessels.*

5.18.4 (A.662(16)/2.7) The float-free arrangement, *if the ship navigates in areas where icing may be expected, be so designed as to minimize the formation of ice and prevent its effects from hindering the release of the satellite EPIRB as far as practicable.*

5.19 Safety precautions

The equipment shall comply with the requirements of 7.3 and 7.4 of A.694(17).

5.20 Interference EMC

The equipment shall comply with the requirements of 6.1 of A.694(17).

5.21 Compass safe distance

The equipment shall comply with the requirements of 6.3 of A.694(17).

6 Methods of testing and required test results

6.1 General

6.1.1 Tests shall normally be carried out at test sites nominated by the type approval authority. The manufacturer shall, unless otherwise agreed, set up the equipment and ensure it is operating normally before testing commences.

If the test site selected by the type approval authority is also an accepted Inmarsat test facility, both series of tests may be combined.

6.1.2 For performance tests, electrical power shall normally be supplied by the battery which forms part of the equipment. For type approval tests, a minimum of three sets of normal batteries shall be submitted.

The normal batteries shall be replaced by a test power source for the following performance tests: 8.3 (Antenna characteristics, radiation and output power), 8.5 (transmitter, all tests) and annex B.

Such a test power source shall be capable of producing the normal and extreme test voltages as specified in 6.7.2.

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6.1.3 During testing all indications including the low duty cycle light (see 5.3.6) shall be operational.

6.1.4 Adequate information shall be provided to enable the equipment to be properly set up, maintained and operated during the type testing.

6.2 Test frequency

For the purpose of type-testing, until further notice by Inmarsat, the equipment shall be set to transmit on the test frequency 1 645 799 800 Hz.

6.3 (5.3.10) Additional facilities

If the equipment contains any additional facilities they shall be operational for all satellite EPIRB measurements and shall all be switched on when the EPIRB is activated.

6.4 Test arrangements

The manufacturer shall obtain a system code from Inmarsat.

All homing devices shall be prepared for test transmission as required by the national authority. Care shall be taken not to transmit distress signals on distress and safety frequencies.

For the purposes of measurement of output power and spurious emissions etc., the manufacturer may either elect to supply the satellite EPIRB submitted for test with the antenna port configured to enable it to be terminated via a coaxial cable in a 50 Ω load or shall supply a screened external test fixture to pick up the radiated signal permitting relative measurements to be made.

A radio frequency termination shall be provided, with a 50 Ω impedance at the working frequency of the EUT and with the following characteristics:

a) the coupling loss shall be as low as possible and in no case greater than 30 dB;

b) the variation of coupling loss with frequency shall not cause errors in measurement exceeding 2 dB;

c) the coupling device shall not incorporate any non-linear elements;

d) the power consumption of the satellite EPIRB shall not substantially change when fitted in the test fixture.

Any connections provided on the equipment in order to facilitate relative measurements to be made shall not affect the performance of the equipment either in the test fixture or when making measurements involving the use of radiated fields.

The manufacturer of the test fixture shall provide guidance as to the minimum distance the test fixture can be operated from other metallic objects without a significant effect being caused to the results obtained (e.g. the minimum size of environmental chamber needed will depend on this).

If the manufacturer elects to test by using a special configuration of the antenna port to enable termination by a 50 Ω load this shall be done prior to the first test or before 8.3 Antenna measurements, radiation and output power measurements and 8.5 transmitter (all tests).

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6.5 Test conditions

Tests shall be carried out under normal test conditions, unless otherwise specified.

6.6 Normal test conditions

6.6.1 Normal temperature and humidity

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

Temperature: +15 °C to +35 °C

Relative humidity: 20 % to 75 %

6.6.2 Normal test voltage

The normal test voltage shall be determined in each case and shall be the voltage corresponding to the voltage that the power source gives under normal temperature and humidity at a load equal to that of the equipment.

6.7 Extreme test conditions

6.7.1 Extreme test temperatures

For tests at extreme temperatures, measurements shall be made in accordance with the procedure specified in IEC 60945 for portable equipment (–20 °C and +55 °C, storage –30 °C and +70 °C except as required in 5.18.2 for the release mechanism which shall operate at –30 °C).

6.7.2 Extreme test voltages

a) Upper extreme test voltage

The EPIRB, fitted with an unused power source, shall be placed in the climatic chamber and heated to a temperature of +55 °C allowing for a stabilizing period of 2 h. The EPIRB shall be switched on for a period of 10 min. At the conclusion of this period, the power source voltage shall be measured during a 1 645 MHz transmission. This voltage shall be taken as the upper extreme test voltage for subsequent testing.

b) Lower extreme test voltage

The lower extreme test voltage shall be the voltage corresponding to the minimum voltage that the power source gives at 20 °C after having supplied a load current equal to the maximum drawn by the equipment for 48 h of operation (see 5.17.1).

6.8 Climatic control systems

Any climatic control system included in the EUT shall normally be switched on except as in 8.2.1 of IEC 60945 dry heat storage test and 8.4.1 low temperature storage test.

6.9 Test sequence

Normally tests are performed on more than one equipment; one equipment shall be used for tests A.1.1 to A.1.14 of annex A and another or other ones for tests A.2.1 to A.2.6. Where tests are performed on a single equipment, they shall be carried out in the order described in annex A.

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6.10 Performance check

A performance check consists of activating the test facility (5.11.1 and 5.11.3 to 5.11.6 as applicable) and a check that the equipment has not been inadvertently activated, if in the standby mode during the test.

6.11 Performance test

A performance test consists of:

– activation of the minimum test facility (see 5.11.1);

– a measurement of the carrier frequency of the emission, by using the test fixture and the method of measurement specified in 8.5.1;

– a measurement of the transmitter output power by using the test fixture. The transmitter output power shall be within +2 dB and –3 dB of the power measured in 8.3.2 adjusted with the coupling loss of the test fixture;

– a check of the position information, if an automatic position updating facility is included. The position information shall be within ±1 nm of the correct, calibrated position of the test site;

– a check of the triggering of the 9 GHz radar transponder, if included, when interrogated by a signal corresponding to a 9 GHz radar signal with a level 6 dB above the sensitivity level of the transponder;

– a check of the carrier frequency of the 121,5 MHz transmitter, if included. The carrier frequency shall be 121,5 MHz ± 50 ppm;

– a check of the capability of the remote control unit, if included, to activate the satellite EPIRB;

– a check that the equipment has not been activated, if in the standby mode;

– a check that the equipment has not been deactivated if in the activated mode.

6.12 Performance criteria

Performance criteria are defined for use when carrying out the immunity tests.

Performance criterion A: Successful performance test during and after the test.

Performance criterion B: Successful performance check during the test and successful performance test after the test.

Performance criterion C: Successful performance test after the test.

6.13 Measurement uncertainty

Absolute measurement uncertainty:	maximum values
RF frequency	$\pm 1 \times 10^{-7}$ absolute
	$\pm 1 \times 10^{-9}$ short term over 10 min
RF power	±0,75 dB
Frequency deviation	±5 %
Radiated emission	±6 dB

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7 Environmental tests

7.1 General

7.1.1 Environmental tests are intended to assess the suitability of the construction of the equipment for its intended physical conditions of use. They are performed in accordance with IEC 60945 as applicable.

7.1.2 After each environmental test the equipment shall be inspected for any mechanical deterioration and/or water penetration. However, subject to a satisfactory performance check, the opening to check for water ingress may be delayed until completion of all environmental tests.

7.1.3 Before commencing the first environmental test and after each environmental test, a performance check or test shall be made (6.10 and 6.11). The number and timing of performance checks or tests shall be as defined for each test in this standard, in line with the requirements of IEC 60945.

7.1.4 The remote control unit, if part of the EUT, may be tested separately from the satellite EPIRB but connected to it.

7.2 (5.18.1.1) Dry heat (Satellite EPIRB, release mechanism and remote control unit)

The test shall be in accordance with 8.2.1 and 8.2.2 of IEC 60945, except that the release mechanism shall be tested for manual release at +65 °C.

7.3 (5.18.1.1) Damp heat (Satellite EPIRB, release mechanism and remote control unit)

This test shall be in accordance with 8.3 of IEC 60945.

7.4 (5.18.1.1) Low temperature (Satellite EPIRB, release mechanism and remote control unit)

This test shall be in accordance with 8.4.1 and 8.4.2 of IEC 60945, but taking into account the additional requirements of 6.7.1 of this standard. This test can be combined with the test in 8.2.

7.5 (5.3.1) Thermal shock (Satellite EPIRB only)

This test shall be in accordance with 8.5 of IEC 60945.

7.6 (5.3.1) Immersion (Satellite EPIRB only)

This test shall be in accordance with 8.9.2 of IEC 60945.

7.7 (5.18.1.5) Drop test into water (Satellite EPIRB only)

This test shall be in accordance with 8.6.2 of IEC 60945.

7.8 (5.18.1.6) Vibration (Satellite EPIRB, release mechanism and remote control unit)

This test shall be in accordance with 8.7 of IEC 60945. The satellite EPIRB shall not release from its mounting arrangement nor shall it automatically activate during the vibration test.

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7.9 (5.18.1.6) Ruggedness (Satellite EPIRB and release mechanism)

7.9.1 Purpose

The ruggedness test is conducted to give a measure of confidence that the equipment will meet service conditions.

7.9.2 Method of test

The satellite EPIRB shall be secured to the testing equipment through its normal attachments or mounting intended for use in service conditions and mounted in the normal operating position(s). Additional straps or other holding means shall not be used.

The satellite EPIRB shall be subjected to a bump test according to the following:

Peak acceleration	: 98 m/s^2 ± 10 %
Pulse duration	: 16 ms or 20 ms ± 10 %
Wave shape	: half-cycle sine wave
Test axis	: vertical
Number of bumps	: 4 000

7.10 Rain

For this test see 8.1.9.

7.11 (5.18.1.8) Solar radiation (Satellite EPIRB and release mechanism)

This test shall be in accordance with 8.10 of IEC 60945, except that the test shall be waived where the manufacturer is able to produce evidence that the components, materials and finishes employed in the equipment would satisfy the test.

7.12 (5.18.1.7) Oil resistance (Satellite EPIRB and release mechanism)

This test shall be in accordance with 8.11 of IEC 60945, except that the test shall be waived where the manufacturer is able to produce evidence that the components, materials and finishes employed in the equipment would satisfy the test.

7.13 (5.18.1.7) Corrosion (Satellite EPIRB, release mechanism and remote control unit)

In accordance with 8.12 of IEC 60945, except that the test shall be waived where the manufacturer is able to produce evidence that the components, materials and finishes employed in the equipment would satisfy the test. The produced evidence shall include indication of compliance with 4.4.1.

7.14 Safety criteria for batteries

As an alternative to the documentation required by 4.6.3.

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There shall not be any leaking, venting, explosion or fire outside the satellite EPIRB due to the following battery related cause:

a) (thermal shock) during or subsequent to storage for 48 h at a temperature of +70 °C, followed by storage for 6 h at a temperature of –30 °C, followed by a storage of at least 24 h at room temperature;

b) during a full or partial discharge at any rate up to and including an internal or external short circuit; and

c) during a charge or forced discharge of a cell or cells by another cell or cells within the battery.

8 Tests of technical characteristics

8.1 (5.4.3) General

The purpose of the test is to demonstrate that removal of the EPIRB from the release mechanism does not cause activation and that at least one further action or event is necessary to cause activation.

8.1.1 (5.4.3) If the function of the activation indicator is combined with the low duty cycle, the test is included in 8.1.3.

8.1.2 (5.4.3) If there is a separate indicator, the test is covered by 4.3.3.

8.1.3 (5.3.6) Low duty cycle light

8.1.3.1 Method of test

The effective luminous intensity and flash rate shall be checked at the normal temperature and at the extreme temperatures. The effective luminous intensity shall be defined by the following formula as indicated in 10.2.2 of resolution A.689(17):

$$\frac{\int_{t_1}^{t_2} i \, \mathrm{d}t}{0{,}2 + (t_2 - t_1)}$$

where

i is the instantaneous intensity

0,2 is the Blondel-Rey constant

t_2, t_1 are the time limits of integration in seconds

8.1.3.2 Results required

The effective luminous intensity shall be at least 0,75 candela. The flash rate shall be at least 20 per minute with a flash duration of between 10^{-6} s and 1 s. The low duty cycle light shall be visible over at least 75 % of the horizontal plane, but may have a cone, whose angle of elevation is not greater than 30°, of lower effective luminous intensity in the vertical direction.

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8.1.4 (5.3.4) Stability

8.1.4.1 Method of test

With the antenna deployed in its normal operating position the satellite EPIRB shall be submerged in fresh water, rotated to a horizontal position about any axis, just below the surface and released.

8.1.4.2 Results required

The antenna of the satellite EPIRB shall pass through an upright position within 2 s.

8.1.5 (5.3.4) Buoyancy

8.1.5.1 Method of test

The satellite EPIRB shall be placed in fresh water and one of the two following methods applied:

a) The complete unit shall be submerged and the buoyant force shall be measured with a scale. The buoyant force shall be divided by the weight of the unit.

b) The position of the waterline shall be determined on the floating satellite EPIRB. The calculated or measured volume of the unit above waterline shall be divided by the calculated or measured volume of the unit below the waterline.

8.1.5.2 Results required

The result shall be at least 0,05.

8.1.6 (5.3.7/5.11) Manual test facility

8.1.6.1 Method of test

The manually operated minimum test facility shall be operated and the resultant emission checked for operation on the operational frequency which for the purpose of this test is the test frequency (see 6.2) for a transmit duration of less than 5 s, even if the test mode has been kept activated. Transmission shall terminate automatically, even if the test function is kept activated. After the test, the EPIRB shall automatically return to normal mode.

The emission check shall be carried out by means of a suitable radio frequency test receiver.

8.1.6.2 Results required

The transmission shall occur on the type test frequency 1 645 799 800 Hz (see 6.2) with an accuracy of ±300 Hz and a duration of less than 5 s.

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8.1.7 (5.5.2) Depth of release of the equipment

8.1.7.1 Method of test (normal temperature)

The satellite EPIRB installed in the automatic release mechanism shall be submerged in water, at normal temperature for all tests. The water temperature shall be noted. The six tests at normal temperature shall be performed with the equipment rotated each time and may be performed in any sequence:

– normal mounting position;
– rolling 90° to starboard;
– rolling 90° to port;
– pitching 90° bow down;
– pitching 90° stern down;
– upside-down position.

8.1.7.2 Results required

The satellite EPIRB shall be automatically released in any orientation, and float free of the mounting before reaching a depth of 4 m or at a water pressure equivalent to that depth, namely 40 kPa.

8.1.7.3 Purpose of test (extreme cold temperature)

The test of operation under extreme temperature conditions is to test satisfactory operation after being subjected to the extreme lower temperature of –30 °C followed by submersion in water at normal temperature as given above. This test shall be performed in the normal mounting position only.

The opening of the satellite EPIRB to check for water ingress may be delayed until the completion of all tests provided a performance check (see 6.10) is successful immediately following each test. Care should be taken that the difference between the extreme lower temperature and the water temperature does not exceed 45 K, which is the requirement for the thermal shock test of the satellite EPIRB. When the test required at extreme temperature cannot be carried out within the environmental chamber, other methods may be used which approximate to the required conditions.

8.1.8 (5.5.4) Safe release of the equipment

This test is covered by 8.1.7.

8.1.9 (5.5.3) Protection against release of the equipment

The test simulates the effect of seas washing over the equipment.

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8.1.9.1 (A.689(17)/5.12) Method of test

The unit consisting of the satellite EPIRB and its release mechanism installed in its bracket, if any, shall be mounted successively in each method intended for mounting on a ship, as described in the manufacturer's instructions. A stream of water from a hose shall be directed at the unit for a period of 5 min. The nozzle of the hose shall have a nominal diameter of 63,5 mm and a water delivery rate of approximately 2 300 l per minute. The end of the nozzle shall be 3,5 m away from the satellite EPIRB and 1,5 m above the base of the antenna. The nozzle or the unit shall be moved during the test, so that water strikes the satellite EPIRB in an arc of at least 180° perpendicular to the normal mounting position of the unit.

8.1.9.2 Results required

The satellite EPIRB shall not release from its bracket nor shall it automatically activate as a result of the water from the hose stream.

8.2 (5.17.1, 5.17.2) Power source capacity test at low temperature

The power source shall be able to supply the full demands of the equipment for the required 48 h and also the demands of manual testing and battery self discharge.

8.2.1 Method of test

The test shall be performed at –20 °C as in 6.7.1.

At the commencement of the test a fresh battery pack shall be used to activate the satellite EPIRB (at ambient temperature), for a period of time as stated by the manufacturer to be equivalent to the loss of battery capacity due to self-testing, as well as battery pack self-discharge during the useful life of the battery pack (see 5.17.2). The manufacturer shall document the method used to determine this time.

The battery duration test at low temperature (–20 °C) shall then be carried out. The detail of this test shall be as in 8.4 of IEC 60945. Following this, the battery shall be discharged to the point where it has insufficient capacity to support operation of the EPIRB within the specified limits as declared by the manufacturer.

8.2.2 Results required

It shall be confirmed that an indication is given when the battery is discharged to the point where it has insufficient capacity as specified by the manufacturer and that this occurs not earlier than 48 h after the beginning of the test (see 5.17.6). This test can be combined with 7.4.

8.3 (5.13/5.14) Antenna characteristics, radiated and output power

8.3.1 Radiated power

This test and the measurement of the reference output power (8.3.2) shall be performed immediately after each other without switching off the satellite EPIRB between measurements.

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8.3.1.1 Method of test

The measurement shall be performed with the equipment mounted in a special mounting consisting of a reference ground plane to simulate the normal operating position.

The special mounting shall consist of a circular ground plane of highly conductive material of at least eight wavelengths (1,5 m) in diameter, mounted 0,75 m ± 0,1 m above ground. The ground plane shall have a circular central aperture to permit the EPIRB to be mounted with its proper float line in the same plane as the ground plane. Adequate screening shall be provided to ensure that radiation only occurs above the float line.

The radiated signal shall be measured at a distance of at least eight wavelengths at the frequency of the emission being measured from the antenna of the satellite EPIRB. It shall be possible to vary the measuring antenna position so as to enable measurements at elevation angles between 0° up to 90°. The strength of the received signal shall be measured by means of a right hand circular polarised (RHCP) receive antenna connected to a detector/receiver suitably corrected for any change of distance between the EPIRB and the measuring antenna. For 0° and 45° elevation, the EPIRB shall be rotated through 360°. The signal strength for each measured position shall be recorded, together with the maximum and minimum values.

The output from the right hand circular polarised receive antenna shall then be replaced by a signal fed from a calibrated RF source through the measuring antenna cable to the detector. The output of the signal source shall be set to each of the recorded values and the equivalent eirp noted.

8.3.1.2 Results required

The eirp shall be within the limits of 0 dBW + 2 dB and – 3 dB eirp.

8.3.2 Reference output power

The reference output power of the EPIRB is the power measured at normal ambient either into a 50 Ω load or into the test fixture as provided by the manufacturer. This reference output power (Pr) shall be used to check relative performance under extreme test conditions.

8.4 (5.18.1) Output power under extreme test voltage

8.4.1 Method of test (upper extreme)

With the test voltage set to the upper extreme test voltage as determined in 6.7.2 the output power shall be measured either into a 50 Ω load or into the test fixture provided by the manufacturer (see 6.4).

8.4.2 Results required

The power measured shall be within +2 dB and –3 dB of the value Pr determined in 8.3.2 after allowing for any variation of radiated power as measured in 8.3.1.

8.4.3 Method of test (lower extreme)

With the test voltage set to the lower extreme test voltage as determined in 6.7.2 the output power shall be measured either into a 50 Ω load or into the test fixture provided by the manufacturer (see 6.4).

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8.4.4 Results required

The power measured shall be within +2 dB and –3 dB of the value Pr determined in 8.3.2 after allowing for any variation of radiated power as measured in 8.3.1.

8.5 Transmitter

All tests in this subclause are performed either using the test fixture (see 6.4) or alternatively with the EPIRB configured to terminate the transmitter output in a 50 Ω load if this is offered by the manufacturer.

8.5.1 (5.7.2) Frequency stability

8.5.1.1 Method of test

The nominal transmitted frequency shall be set initially to the test frequency 1645 799 800 Hz as in 6.2. Alternatively the EPIRB may be set to generate all “1”s (or all “0”s) in which case the frequency shall be the type test frequency +120 Hz (or –120 Hz).

The long term stability shall be checked by inspection of documentation. The short term stability shall be measured over a period of at least 5 min.

The transmitter output shall be checked, for instance by means of a spectrum analyzer. In this case the input impedance of the spectrum analyzer shall be 50 Ω. The centre frequency of the spectrum analyzer shall be the nominal satellite EPIRB carrier frequency. The resolution of the test set-up shall be sufficient to allow measurement of the side-band frequencies. This measurement shall be repeated during the 4th transmission period.

8.5.1.2 Results required

The long term transmitted frequency, as demonstrated by the submitted documentation, shall be better than $\pm 3 \times 10^{-6}$ per year. The short term stability, as measured after the warm up time (see 5.6), shall be equal or better than 2×10^{-8} per min.

8.5.2 (5.12) Frequency shift

8.5.2.1 Method of test

For the purpose of this test, two special test signals shall be generated. These test signals shall comprise all “1”s and all “0”s in order to verify the correct frequency shift of the modulated signal. A frequency counter connected to the output of the transmitter shall be used to measure the upper and lower frequencies. The frequency shift is the difference between the two measured frequencies.

8.5.2.2 Results required

The frequency shift shall be 240 Hz ± 2,4 Hz.

8.5.3 Bit clock accuracy

8.5.3.1 Method of test

The bit clock accuracy shall either be checked by reference to manufacturer documentation, where the bit clock is derived from the EPIRB frequency source, or measured as agreed between the manufacturer and the test authority.

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8.5.3.2 Results required

The bit clock accuracy shall be $\geq 2 \times 10^{-6}$ per year.

8.6 (5.8) Signal format

The signal format shall be defined as in ITU-R M. 632-2 Appendix 1 of annex 1 and as detailed hereunder. All tests in this subclause are performed using the test fixture (see 6.4) or alternatively a 50 Ω resistive termination, if this is offered by the manufacturer.

8.6.1 Transmission period

The transmission period is measured as the time between start and stop transmission in the two frequency bands for first and second generation Inmarsat satellites.

NOTE 1 – Inmarsat has now declared (1997-03-10) that the Inmarsat first generation space segment (spare and operational) has been completely replaced and that henceforth, all Inmarsat-E EPIRBs submitted to Inmarsat for type approval will be permitted to transmit in the frequency band from 1 645,6 MHz to 1 645,8 MHz only. With effect from 1 June 1997, it will be mandatory for Inmarsat-E EPIRBs submitted for type approval to transmit in the band 1 645,6 MHz to 1 645,8 MHz only.

NOTE 2 – The duration of each transmission period in the band from 1 645,6 MHz to 1 645,8 MHz shall be 5 min.

8.6.1.1 Method of test

The transmission period is measured as the time between start and stop of one continuous transmission on the frequency band.

8.6.1.2 Results required

The total duration of each transmission shall be 5 min ± 1 %, in each frequency band.

8.6.2 Message format

The message format shall be as given in ITU-R M.632-2 Annex 1, tables 2 and 4 of appendix 1.

8.7 (5.18.1) Antenna mismatch

Either the following test shall be carried out, or the manufacturer may be invited to offer an alternative, provided it can be shown to be equivalent or more severe. The equipment whilst transmitting shall be immersed in salt water (nominal 3,5 % solution) to a depth of 10 cm below the surface, measured from the highest point of the equipment to the surface of the water, for the duration of one transmission period.

After completion of the test a performance check shall be carried out to show the equipment is still operational.

9 Safety

9.1 Electromagnetic RF radiation

The test shall be in accordance with 12.2 of IEC 60945 except that the test shall be waived where the manufacturer has produced evidence as required by 4.7.

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9.2 Safety test for VDU

If applicable, e.g. for the remote control panel, the test shall be in accordance with 12.3 of IEC 60945 except that the test shall be waived where the manufacturer is able to produce evidence that the VDU would satisfy the test.

9.3 Safety test for X radiation

The test shall be in accordance with 12.3 of IEC 60945 except that the test shall be waived where the manufacturer is able to produce evidence that the equipment would satisfy the test.

10 (4.9/5.21) Compass safe distance

The test shall be in accordance with 11.2 of IEC 60945 with the satellite EPIRB activated.

The compass safe distance for both the EPIRB and its release mechanism and for the remote control if fitted, shall be noted, indicated on the label or labels (see 4.9) and published in the handbook for the EPIRB.

11 Unwanted electromagnetic emission

11.1 Radiated emission

This measurement shall be carried out both with the EUT activated and not activated.

11.1.1 Method of test (EPIRB not activated)

The EPIRB shall be mounted in its release mechanism connected via its normal interface to an external power supply as specified by the manufacturer. A search shall be made for any spurious emissions in the bands 108 MHz – 137 MHz, 156 MHz – 174 MHz, 406 MHz – 406,1 MHz, 450 MHz – 470 MHz, 1 535 MHz – 1 545,4 MHz and 1 636 MHz – 1 646,5 MHz. A check for radiated signals shall be made at least 2 m from the EPIRB antenna and the measuring antenna varied in height above ground by at least half a wavelength. The strength of any received signal shall be measured by means of a peak detector. The measuring bandwidth shall be 10 kHz. For each spurious emission detected the satellite EPIRB shall be rotated and the height of the measuring antenna varied until the maximum reading is found. If the test house has a set of calibrated measuring antennas to perform this test the following step need not be taken. The satellite antenna shall then be replaced by a substitution antenna, which shall be a right hand circular polarised antenna suitably mounted and arranged to present a 50 Ω resistive load to the signal source. The height of the measuring antenna shall be varied until the maximum signal strength is found. The level from the signal source shall then be adjusted to give the same reading as the peak reading detected from the satellite EPIRB. This output power from the signal source is defined as the effective radiated peak power of the emission. Due allowance shall be made for cable attenuation. Measurements shall be performed under normal test conditions.

11.1.2 Results required

The effective radiated power of any spurious emission found shall not exceed 2 nW.

NOTE – This test covers also the requirements of 9.1 and 9.3 of IEC 60945.

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11.1.3 Method of test (EPIRB activated)

The measurements described under 11.1.1 above shall be repeated, with the satellite EPIRB activated but outside the transmit periods.

11.1.4 Results required

For this set of measurements the effective radiated power of any spurious emission found shall not exceed 25 mW.

11.2 Conducted emission

The test shall be in accordance with 9.2 of IEC 60945 and thus limited to a test of an eventual power supply port such as to the remote control panel.

12 Electromagnetic immunity

12.1 General

The applicable criteria for assessing the results of the tests are defined in 6.12. The performance tests required by criteria A, B and C after the tests may be combined in one performance test at the end of the series of tests of this subclause. Special attention is drawn to the importance of not generating false alerts by inadvertent activation during or after each test (see 6.10 and 6.11 requiring this check).

12.2 Conducted LF interference

The test shall be in accordance with 10.2 of IEC 60945 and thus limited to a test of a power supply port, if provided, such as to the remote control panel. Performance criterion A is applicable.

12.3 Conducted RF interference

The test shall be in accordance with 10.3 of IEC 60945 and thus limited to a test of a power supply port, if provided, such as to the remote control panel. Performance criterion A is applicable.

12.4 Radiated RF interference

The test shall be in accordance with 10.4 of IEC 60945. Performance criterion A is applicable.

12.5 Immunity to fast transients

The test shall be in accordance with 10.5 of IEC 60945 and thus limited to a test of a power supply port, if provided, such as to the remote control panel. Performance criterion B is applicable.

12.6 Immunity to surges on a.c. power lines

The test shall be in accordance with 10.6 of IEC 60945 and thus limited to a test of an a.c. power supply port, if provided, such as to the remote control panel. Performance criterion B is applicable.

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12.7 Immunity to power supply short term variations

The test shall be in accordance with 10.7 of IEC 60945 and thus limited to a test of an a.c. power supply port, if provided, such as to the remote control panel. Performance criterion B is applicable.

12.8 Immunity to power supply failure

The test shall be in accordance with 10.8 of IEC 60945 and thus limited to a test of a power supply port, if provided, such as to the remote control panel. Performance criterion C is applicable.

12.9 Immunity to electrostatic discharge

The test shall be in accordance with 10.9 of IEC 60945. Performance criterion B is applicable.

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Annex A
(normative)

Sequence of tests

The following environmental and operational tests shall be conducted in the sequence as stated below.

Tests A.1.2 to A.1.17 shall be performed on a single unit in the sequence given below. Tests A.2.1 to A.2.13 may be performed on the same unit or on one or more other units. This second series of tests (A.2.1 to A.2.13) may be performed in any sequence.

Where tests are performed on a single unit (see 6.9), the tests A.1.2 to A.1.17 shall be carried out in the order described here below and followed by the tests A.2.1 to A.2.13.

The tests defined in annex B may be combined or separate from this series of tests.

A performance check (see 6.10) or test (see 6.11) as applicable, shall be performed before, during and/or after each test as defined in IEC 60945 and in this standard.

A.1 Sequence of first series of tests

A.1.1 Manual test facility (8.1.6),

A.1.2 Message format (8.6.2),

A.1.3 Ruggedness/bump (7.9),

A.1.4 Vibration test (7.8),

A.1.5 Dry heat (7.2),

A.1.6 Damp heat (7.3),

A.1.7 Thermal shock (7.5),

A.1.8 Power source capacity and low temperature (7.4/8.2),

A.1.9 Drop into water (7.7),[1)]

A.1.10 Immersion (7.6),

A.1.11 Protection against release (8.1.9),

A.1.12 Transmission period (8.6.1),

A.1.13 Low duty cycle light (8.1.3),

A.1.14 Radiated and output power (8.3),

A.1.15 Output power under extreme voltage (8.4),

A.1.16 Antenna mismatch (8.7),

A.1.17 Transmitter (8.5.1/8.5.2/8.5.3).

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1) If the drop test into water, the immersion test and the protection against release test cannot be performed in one laboratory, they may be moved to the end of the sequence and performed later at another location, but on the same equipment as was used for the remainder of the tests listed in A.1.

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A.2 Second series of tests

A.2.1 Corrosion (7.13),

A.2.2 Solar radiation (7.11),

A.2.3 Oil resistance (7.12),

A.2.4 Safety for batteries (7.14),

A.2.5 Automatic release mechanism and automatic activation (8.1.7),

A.2.6 Stability and buoyancy (8.1.4 /8.1.5),

A.2.7 Float free activation (8.1.1),

A.2.8 Safety (9.1/9.2 and 9.3),

A.2.9 Compass safe distance (clause 10),

A.2.10 Spurious emission (11.1),

A.2.11 Conducted interference (11.2),

A.2.12 Electromagnetic immunity (clause 12),

A.2.13 Tests of operational requirements (clause 4) may be carried out at any moment in the test sequence or independently.

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Annex B
(normative)

Technical standard for 121,5 MHz homing device

B.1 General

This annex specifies the operational and performance requirements, technical characteristics and methods of testing of a shipborne 121,5 MHz homing device, which may form part of a satellite emergency indicating radio beacon used in the Inmarsat-E satellite system as described in this standard.

B.2 Performance requirements

If provided with a 121,5 MHz homing beacon the 121,5 MHz homing signal shall:

– have a continuous duty cycle for a duration of 48 h;

– with the exception of the sweep direction, meet the technical characteristics from appendix 37A of the Radio Regulations. The sweep may be either upward or downward.

B.3 Technical characteristics

B.3.1	Carrier frequency	121,5 MHz ± 50 ppm
B.3.2	Peak effective radiated power	+17 dBm (50 mW ± 3 dB)
B.3.3	Transmitter duty cycle	100 % (see B.2)
B.3.4	Modulation	amplitude modulated (3K20A3X)
B.3.4.1	(R M.690-1/A1/d) the A3X emission shall include a clearly defined carrier frequency distinct from the modulation side-band components; in particular, at least 30 % of the total power emitted during any transmission cycle with or without modulation shall be contained at all times within ±30 Hz of the carrier frequency on 121,5 MHz. Additionally, if the type of emission is changed during transmission, the carrier frequency shall not shift more than ±30 Hz from the carrier frequency.	
B.3.4.2	Frequency	an audio signal swept upward or downward by not <700 Hz within the range 300 Hz to 1 600 Hz.
B.3.4.3	Duty cycle	33 % to 55 %
B.3.4.4	Factor	between 0,85 and 1,0
B.3.4.5	Sweep repetition rate	2 Hz to 4 Hz
B.3.5	Spurious emissions	see figure B.1
B.3.6	Antenna	
B.3.6.1	Pattern	essentially omnidirectional in the horizontal plane
B.3.6.2	Polarisation	vertical
B.3.7	Environment	shall meet the applicable requirements of clause 7
B.3.8	Minimum operating lifetime	48 h throughout the specified operating temperature range.

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B.4 Methods of testing and required test results

B.4.1 General

Unless otherwise specified, all transmitter signal characteristics shall be measured at the minimum and maximum operating temperatures. For the purpose of testing outside a screened room, the equipment shall be prepared as required by the type test authority.

The tests may be performed in any sequence and in conjunction with other electrical tests. In all cases, the tests shall be conducted after the satellite EPIRB has been temperature stabilised for at least 1 h and has been ON for at least 15 min. Unless otherwise specified, the test shall be performed with modulation present.

B.4.2 Carrier frequency

The carrier frequency test may be performed with a frequency counter or a spectrum analyzer. The carrier frequency, measured at the minimum and maximum operating temperatures, shall be 121,5 MHz ± 6 kHz.

B.4.3 Peak effective power (PEP)

The peak effective power is the average power during one radio frequency cycle at the crest of the modulation envelope.

B.4.3.1 Method of test

The measurement shall be performed at normal temperature conditions and shall use a satellite EPIRB whose battery has been switched on for a minimum of 44 h. If the test duration exceeds 4 h, the battery may be replaced by another which has been preconditioned with at least 44 h in the ON condition.

For the purpose of testing outside a screened room, care shall be taken not to transmit distress signals on distress and safety frequencies, e.g. by offsetting the carrier frequency.

This test is only required to be performed at normal temperature and at the lower extreme test voltage (see 6.7.2). The measurement procedure consists in a determination of twelve values of PEP made by direct measurement of radiated power. The measurements are taken at an azimuth angle of 30° ± 3°. All PEP measurements shall be made at the same elevation angle; the elevation used shall be the angle between 5° and 20° for which the satellite EPIRB exhibits a maximum antenna gain.

B.4.3.2 Results required

The median value of PEP shall be between 25 mW and 100 mW; the ratio of maximum to minimum of the eleven highest values of PEP shall not exceed 4 to 1 (6 dB).

B.4.3.3 Radiated power test condition

The test site shall be on level ground which has uniform electrical characteristics. The site shall be clear of metal objects, overhead wires, etc., and as free as possible from undesired signals such as ignition noise or RF carriers. The distance from the satellite EPIRB, or the search antenna, shall be at least 5 m. The satellite EPIRB shall be placed in the centre of a ground plane with a radius of no less than 75 cm ± 5 cm.

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It shall be positioned vertically so that the ground plane is at the nominal waterline. The ground plane shall be resting on ground level and shall be extended so that it completely encloses and presents a snug fit to the portion of the satellite EPIRB which is below the water-line.

Measurement of the radiated signals shall be made at a point 5 m or more from the satellite EPIRB. At this point, a wooden pole or insulated tripod with a movable horizontal boom shall be arranged so that a search antenna can be raised and lowered through an elevation angle of 5° to 20°. The search antenna shall be mounted on the end of the boom with its cable lying horizontally on the boom and run back to the supporting mast. The other end of the search antenna cable shall be connected to a spectrum analyzer located at the foot of the mast.

The elevation angle between 5° and 20° which produces a maximum gain is determined with the satellite EPIRB at an arbitrary azimuth. The PEP shall be measured and the elevation angle noted and shall remain fixed for the remainder of the test. The remaining eleven measurements of PEP may be obtained by rotating the satellite EPIRB in increments of 30° ± 3°. For each measurement the satellite EPIRB PEP shall be computed using the following equation: [1)]

$$PEP = 10^{\frac{P_{REC} - G_{REC} + L_C + L_P}{10}}$$

where:

P_{REC} is the measured power level from the spectrum analyzer (dBm);

G_{REC} is the antenna gain of search antenna (dB);

L_C is the receive system attenuator and cable loss (dB);

L_P is the free space propagation loss (dB).

B.4.4 Transmitter duty cycle

The transmitted signal shall be observed on a suitable test instrument and it shall be determined that the carrier is not interrupted between consecutive sweeps.

B.4.5 Modulation characteristics

The transmitter duty cycle, modulation frequency, modulation duty cycle, modulation factor, and sweep repetition rate shall be determined by observing the detected RF signal with a storage oscilloscope. All measurements shall be made at the minimum and maximum operating temperatures.

B.4.5.1 Modulation frequency and sweep repetition rate

The modulation envelope shall be observed and the upper and lower audio-frequency sweep limits and sweep repetition rate shall be determined. The limits and rate shall meet the requirements of B.3.4.2 and B.3.4.5 respectively.

B.4.5.2 Modulation duty cycle

Modulation duty cycle is the ratio of the positive modulation peak duration to the period of the instantaneous fundamental audio modulation frequency, observed at the half amplitude points on the modulation envelope using the following formula (see figure B.2a):

$$\text{Duty cycle} = 100\ \frac{A}{B}\ \%$$

[1)] This equation is equivalent to the one given in IEC 61097-2 (D.4.2.2).

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B.4.5.2.1 Method of test

The transmitter output shall be connected to a storage oscilloscope. T1 and T2 shall be measured near the start, midpoint and end of the modulation period. The modulation duty cycle shall be calculated.

– T1 is the duration of the positive half cycle of the audio modulation measured at the half amplitude points of the modulation envelope, and

– T2 is the period of the fundamental of the audio modulation.

B.4.5.2.2 Results required

The modulation duty cycle shall be between 33 % and 55 %. It shall be measured near the start, midpoint, and end of the modulation period. The duty cycle shall meet the requirements of B.3.4.3.

B.4.5.3 Modulation factor

The modulation factor shall be defined with respect to the maximum and minimum amplitudes of the modulation envelope by the following formula (see figures B.2b and B.2c):

$$\text{Modulation factor} = \frac{A - B}{A + B}$$

The modulation factor shall meet the requirements of B.3.4.4.

B.4.6 Spurious emissions

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.

B.4.6.1 Method of test

Spurious emissions shall be measured in the frequency bands 108 MHz – 137 MHz, 156 MHz – 162 MHz, 406,0 MHz – 406,1 MHz and 450 MHz – 470 MHz at the test site described in 7.2.2.

B.4.6.2 Results required

The power of any spurious emission component shall not exceed the limits given in figure B.1.

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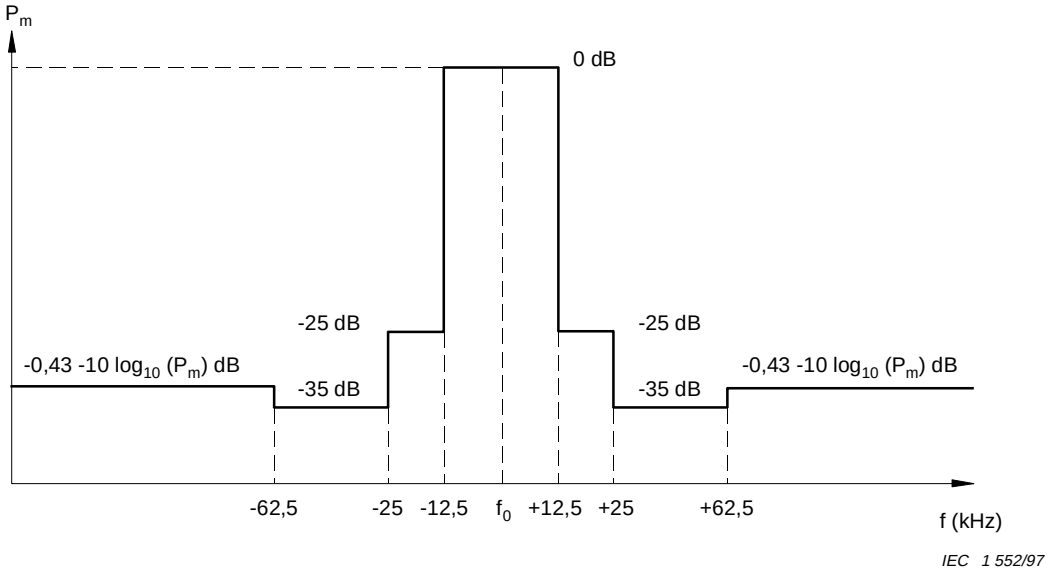

Relative frequency of 121,5 MHz homing device (kHz)

PEP = peak effective power

P_m = mean power

D = modulation duty cycle

P_m = D (PEP) relative power output of 121,5 MHz homing device

Figure B.1 – Spurious emission mask for 121,5 MHz signal

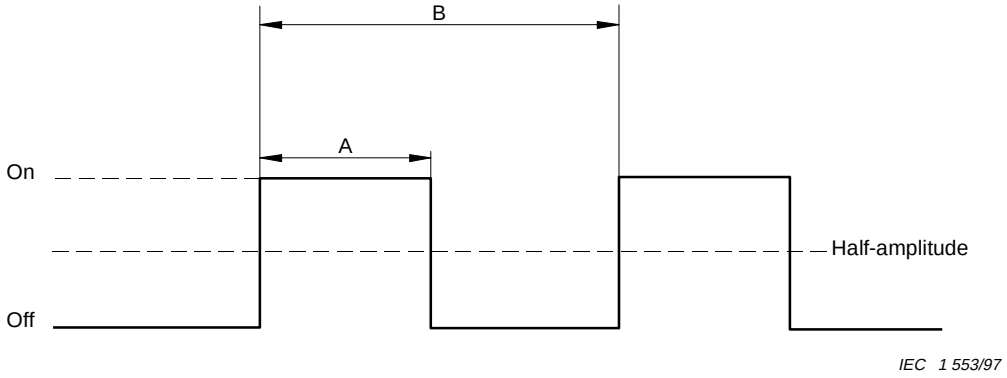

Figure B.2a – Typical modulation waveform

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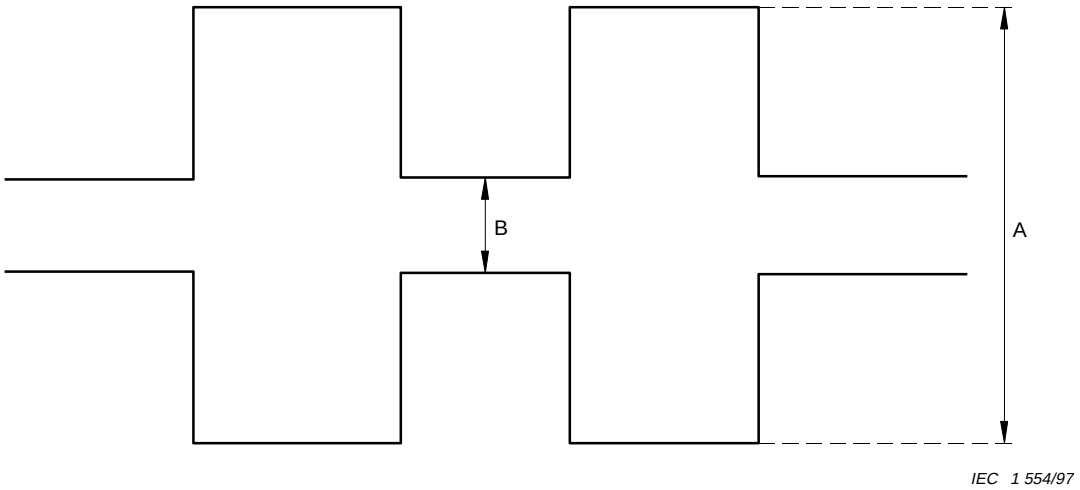

Figure B.2b – Typical full-wave modulation envelope

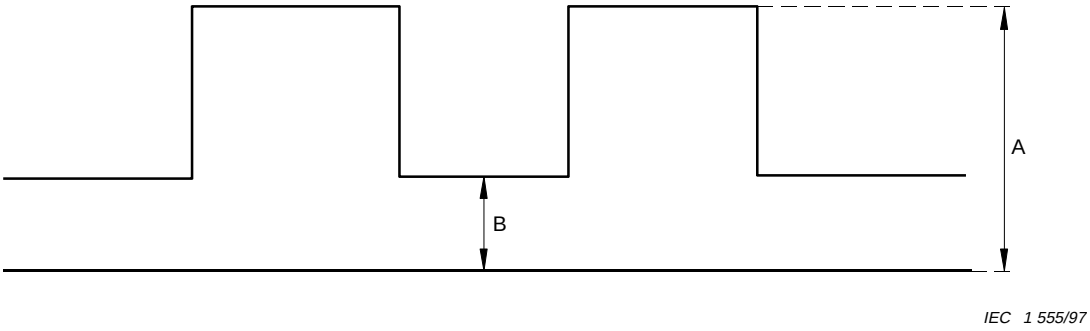

Figure B.2c – Typical one half-wave modulation envelope

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Annex C
(normative)

Manually activated satellite EPIRB without a float-free mechanism

C.1 A manually activated satellite EPIRB without a float-free mechanism shall meet all the requirements of this standard with the exception of the following subclauses:

4.4.1, 4.4.2, 4.4.3, 4.4.4, 4.9.2, 4.10.3, 5.3.9, 5.5.1, 5.5.2, 5.5.3, 5.5.4, 5.18.2, 5.18.3, 5.18.4, and replace 5.3.2 by:

5.3.2 The satellite EPIRB shall be designed to activate when manually released from its mounting bracket and floating in water.

C.2 In the context of this annex: wherever remaining clauses/subclauses in the standard refer to “release mechanism”, these words shall be amended to read “mounting bracket”.

———————

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.....

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Tell us why you have the standard. (check as many as apply). I am:

- ☐ the buyer
- ☐ the user
- ☐ a librarian
- ☐ a researcher
- ☐ an engineer
- ☐ a safety expert
- ☐ involved in testing
- ☐ with a government agency
- ☐ in industry
- ☐ other.....

3.

This standard was purchased from?

.....

4.

This standard will be used (check as many as apply):

- ☐ for reference
- ☐ in a standards library
- ☐ to develop a new product
- ☐ to write specifications
- ☐ to use in a tender
- ☐ for educational purposes
- ☐ for a lawsuit
- ☐ for quality assessment
- ☐ for certification
- ☐ for general information
- ☐ for design purposes
- ☐ for testing
- ☐ other.....

5.

This standard will be used in conjunction with (check as many as apply):

- ☐ IEC
- ☐ ISO
- ☐ corporate
- ☐ other (published by.....)
- ☐ other (published by.....)
- ☐ other (published by.....)

6.

This standard meets my needs (check one)

- ☐ not at all
- ☐ almost
- ☐ fairly well
- ☐ exactly

7.

Please rate the standard in the following areas as (1) bad, (2) below average, (3) average, (4) above average, (5) exceptional, (0) not applicable:

- ☐ clearly written
- ☐ logically arranged
- ☐ information given by tables
- ☐ illustrations
- ☐ technical information

8.

I would like to know how I can legally reproduce this standard for:

- ☐ internal use
- ☐ sales information
- ☐ product demonstration
- ☐ other.....

9.

In what medium of standard does your organization maintain most of its standards (check one):

- ☐ paper
- ☐ microfilm/microfiche
- ☐ mag tapes
- ☐ CD-ROM
- ☐ floppy disk
- ☐ on line

9A.

If your organization currently maintains part or all of its standards collection in electronic media, please indicate the format(s):

- ☐ raster image
- ☐ full text

10.

In what medium does your organization intend to maintain its standards collection in the future (check all that apply):

- ☐ paper
- ☐ microfilm/microfiche
- ☐ mag tape
- ☐ CD-ROM
- ☐ floppy disk
- ☐ on line

10A.

For electronic media which format will be chosen (check one)

- ☐ raster image
- ☐ full text

11.

My organization is in the following sector (e.g. engineering, manufacturing)

.....

12.

Does your organization have a standards library:

- ☐ yes
- ☐ no

13.

If you said yes to 12 then how many volumes:

.....

14.

Which standards organizations published the standards in your library (e.g. ISO, DIN, ANSI, BSI, etc.):

.....

15.

My organization supports the standards-making process (check as many as apply):

- ☐ buying standards
- ☐ using standards
- ☐ membership in standards organization
- ☐ serving on standards development committee
- ☐ other.....

16.

My organization uses (check one)

- ☐ French text only
- ☐ English text only
- ☐ Both English/French text

17.

Other comments:

.....

.....

.....

.....

.....

.....

18.

Please give us information about you and your company

name: .....

job title:.....

company: .....

address:.....

.....

.....

.....

No. employees at your location:.....

turnover/sales:.....

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