

INTERNATIONAL STANDARD

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First edition
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Global maritime distress and safety system (GMDSS) –

Part 10: Inmarsat-B ship earth station equipment – Operational and performance requirements, methods of testing and required test results

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

*Partie 10: Matériel destiné aux stations terrestres
des navires de type Inmarsat-B –
Exigences d'exploitation et de fonctionnement,
méthodes d'essai et résultats d'essai exigés*



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –

**Part 10: Inmarsat-B ship earth station equipment –
Operational and performance requirements,
methods of testing and required test results**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61097-10 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
80/216/FDIS	80/231/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.

Annex A forms an integral part of this standard.

Annexes B and C are for information only.

A bilingual version of this standard may be issued at a later date.

GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –

Part 10: Inmarsat-B ship earth station equipment – 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 for Inmarsat-B maritime class 1 ship earth stations (SES), capable of transmitting and receiving distress and safety communications using telephony and direct-printing telegraphy, as required by regulation IV / 10.1 and 14.1 of the 1988 amendments to the 1974 International Convention for the Safety of Life at Sea (SOLAS), for use in the GMDSS.

In order to meet the carriage requirements of the GMDSS in respect of receipt of SafetyNET broadcasts, it is necessary to install an additional EGC receiver or a combined Inmarsat-C/EGC receiver.

This standard takes account of IMO Resolution A.694, to which IEC 60945 is associated. When a requirement in this standard is different from IEC 60945, the requirement in this standard takes precedence.

This standard incorporates the performance standards of IMO Resolution A.808. It also incorporates the relevant ITU Radio regulations.

This standard does not incorporate the Inmarsat system requirements needed for Inmarsat type approval. For these, the latest edition of the Inmarsat-B system definition manual (SDM) shall be consulted. When a requirement in this standard is different from one in the Inmarsat-B SDM, reference shall be made to the most recent IMO and ITU applicable documents to resolve the difficulty.

NOTE – All text of this standard, the wording of which is identical to that in the IMO SOLAS Convention 1974 as amended and IMO Resolution A.808, is printed in *italics* and it is followed by 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. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61097 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

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

IEC 61162-1:1995, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners*

IMO International Convention for the Safety of Life at Sea (SOLAS) 1974, as amended

IMO Resolution A.694:1991, *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.808:1995, *Performance standards for ship earth stations capable of two-way communications*

IMO MSC Circular 862:1998, *Clarifications of certain requirements in IMO performance standards for GMDSS equipment*

ITU:1997, *Radio Regulations*

ITU-R SM.329-7:1997, *Spurious emissions*

Inmarsat:1997, *Inmarsat-B system definition manual (SDM) – Issue 3.0 including change note CN 13 – technical performance requirements (module 2, part I) and type approval procedures (module 2, part II)*

Inmarsat:1997, *Inmarsat-B design and installation guidelines (DIGS)*

3 Definitions and abbreviations

3.1 Definitions

For the purpose of this standard, the following definitions apply:

3.1.1

L-band

the frequency band in the range 1,4 GHz to 1,7 GHz allocated to the mobile satellite service and in which the EUT transmits and receives

3.1.2

LES simulator

an item of test equipment designed to simulate the combined operation of an Inmarsat satellite and an Inmarsat-B land earth station. The LES simulator interfaces to the EUT at L-band, either by means of a small antenna or via a coaxial cable. It permits voice and telex calls to be set up in accordance with the relevant Inmarsat-B protocols

3.1.3

SafetyNET

a service provided over a dedicated Inmarsat-C carrier, for the dissemination of maritime safety information, such as distress alerts, weather forecasts and coastal warnings

3.1.4

carrier to noise density ratio

the ratio of unmodulated carrier power to noise power normalised to a 1 Hz bandwidth

3.1.5

performance check

in this standard, a performance check for the purpose defined in IEC 60945, comprises standard tests A and D in 6.2.2, carried out under normal test conditions for distress priority only

3.1.6

performance test

a performance test for the purpose defined in IEC 60945, comprises standard tests A, B, C, D and E in 6.2.2, carried out for both distress and safety priorities

3.2 Abbreviations

For the purpose of this standard, the following abbreviations apply:

C/No	Carrier to noise density ratio in a 1 Hz bandwidth
CR	Carriage return
DIGS	Design and installation guidelines (Inmarsat)
EGC	Enhanced group call
EUT	Equipment under test
GMDSS	Global maritime distress and safety system
ID	Identity
IEC	International Electrotechnical Commission
IMO	International Maritime Organization
Inmarsat	International Mobile Satellite Organization
ISO	International Organization for Standardization
ITU	International Telecommunication Union
LES	Land earth station
LF	Line feed
MES	Mobile earth station
MSI	Maritime safety information
Navarea	Navigation warning area (see annex B)
RCC	Rescue co-ordination centre
SAR	Search and rescue
SDM	System definition manual
SES	Ship earth station
SOLAS	International convention for the Safety of Life at Sea

4 General and operational requirements

4.1 General

This clause includes the requirements taken from SOLAS and IMO Resolutions A.808 and A.694 for which no repeatable or verifiable test can be specified or for which the test is limited to the verification of 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 operational requirements of IEC 60945.

4.2 General requirements

4.2.1 (SOLAS IV/10.1.1) *An Inmarsat ship earth station which is defined in the Inmarsat-B SDM as a maritime class 1 SES shall be capable of:*

- .1 transmitting and receiving distress and safety communications using direct-printing telegraphy;*
- .2 initiating and receiving distress priority calls;*
- .3 maintaining watch for shore-to-ship distress alerts, including those directed to specifically defined geographical areas. This requirement should normally be met by provision of an EGC receiver;*

.4 transmitting and receiving general radio communications, using either radiotelephony or direct-printing telegraphy.

Annex C contains the anticipated availability of the watch-keeping capabilities for an Inmarsat-B SES.

4.2.2 (A.808/A.2) *The equipment shall be type approved by Inmarsat and shall comply with the environmental conditions specified in its technical requirements for Inmarsat ship earth stations capable of two-way communications.*

4.2.3 (A.808/A.1) *The ship earth station installation capable of telephony and direct printing shall comply with the applicable general requirements set out in IMO resolution A.694 (17) as detailed in IEC 60945, except as follows:*

4.2.3.1 *The equipment shall indicate the status of the distress alert transmission (4.2.9 of IEC 60945).*

4.2.3.2 *The equipment shall be provided with facilities which permit the testing of all operational indicators (warning, alarm and routine), displays, and audible devices required by the relevant equipment standard (4.2.9 of IEC 60945).*

4.3 Operational requirements for Inmarsat-B maritime class 1 SES

4.3.1 (A.808/A.3.1) *No control external to the equipment shall be available for alteration of the ship earth station identity.*

4.3.2 (A.808/A.3.2) *It shall be possible to initiate and make distress calls by telephony or direct printing from the position at which the ship is normally navigated and from any position designated for distress alerting. In addition, where a room is provided for radio communications, means to initiate distress calls shall also be fitted in that room.*

4.3.3 (A.808/A.3.3) *Where no other means of receiving distress, urgency and safety broadcasts or an additional distress alert relay are provided and existing levels of aural signals produced by the telephone or teletype are considered to be inadequate, the ship earth station equipment shall be configured to actuate an aural/visual alarm of appropriate level.*

4.3.4 (A.808/A.3.4) *It shall be possible to interrupt and initiate distress calls at any time.*

4.3.5 (A.808/A.3.5) *A distress call shall be activated 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.*

(MSC/Circular 862/1.1) *This button should not be any key of an ITU-T input panel or an ISO keyboard associated with the equipment and should be physically separated from functional buttons/keys used for normal operation. This button should be a single button for no other purpose than to initiate a distress alert.*

4.3.6 (A.808/A.3.6) *The dedicated button shall:*

- .1 be clearly identified; and*
- .2 be protected against inadvertent operation.*

(MSC/Circular 862/1.2) *The distress button should be red in colour and marked DISTRESS. Where a non-transparent protective lid or cover is used, it should also be marked DISTRESS.*

(MSC/Circular 862/1.3) *The required protection of the distress button should consist of a spring loaded lid or cover permanently attached to the equipment by for example hinges. It*

should not be necessary for the user to remove additional seals or to break the lid or cover in order to operate the distress button.

4.3.7 (A.808/A.3.7) *The distress call initiation shall require at least two independent actions.*

(MSC Circular 862/1.4) Lifting of the protective lid or cover is considered the first action. Pressing the distress button as specified is considered as the second independent action.

4.4 Inter-operability

4.4.1 Where a unit of equipment provides a facility which is additional to the minimum requirements of this standard, and which has been accepted by the manufacturer of the EUT, the operation and, as far as is reasonably practicable, the malfunction of such additional facility shall not degrade the performance of the equipment (A.694/1.2).

4.4.2 If a unit of equipment is connected to one or more other units of equipment accepted by the manufacturer of the EUT, the performance of each of the latter shall be maintained (A.694/3.5).

4.5 Interfaces

4.5.1 An input shall be provided to comply with 4.3.2.

4.5.2 An output shall be provided to actuate an external aural/visual alarm on the receipt of a distress priority call (see 4.3.3).

4.5.3 An SES intended for installation on passenger ships shall have an interface to receive information on the ship's position for inclusion in the initial distress alert. Such interface shall comply with IEC 61162-1.

4.6 Safety

4.6.1 Radio frequency hazards

(A.808/A.4) *In order to permit warnings of potential hazards to be displayed in appropriate places, a label shall be attached to the radome indicating the distance at which radiation levels of 100 W/m², 25 W/m² and 10 W/m² exist. The label shall have characters at least 20 mm high and be clearly readable in the normally installed position from a distance of at least 5 m.*

4.6.2 Safety precautions

The EUT shall satisfy the requirements for safety as stated in A.694 and detailed in IEC 60945 (A.694/A.7).

4.7 Equipment manual

4.7.1 Adequate information shall be provided to enable the equipment to be properly installed, operated and maintained. The manual shall comply with the requirements of IEC 60945 as applicable, and shall:

- .1 in the case of equipment so designed that fault diagnosis and repair down to component level are practicable, provide full circuit diagrams, component layouts and a component part list; and
- .2 in the case of equipment containing complex modules in which fault diagnosis and repair down to component level are not practicable, contain sufficient information to enable a defective complex module to be located, identified and replaced. Other modules and those discrete components, which do not form part of modules, should also meet the requirements of .1 above (A.694/A.8.3).

4.7.2 The manual shall also address the issue of reception of maritime safety information (MSI) (see annex B).

4.7.3 The manual shall contain information for the installation to comply with IMO requirements as detailed in the relevant IEC standards taking into account EMC and the requirements contained in annex A.

4.7.4 The manual shall also include a cautionary note to the effect that the RCC shall be advised as to why the call is being cleared, before clearing of a distress priority call is initiated.

4.8 Marking and identification

Each unit of the equipment shall be marked externally with the following information, which should be clearly visible in the normal installation position:

- .1 identification of the manufacturer;
- .2 equipment type number or model identification under which it was type tested; and
- .3 serial number of the unit (A.694/9).

Details of the labelling requirements shall comply with IEC 60945.

4.9 Maintenance

4.9.1 The equipment shall be so designed that the main units can be replaced readily, without elaborate recalibration or readjustment (A.694/8.1).

4.9.2 Equipment shall be so constructed and installed that it is readily accessible for inspection and maintenance purposes (A.694/8.2).

5 Technical characteristics

5.1 Purpose

This clause includes all IMO/ITU requirements not covered by the Inmarsat-B SDM and for which a repeatable method of measurement has been specified. The related test methods and required test results can be found in clause 6.

5.2 General

5.2.1 The equipment shall, in addition to meeting the requirements of the Radio Regulations, the relevant ITU recommendations, the relevant Inmarsat technical requirements (Inmarsat-B SDM) and the general requirements set out in A.694, as detailed in IEC 60945, comply with the requirements of this standard.

5.2.2 In addition to the operational requirements in 4.3.7 the second action to initiate a distress call shall be by pressing the button once, for at least 3 s. A visual indication shall be provided immediately after a distress call has been initiated. This indication shall be made at all positions from where a distress call may be initiated, irrespective of the telephone or telex terminal from which the distress call is originated. The indication shall continue until reset manually. This reset facility shall only be available to authorised personnel. It shall be possible to initiate further distress calls without re-setting the first indication. The indication shall function identically during performance testing with distress priority.

5.2.3 On initiation of a distress priority call the equipment shall interrupt any on-going call of lower priority, if necessary, and then set up the distress priority call automatically.

5.2.4 The power of any spurious output measured in a 4 kHz bandwidth shall be equal to or less than –43 dBW or –60 dBc, whichever is less stringent, measured at the antenna connector (ITU-R SM.329-7).

5.3 Power supply

5.3.1 Extreme power supply

Equipment shall continue to operate in accordance with the requirements of this standard in the presence of variations of the power supply normally to be expected in a ship (A.694/4.1).

5.3.2 Excessive conditions

Means shall be incorporated for the protection of equipment from the effects of excessive current and voltage, transients and accidental reversal of power supply polarity or phase sequence (A.694/4.2).

5.3.3 Power supply interruption

(A.808/5.2) *Changing from one source of supply to another or any interruption up to 60 s of the supply of electrical energy shall not render the equipment inoperative or require the equipment to be manually re-initialized.*

Programmable functions stored in memory shall not be lost on power down and power up of the equipment.

6 Methods of testing and required test results

6.1 General

6.1.1 The requirements of this clause are in addition to the Inmarsat requirements for type approval, given in the Inmarsat-B SDM, as amended. The manufacturer shall, unless otherwise agreed, set up the equipment and ensure it is operating normally before testing commences. If the test site used for type approval is also an accepted Inmarsat test facility, both series of tests may be combined, with the prior agreement of Inmarsat.

6.1.2 After successful completion of the Inmarsat phase I tests, (see Inmarsat-B SDM module 2, part II) compliance with the requirements of this standard shall be demonstrated by carrying out the tests described in the following subclauses. These tests shall be conducted using a LES simulator or an alternative method of functionally achieving the same results.

6.1.3 The manufacturer shall state which items of equipment are classified as exposed and which are protected. The equipment normally protected by a radome shall be tested with the radome in place under the exposed environmental conditions stated in IEC 60945.

6.1.4 The manufacturer shall state what pre-conditioning is necessary before environmental testing, for example, the activation of cooling fans in advance of testing.

6.2 Performance testing

6.2.1 General

6.2.1.1 A performance check or test shall normally consist of communication tests between the EUT and an Inmarsat LES simulator. Ship's heading information may need to be provided.

6.2.1.2 All tests shall be performed at a C/No of 51 dBHz ± 2 dB, measured at L-band.

6.2.1.3 Verification of compliance with the technical requirements is provided by performance tests or performance checks as defined in 3.1 at normal test conditions, unless otherwise stated.

6.2.2 Standard tests

6.2.2.1 Test A: Duplex telex test (ship originated)

The EUT operator shall set up a duplex telex channel with the appropriate priority. Correct exchange of answer-backs shall be verified by inspection.

The EUT operator shall transmit the test message:

TEST A (LF, CR)

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG (FROM EUT) (LF, CR)

0123456789 (LF, CR)

The LES simulator operator shall transmit the test message:

TEST A (LF, CR)

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG (FROM LES) (LF, CR)

0123456789 (LF, CR)

The EUT operator shall clear the call.

6.2.2.2 Test B: Duplex telex test (shore originated)

The LES simulator operator shall set up a duplex telex channel with the appropriate priority. Correct exchange of answer-backs shall be verified by inspection.

The LES simulator operator shall transmit the test message:

TEST B (LF, CR)

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG (FROM LES) (LF, CR)

0123456789 (LF, CR)

The EUT operator shall transmit the test message:

TEST B (LF, CR)

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG (FROM EUT) (LF, CR)

0123456789 (LF, CR)

The EUT operator shall clear the call.

6.2.2.3 Test C: Simplex telex test (shore originated)

The LES simulator operator shall set up a simplex telex channel with the appropriate priority.

The LES simulator operator shall transmit the test message:

TEST C (LF, CR)

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG (FROM LES) (LF, CR)

0123456789 (LF, CR)

The LES simulator operator shall clear the call.

6.2.2.4 Test D: Duplex telephone test (ship originated)

The EUT operator shall set up a duplex telephone channel with the appropriate priority.

The EUT operator shall say clearly:

“This is the EUT operator performing test D, delta. Please report my speech quality. Over”

The LES simulator operator shall reply:

“This is the LES simulator operator performing test D, delta. Your speech quality is good/poor. Please report my speech quality. Over”

The EUT operator shall reply:

“Your speech quality is good/poor. I am now clearing the channel. Over”

The EUT operator shall clear the call.

6.2.2.5 Test E: Duplex telephone test (shore originated)

The LES simulator operator shall set up a duplex telephone channel with the appropriate priority.

The LES simulator operator shall say clearly:

“This is the LES simulator operator performing test E, echo. Please report my speech quality. Over”

The EUT operator shall reply:

“This is the EUT operator performing test E, echo. Your speech quality is good/poor. Please report my speech quality. Over”

The LES simulator operator shall reply:

“Your speech quality is Good/Poor. I am now clearing the channel. Over”

The LES simulator operator shall clear the call.

6.2.3 Results required

6.2.3.1 For the performance check (3.1.5), in test A for telex, no errors shall be recorded in each direction of communication and in test D for voice communication, it shall be possible to distinguish clearly the content of the voice message.

6.2.3.2 For the performance test (3.1.6), in tests A, B and C for telex, no errors shall be recorded in each direction of communication and in tests D and E for voice communication, it shall be possible to distinguish clearly the content of the voice message.

6.3 Environmental testing

The EUT shall be tested for compliance with the environmental requirements set out in IMO resolution A.694, as detailed in IEC 60945. Compliance with the environmental test conditions is tested by Inmarsat except for vibration and need not be repeated.

6.4 Electromagnetic compatibility

The EUT shall be tested for compliance with the EMC requirements set out in A.694 as detailed in IEC 60945. For immunity tests, the method of demonstrating compliance with criteria A, B or C shall be by carrying out a performance check during or after each test, as appropriate.

6.5 General tests

6.5.1 The following tests shall be performed

- **Test A with distress priority
- Test A with safety priority
- Test A with routine priority
- **Test B with distress priority
- Test B with safety priority
- Test B with routine priority
- *Test C using an area group code and distress priority
- **Test D with distress priority
- Test D with routine priority
- **Test E with distress priority
- Test E with routine priority

* This test may be performed at the same time as that in 6.6.3.

** These test calls shall be set up using a distress button co-located with the EUT.

6.5.2 Results required

Calls shall be set up and cleared down satisfactorily. For the telex tests, no character errors shall be received. For the telephone tests, voice quality shall be good in both directions.

6.6 Operational tests

6.6.1 Telex test

6.6.1.1 Method of test

Test A shall be performed using distress priority, the call being initiated from a remote distress button, located at least 10 m away from the EUT.

6.6.1.2 Results required

The call shall be set up and cleared down satisfactorily. No character errors shall be received.

6.6.2 Telephone test

6.6.2.1 Method of test

Test D shall be performed using distress priority, the call being set up using a remote distress button, located at least 10 m away from the EUT.

6.6.2.2 Results required

The call shall be set up and cleared down satisfactorily. Voice quality shall be good in both directions.

6.6.3 Distress priority

6.6.3.1 Methods of test

- .1 A routine duplex telex call shall be set up from the EUT. Test A shall then be performed with distress priority, without first clearing the routine call in progress.

- .2 A routine duplex telephone call shall be set up from the EUT. Test A shall then be performed with distress priority, without first clearing the routine call in progress.
- .3 A routine duplex telex call shall be set up from the EUT. Test D shall then be performed with distress priority, without first clearing the routine call in progress.
- .4 A routine duplex telephone call shall be set up from the EUT. Test D shall then be performed with distress priority, without first clearing the routine call in progress.

6.6.3.2 Results required

Routine priority calls shall clear automatically. Distress priority calls shall be set up automatically.

6.7 Power supply

6.7.1 General

The EUT shall be tested for compliance with the power supply requirements as set out in A.694 and detailed in IEC 60945.

6.7.2 Method of test

The receiver/antenna of the EUT shall be set to acquire the LES simulator, radiating to the EUT by means of a test antenna. The EUT shall then be subjected to the power supply failures as described in 10.8 of IEC 60945.

6.7.3 Results required

Re-acquisition of the LES simulator shall not be necessary. A check shall also be made that no spurious transmissions occur as a result of the power supply interruptions.

Annex A (normative)

Requirements relating to installation

The equipment manual shall include all information necessary to determine whether the EUT complies with the IMO installation requirements.

A.1 Power supply

A.1.1 (A.808/A.5.1) *The ship earth station shall normally be powered from the ship's main source of electrical energy. In addition, it shall be possible to operate the ship earth station and all equipment necessary for its normal functioning, including the antenna tracking system, from an alternative source of energy.*

A.1.2 (A.808/A.5.2) *Changing from one source of supply to another or any interruption up to 60 s of the supply of electrical energy shall not render the equipment inoperative or require the equipment to be manually re-initialized.*

A.1.3 If provision is made for operating equipment from more than one source of electrical energy, arrangements for rapidly changing from one source to the other shall be provided but not necessarily incorporated in the equipment (A.694/4.4).

A.2 Antenna siting

A.2.1 (A.808/A.6.1) *It is desirable that the antenna be sited in such a position that no obstacle likely to significantly degrade the performance of the equipment appears in any azimuth down to an angle of elevation of -5° .*

A.2.2 (A.808/A.6.2) *The siting of the antenna needs careful consideration, taking into account the adverse effect of high levels of vibration which might be introduced by the use of a tall mast and the need to minimise shadow sectors. Objects, especially those within 10 m of the radome which cause a shadow sector of greater than 6° , are likely to significantly degrade the performance of the equipment.*

A.2.3 (A.808/A.6.3) *The above deck equipment shall be separated, as far as is practicable, from the antennae of other communication and navigation equipment.*

Additional information is included in the Inmarsat design and installation guidelines (DIGS) for Inmarsat-B.