IEC 61108-6

Edition 1.0 2023-02

INTERNATIONAL STANDARD

Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 6: Navigation with Indian constellation (NavIC)/Indian regional navigation satellite system (IRNSS) – Receiver equipment – Performance requirements, methods of testing and required test results

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 33.060; 47.040; 47.060

ISBN 978-2-8322-6363-1

Warning! Make sure that you obtained this publication from an authorized distributor.

® Registered trademark of the International Electrotechnical Commission

CONTENTS

FOREWORD 4
1 Scope 6
2 Normative references 6
3 Terms, definitions and abbreviated terms 8
3.1 Terms and definitions 8
3.2 Abbreviated terms 8
4 Minimum performance requirements 9
4.1 Object 9
4.2 IRNSS/NavIC receiver equipment 10
4.2.1 Minimum facilities 10
4.2.2 Configuration 10
4.2.3 Quality assurance 10
4.3 Performance of IRNSS/NavIC receiver equipment 10
4.3.1 General 10
4.3.2 Equipment interfaces 11
4.3.3 Accuracy 12
4.3.4 Acquisition 12
4.3.5 Protection 13
4.3.6 Antenna design 13
4.3.7 Sensitivity and dynamic range 14
4.3.8 Effects of specific interfering signals 14
4.3.9 Position update 14
4.3.10 Differential IRNSS/NavIC input 15
4.3.11 Navigation warnings and status indications 15
4.3.12 Output of COG, SOG and UTC 17
4.3.13 Typical interference conditions 18
5 Methods of testing and required test results 18
5.1 Test sites 18
5.2 Test sequence 19
5.3 Standard test signals 19
5.4 Determination of accuracy 20
5.5 General requirements and presentation requirements 20
5.5.1 Normal environmental conditions for tests 20
5.5.2 General requirements 20
5.5.3 Presentation requirements 20
5.6 Receiver performance tests 20
5.6.1 IRNSS/NavIC receiver equipment 20
5.6.2 Position output 20
5.6.3 Equipment interfaces 21
5.6.4 Accuracy 21
5.6.5 Acquisition 22
5.6.6 Protection 23
5.6.7 Antenna design 23
5.6.8 Sensitivity and dynamic range 23
5.6.9 Protection from other shipborne transmitters 24
5.6.10 Position update 25
5.6.11 Differential IRNSS/NavIC input 25

5.6.12 Navigational warnings and status indications 26
5.6.13 Accuracy of COG and SOG 28
5.6.14 Validity of COG and SOG information 29
5.6.15 Output of UTC 29
5.7 Tests for typical RF interference conditions 29
5.7.1 Simulator conditions 29
5.7.2 Navigation solution accuracy test 29
5.7.3 Re-acquisition test 30
Annex A (normative) Typical IRNSS/NavIC interference environment 32
A.1 IRNSS/NavIC CW in-band and near-band interference environment 32
A.2 Band-limited noise-like interference 33
A.3 Pulsed interference 34
A.4 IRNSS/NavIC minimum antenna gain 35
Annex B (normative) Alert management 36
Bibliography 37

Figure 1 – Logical interfaces of IRNSS/NavIC receiver 11
Figure A.1 – CW interference thresholds for IRNSS/NavIC L5 band receivers in steady state navigation 33
Figure A.2 – CW interference thresholds for IRNSS/NavIC S band receivers in steady state navigation 33
Figure A.3 – Effect of interference bandwidth on interference thresholds for IRNSS/NavIC receivers (for noise like interference) 34

Table 1 – Acquisition time limits 13
Table 2 – RAIM integrity status 17
Table 3 – Accuracy of COG 18
Table 4 – RF interference value 30
Table A.1 – CW interference thresholds for IRNSS/NavIC L5 band receivers in steady-state navigation 32
Table A.2 – CW interference thresholds for IRNSS/NavIC S band receivers in steady-state navigation 32
Table A.3 – Interference threshold for band-limited noise-like interference to IRNSS/NavIC receivers in steady-state navigation 34
Table A.4 – Interference thresholds for pulsed interference 35
Table A.5 – IRNSS/NavIC minimum antenna gain 35
Table B.1 – Required alerts and their classification 36

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS) –

Part 6: Navigation with Indian constellation (NavIC)/Indian regional navigation satellite system (IRNSS) – Receiver equipment – Performance requirements, methods of testing and required test results

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 61108-6 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
80/1055/FDIS	80/1058/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 61108 series, published under the general title *Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS)*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS) –

Part 6: Navigation with Indian constellation (NavIC)/Indian regional navigation satellite system (IRNSS) – Receiver equipment – Performance requirements, methods of testing and required test results

1 Scope

This part of IEC 61108 specifies the minimum performance requirements, methods of testing and required test results for the Indian regional navigation satellite system (IRNSS), also known as Navigation with Indian Constellation (NavIC), shipborne receiver equipment, based on IMO resolution MSC.449(99), which uses the signals from NavIC/IRNSS in order to determine position.

This document takes account of the general requirements given in IMO resolution A.694(17) and is associated with IEC 60945. When a requirement in this document is different from IEC 60945, the requirement in this document takes precedence. This document also takes into account, as appropriate, requirements for the presentation of navigation-related information on shipborne navigational displays given in IMO resolution MSC.191(79) and is associated with IEC 62288. This document further takes into account, as appropriate, requirements for bridge alert management given in IMO resolution MSC.302(87) and is associated with IEC 62923-1.

This document applies to navigation in ocean waters for the standard positioning service and harbour entrances, harbour approaches and coastal waters, as defined in IMO resolution A.1046(27) within IRNSS/NavIC coverage area as given in IMO resolution MSC 449(99).

All text of this document whose meaning is identical to that in IMO resolution MSC. 449(99) is printed in italics and the resolution and paragraph number indicated between brackets, i.e. "(M.449(99)/A1.2)".

The requirements in Clause 4 are cross-referenced to the tests in Clause 5 and vice versa.

NOTE 1 A description of the IRNSS standard positioning service can be found in the interface control documents which were officially released in 2017 in the public domain (see ISRO-IRNSS-ICD-SPS-1.1).

NOTE 2 The IRNSS constellation was renamed as "NavIC" (navigation with Indian constellation) in 2016.

2 Normative references

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

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

IEC 61108-4, *Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 4: Shipborne DGPS and DGLONASS maritime radio beacon receiver equipment – Performance requirements, methods of testing and required test results*

IEC 61108-5:2020, *Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 5: BeiDou navigation satellite system (BDS) – Receiver equipment – Performance requirements, methods of testing and required test results*

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

IEC 61162-2, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 2: Single talker and multiple listeners, high-speed transmission*

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

IEC 62288, *Maritime navigation and radiocommunication equipment and systems – Presentation of navigation-related information on shipborne navigational displays – General requirements, methods of testing and required test results*

IEC 62923-1*, Maritime navigation and radiocommunication equipment and systems – Bridge alert management – Part 1: Operational and performance requirements, methods of testing and required test results*

IEC 62923-2*, Maritime navigation and radiocommunication equipment and systems – Bridge alert management – Part 2: Alert and cluster identifiers and other additional features*

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.915(22), *Revised maritime policy and requirements for a future Global Navigation Satellite System (GNSS)*

IMO resolution A.1046(27), *Worldwide radio navigation system*

IMO resolution MSC.302(87), *Performance standards for bridge alert management*

IMO resolution MSC.449(99), *Performance Standards for Shipborne IRNSS Receiver Equipment*

ITU-R Recommendation M.823-3, *Technical characteristics of differential transmissions for global navigation satellite systems from maritime radio beacons in the frequency band 283.5-315 kHz in Region 1 and 285-325 kHz in Regions 2 and 3*

ISRO-IRNSS-ICD-SPS-1.1, *Navigation with Indian Constellation System – Signal in Space Interface Control Document for Standard Positioning Service V 1.1*, Aug 2017 [viewed 2022-11-11]. Available at https://www.isro.gov.in/media_isro/pdf/Publications/Vispdf/Pdf2017/irnss_sps_icd_version1.1-2017.pdf

RTCM 10402, *RTCM Recommended Standards for Differential GNSS (Global Navigation Satellite Systems) Service*