

RESOLUTION MSC.113(73)  
(adopted on 1 December 2000)  
ADOPTION OF THE REVISED PERFORMANCE STANDARDS  
FOR SHIPBORNE GLONASS RECEIVER EQUIPMENT

**ANNEX 26**

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GLONASS RECEIVER EQUIPMENT**

THE MARITIME SAFETY COMMITTEE,

RECALLING Article (28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING ALSO resolution A.886(21), by which the Assembly resolved that the function of adopting performance standards and technical specifications, as well as amendments thereto shall be performed by the Maritime Safety Committee and/or the Marine Environment Protection Committee, as appropriate, on behalf of the Organization,

RECALLING FURTHER that, in accordance with resolution A.815(19) by which the Assembly adopted the IMO policy for the recognition and acceptance of suitable radionavigation systems intended for international use to provide ships with navigational position-fixing throughout their voyages, the Global Navigation Satellite System (GLONASS) has been recognized as a possible component of the world-wide radionavigation system,

NOTING that shipborne receiving equipment for the world-wide radionavigation system should be designed to satisfy the detailed requirements of the particular system concerned,

RECOGNIZING the need to improve the previously adopted, by resolution MSC.53(66), performance standards for shipborne GLONASS receiver equipment in order to ensure the operational reliability of such equipment and taking into account the technological progress and experience gained,

HAVING CONSIDERED the recommendation on the revision of resolution MSC.53(66) made by the Sub-Committee on Safety of Navigation at its forty-sixth session,

1. ADOPTS the Revised Recommendation on Performance Standards for GLONASS Receiver Equipment, set out in the Annex to the present resolution;
2. RECOMMENDS Governments to ensure that GLONASS receiver equipment:
  - (a) if installed on or after 1 July 2003, conform to performance standards not inferior to those specified in the Annex to the present resolution; and
  - (b) if installed before 1 July 2003, conform to performance standards not inferior to those specified in the Annex to resolution MSC.53(66).

## ANNEX

### REVISED RECOMMENDATION ON PERFORMANCE STANDARDS FOR SHIPBORNE GLONASS RECEIVER EQUIPMENT

#### 1 INTRODUCTION

1.1 The Global Navigation Satellite System (GLONASS) is a space-based positioning, velocity, and time system that has three major segments: Space, Control and User. The GLONASS Space Segment, will normally be composed of 24 satellites placed in three orbital planes with eight satellites in each plane. The satellites operate in circular 19,100 km orbits at an inclination angle of 64.8° and with an 11 h and 15 min period. The spacing of satellites in orbit will be arranged so that a minimum of four satellites will be in view to users world-wide, with a position dilution of precision (PDOP) of  $\leq 6$ . Satellites of the system transmit signals on "L" band frequencies. Each satellite has separate lettered frequencies L1 (1602, 5625-1615.5 MHz).

1.2 Each L1 frequency carries a code standard accuracy (C), which is used in shipborne GLONASS receiver equipment. A navigation data message is superimposed on this code.

1.3 Receiver equipment for the GLONASS intended for navigational purposes on ships with maximum speeds not exceeding 70 knots should, in addition to the general requirements contained in resolution A.694(17)\*, comply with the following minimum performance requirements.

1.4 These standards cover the basic requirements of position-fixing for navigation purposes only and does not cover other computational facilities which may be in the equipment.

#### 2 GLONASS RECEIVER EQUIPMENT

2.1 The words "GLONASS receiver equipment" as used in these performance standards include all the components and units necessary for the system to properly perform its intended functions. The equipment should include the following minimum facilities:

- .1 antenna capable of receiving GLONASS signals;
- .2 GLONASS receiver and processor;
- .3 means of accessing the computed latitude/longitude position;
- .4 data control and interface; and
- .5 position display and, if required, other forms of output.

2.2 The antenna design should be suitable for fitting at a position on the ship which ensures a clear view of the satellite constellation.

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\* Refer to IEC Publication 60945.

### 3 PERFORMANCE STANDARDS FOR GLONASS RECEIVER EQUIPMENT

The GLONASS receiver equipment should:

- .1 be capable of receiving and processing the Standard Positioning Service (SPS) signals of the GLONASS system and provide position information in latitude and longitude PZ-90 co-ordinates in degrees, minutes and thousandths of minutes and time of solution referenced to UTC (SU). Means should be provided to transform the computed position based upon PZ-90 into WGS-84 or into data compatible with the datum of the navigational chart in use. Where this facility exists, the display should indicate that the co-ordinate conversion is being performed and should identify the co-ordinate system in which the position is expressed;
- .2 operate on the Standard Positioning Service (on lettered L1 frequencies and C code);
- .3 be provided with at least one output from which position information can be supplied to other equipment. The output of position information based upon PZ-90 or WGS-84, should be in accordance with international standards\*;
- .4 have static accuracy such that the position of the antenna is determined to within 45 m (95%) with horizontal dilution of position (HDOP) = 4 (PDOP = 6);
- .5 have dynamic accuracy such that the position of the antenna is determined to within 45 m (95%) with horizontal dilution of position (HDOP) = 4 (PDOP = 6) under the conditions of sea states and ship's motion likely to be experienced in ships\*\*;
- .6 be capable of selecting automatically the appropriate satellite transmitted signals for determination of the ship's position with the required accuracy and update rate;
- .7 be capable of acquiring satellite signals with input signals having carrier levels in the range of - 130 dBm to - 120 dBm. Once the satellite signals have been acquired the equipment should continue to operate satisfactorily with satellite signal having carrier levels down to - 133 dBm;
- .8 be capable of acquiring position to the required accuracy, within 30 min, when there is no valid almanac data;
- .9 be capable of acquiring position to the required accuracy, within 5 min, when there is valid almanac data;
- .10 be capable of re-acquiring position to the required accuracy, within 5 min, when the GLONASS signals are interrupted for a period of at least 24 h, but there is no loss of power;

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\* IEC Publication 61162.

\*\* Resolution A.694(17), Publications IEC 6721 3-6, IEC 60945 and IEC 61108-2.

- .11 be capable of re-acquiring position to the required accuracy, within 2 min, when subjected to a power interruption of 60 s;
- .12 generate and output to a display and digital interface\* a new position solution at least once every 1 s;\*\*
- .13 have a minimum resolution of position, i.e. latitude and longitude of 0.001 minutes;
- .14 generate and output to the digital interface\* course over the ground (COG), speed over the ground (SOG) and universal time co-ordinated (UTC). Such outputs should have a validity mark aligned with that on the position output. The accuracy requirement for COG and SOG should not be inferior to the relevant Performance Standards for Heading\*\*\* and SDME;\*\*\*\*
- .15 have the facilities to receive and process differential GLONASS (DGLONASS) data fed to it in accordance with the standards of Recommendation ITU-R M.823. When a GLONASS receiver is equipped with a differential receiver, performance standards for static and dynamic accuracies (paragraphs 3.4 and 3.5 above) should be 10 m (95%);\*\*\*\*\* and
- .16 be capable of operating satisfactorily in typical interference conditions.

#### 4 PROTECTION

Precautions should be taken to ensure that no permanent damage can result from an accidental short circuit or grounding of the antenna or any of its input or output connections or any of the GLONASS receiver equipment inputs or outputs for a duration of 5 min.

#### 5 FAILURE WARNINGS AND STATUS INDICATIONS

5.1 The equipment should provide an indication if the position calculated is likely to be outside of the requirements of these performance standards.

5.2 The GLONASS receiver equipment should provide as a minimum:

- .1 an indication within 5 s if either:
  - .1.1 the specified HDOP has been exceeded; or

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\* Publication IEC 61162 series.

\*\* For craft meeting the HSC Code, a new position solution at least every 0.5 s is recommended.

\*\*\* Resolution A.424(XI).

\*\*\*\* Resolution A.824(19).

\*\*\*\*\* Refer to resolution A.815(19) on the World-wide Radionavigation System.

.1.2 a new position has not been calculated for more than 1 s.\*

Under such conditions the last known position and the time of the last valid fix, with explicit indication of this state, so that no ambiguity can exist, should be output until normal operation is resumed;

.2 a warning of loss of position;

.3 differential GLONASS status indication of:

.3.1 the receipt of DGLONASS signals; and

.3.2 whether DGLONASS corrections are being applied to the indicated ship's position;

.4 DGLONASS integrity status and alarm; and

.5 DGLONASS text message display.

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\* For craft meeting the HSC Code, a new position solution at least every 0.5 s is recommended.

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