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# DEVELOPMENT OF THE DRAFT IMO POSITION ON WORLD RADIOCOMMUNICATION CONFERENCE 2023 (WRC-23) AGENDA ITEM 10

## Proposal on WRC-23 agenda item 10 regarding VDES R-Mode

**Submitted by International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA)**

**SUMMARY**

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| *Executive summary:* | This document provides comments on a new approach towards terrestrial radionavigation systems suitable as stand-alone maritime positioning systems and backup systems for today's satellite navigation systems. The R-Mode technology offers a new terrestrial radionavigation opportunity by the inauguration of ranging signals or specially designed ranging messages within existing radiocommunication systems. It is proposed that VHF Data Exchange System (VDES) Ranging-Mode (R-Mode) be included in the draft IMO position on WRC-23 agenda item 10 |
| *Strategic direction, if applicable:* | |
| *Output:* | |
| *Action to be taken:* | |
| *Related documents:* | Resolution A.915(22), A.1046(27), MSC.401(95), MSC.432(98), MSC.1/Circ.1575, MSC.1/circ.1595, SN.1/Circ.329, SN.1/Circ.334, MSC 105-INF.10, NCSR 9/24, and NCSR 9/WP.5 |

## Introduction

1 At its seventeenth meeting, the Joint IMO/ITU Expert Group on Maritime Radiocommunication Matters (EG 17) invited interested Member States and organisations to

submit proposals to the ninth session of the NCSR Sub-Committee (NCSR 9) for inclusion in the draft IMO position for WRC-23 agenda item 10 (NCSR 9/12, annex, paragraph 4.25).

2 IALA submitted an input paper on “Response to matters related to the ITU-R study groups and ITU World Radiocommunication Conference (Proposal on WRC-23 agenda item 10) to NCSR 9:

- providing a means to accommodate digital systems in the VHF maritime mobile band, which would include digital voice; and

- providing a radionavigation allocation for VDES Ranging-Mode (R-Mode) to support resilient position, navigation and timing.

3 The Working Group on Communications at NCSR 9 considered the development of the draft IMO position on WRC-23 agenda item 10 based on the proposals in documents NCSR 9/12/6 and NCSR 9/12/9 with respect to the introduction of digital voice radiotelephony in the VHF maritime mobile band and VDES R-Mode, as appropriate. In this regard, views have been expressed as follows:

- noting that the VHF frequencies under discussion are already allocated to radiocommunication services, the required regulatory action by WRC-27 would include development of a new allocation to radionavigation, i.e. the amendment of Article 5 and Appendix 18 of the ITU-R Radio Regulations;

- R-Mode, as an integrated part of VDES, would use the existing frequencies of VDES, therefore it would not cause interference to other systems, but it would reduce the VDES data transfer capacity to a certain degree; and

- ITU would need to develop relevant studies to support VDES R-Mode.

4 NCSR 9 further noted the view that it was important to have a reliable backup for satellite-based position, navigation and timing systems.

5 NCSR 9 instructed EG 18 to develop the draft IMO position on WRC-23 agenda item 10, taking into account comments and documents submitted at NCSR 9, and advise NCSR 10 as appropriate.

6 An information document on R-Mode, terrestrial positioning for resilient navigation has been submitted by Germany, Finland and Poland to the 105th session of the IMO Maritime Safety Committee. That paper provided information about the technical use of R-Mode and the results gained in a large test bed implemented in the Baltic Sea project (2017-2021).

**Background**

7 Currently, a number of additional projects dealing with R-Mode using MF radio beacons and/or VDES base stations are implemented in Europe, Asia and North America. The finalisation of these projects can be expected in due course. These results will provide further information to finalise the standardisation of R-Mode.

8 Further studies are in preparation to support VDES R-Mode and to confirm that VDES R-Mode will not cause interference to other systems and that the VDES data transfer capacity is as efficient as possible without limiting other services planned on VDES.

9 ITU-R Recommendation ITU-R M.2092-1 has reserved a ranging channel for future radionavigation applications. IALA Guideline G1158 describes the system requirements and goals for a VDES R-Mode System. Further work is being conducted at IALA regarding a guideline for the implementation of R-Mode using transmissions in the MF and VHF frequency bands.

10 GNSS (e.g. GPS, Galileo, GLONASS, BeiDou) have become the primary source for maritime Positioning, Navigation and Timing (PNT) data provision. Such PNT data is used by many applications on vessels, like AIS (Automatic Identification System), ECDIS (Electronic Chart Display and Information System), for communication systems and GMDSS (Global Maritime Distress and Safety System) to obtain the accurate position in a case of emergency. Safe navigation, the protection of the marine environment and the efficiency of access to ports are today highly dependent on the availability, continuity, accuracy and integrity of GNSS based positioning and timing.

11 However, it is well known that the radionavigation signals from GNSS are received at very low power levels. Thus, the signal reception is vulnerable to jamming and natural interference. As a result, the provision of PNT data as needed may be corrupted or interrupted. Unavailable PNT data, even for short periods, limits the situation assessment and results in numerous alerts raised by multiple systems on the bridge. The signal reception of GNSS is also vulnerable to spoofed signals, which is critical as hazardously misleading information as a result of position errors that are large enough to have a severe impact on navigation safety but small enough to remain undetected.

12 Within the Strategy Implementation Plan of e-navigation (MSC.1/circ.1595), IMO has identified the user need for improved reliability, resilience and integrity of bridge equipment and navigation information as one of the five prioritised e-navigation solutions.

13 R-Mode provides the potential of a reliable backup solution for satellite-based PNT systems, as described in paragraph 4 above.

14 Through its Performance Standards for Multi-System Shipborne Radionavigation Receivers (MSC.401(95) and the associated guideline (MSC.1/circ.1575), the IMO provides the regulatory means to combine any recognised IMO World-Wide Radionavigation System (WWRNS) with terrestrial position fixing systems as well as wide area augmentation systems. The rising number of available ranging signals from any source supports the determination of position accuracy and associated integrity.

**Conclusion**

15 The VHF frequencies under discussion are already allocated to maritime radiocommunication services. Thus, the required regulatory action by WRC-27 would include the development of an additional allocation to the radionavigation service by modification of Article 5 and Appendix 18 of the Radio Regulations.

16 IALA considers that VDES R-Mode has become sufficiently mature for inclusion under agenda item 10 of WRC-23. IALA will cooperate with ITU and will be pleased to keep IMO, and ITU informed of the progress made.

**Action requested**

17 The Experts Group is invited to consider the information provided and take action as appropriate.