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Agenda item [[2]](#footnote-2)

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Standardisation of R-Mode

(Updated Roadmap)

# Summary

The document provide a detailed and updated roadmap for the planed R-Mode standardisation (see Annex 1). The roadmap shows the necessary steps and dependencies towards a standardised R-Mode system. The roadmap provides information for the required activities and milestones for various international organisations like IMO, ITU, IALA, IEC and RTCM. Further, the document explains that standardisation of the R-Mode user equipment could be performed when R-Mode becomes an integrated part of the existing multi-system radionavigation receiver (MSC.401(95)) performance standard.

# Background

Position, Navigation, and Timing (PNT) is part of the critical infrastructure necessary for the safety and efficiency of vessel movements, especially in congested areas. Global Navigation Satellite Systems (GNSS) have become the primary PNT source for maritime operations. Unfortunately, GNSS is vulnerable to jamming and interference, intentional or not, which can lead to the loss or, even worse, to incorrect PNT information. Furthermore, satellite navigation systems could fail in their ground and/or satellite segments. Thus, additional supporting and complementary systems are required to provide resilient PNT. One candidate system, which could provide alternative positioning and timing information, is called R-Mode, or ranging mode. The idea of R-Mode is based on the transmission of a ranging signal or a ranging message via marine radio beacons or from Very High Frequency (VHF) shore networks using the VHF Data Exchange System (VDES).

Over the last years a number of studies were performed which demonstrated the feasibility of R-Mode. In addition, first static tests validated the theoretical findings and showed the potential of R-Mode as a future contingency or backup system to GNSS. A first roadmap to standardise the R-Mode system was already drafted during the IALA R-Mode workshop in September 2019 [1].

# Discussion

## Standardisation of the R-Mode system

The R-Mode system consists of various system segments:

* The shore segment, consisting e.g. of clocks, modulators, transmitters and antennas, performance monitor
* The radio link segment, using transmissions within the MF- and VHF band
* The user segment, consisting e.g. of antenna and receiver

To enable a harmonized usage of R-Mode, standardisation is required in each segment, addressing various standardisation organisations.

## Standardisation organisations involved

Table 1 informs about the currently addressed organisations as well as the required topics, which require standardisation.

1. Standardisation tasks and organisations involved

|  |  |  |
| --- | --- | --- |
| **Shore site** | **Radio link** | **On-board** |
| **IALA:**   * implementation matters using MF and VHF frequencies * specification of used R-Mode methods (e.g. Guideline on VDES R-Mode) | **ITU:**   * spectrum related topics (e.g. frequency allocation, modulation, etc.) * implementation matters using MF and VHF frequencies | **IMO**   * general information papers * performance standards * performance requirements |
| **RTCM:**   * definition of navigation messages * definition of  dR-Mode messages * preparation of test standards for receiver equipment (e.g. MSR) within special committees (e.g. SC 138 for VDES R-Mode) |  | **IEC**   * test standards for type approval * appropriate IEC 61162 interface messages |

## Proposed Roadmap

The roadmap provided in Annex 1 propose the planned standardisation initiatives in various organisations. Some of the standardisation work has already been started or is already available (e.g. IALA guideline on VDES R-Mode). One of the main challenges is the standardisation of the required navigation messages at RTCM and the test standards for the user receiver at IEC.

The suggested way for an efficient standardisation process of the user equipment is to address the existing IMO performance standard for Multi-System Shipborne Radionavigation Receivers (MSR) [2] and the associated GUIDELINES FOR SHIPBORNE POSITION, NAVIGATION AND TIMING (PNT) DATA PROCESSING (MSC.1/circ.1575), [3]. These recent performance standards allow the combination of any recognised IMO World-Wide Radionavigation System (WWRNS) with terrestrial position fixing systems (like R-Mode and others) as well as augmentation systems in one receiver.

# References

1. Report of IALA Workshop on R-Mode, September 2019, IALA HQ.
2. IMO, “PERFORMANCE STANDARDS FOR MULTI-SYSTEM SHIPBORNE RADIONAVIGATION RECEIVERS“, MSC.401(95).
3. IMO, “GUIDELINES FOR SHIPBORNE POSITION, NAVIGATION AND TIMING (PNT) DATA PROCESSING”, MSC.1/circ.1575.

# Action requested of the Committee

The Committee is requested to:

1. Note the information provided
2. Discuss how the developed roadmap for standardisation of R-Mode can be supported by IALA by liaison with other standardisation organisations.
3. Annex R-Mode Standardisation (Updated Roadmap)



1. Input document number, to be assigned by the Committee Secretary [↑](#footnote-ref-1)
2. Leave open if uncertain [↑](#footnote-ref-2)