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| IALA Guideline |

DRAFT

on Implementation of R-Mode on MF and VHF frequencies

Edition x.x

Document date

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**Har ikke fundet nogen tekst til listen over figurer.**

# Introduction

## Scope of Document

## Structure of document

# Performance requirements

## Definitions

### Absolute accuracy (Geodetic or Geographic accuracy)

### Integrity

### Continuity

### Availability

### Coverage

## Positioning Performance Requirements

## Timing Performance requirements

# System Architecture

## General system Architecture

Figure 1 provides a general system architecture developed from IALA Guideline 1113 on “DESIGN AND IMPLEMENTATION PRINCIPLES FOR HARMONISED SYSTEM ARCHITECTURES OF SHORE‐BASED INFRASTRUCTURE”, [x]

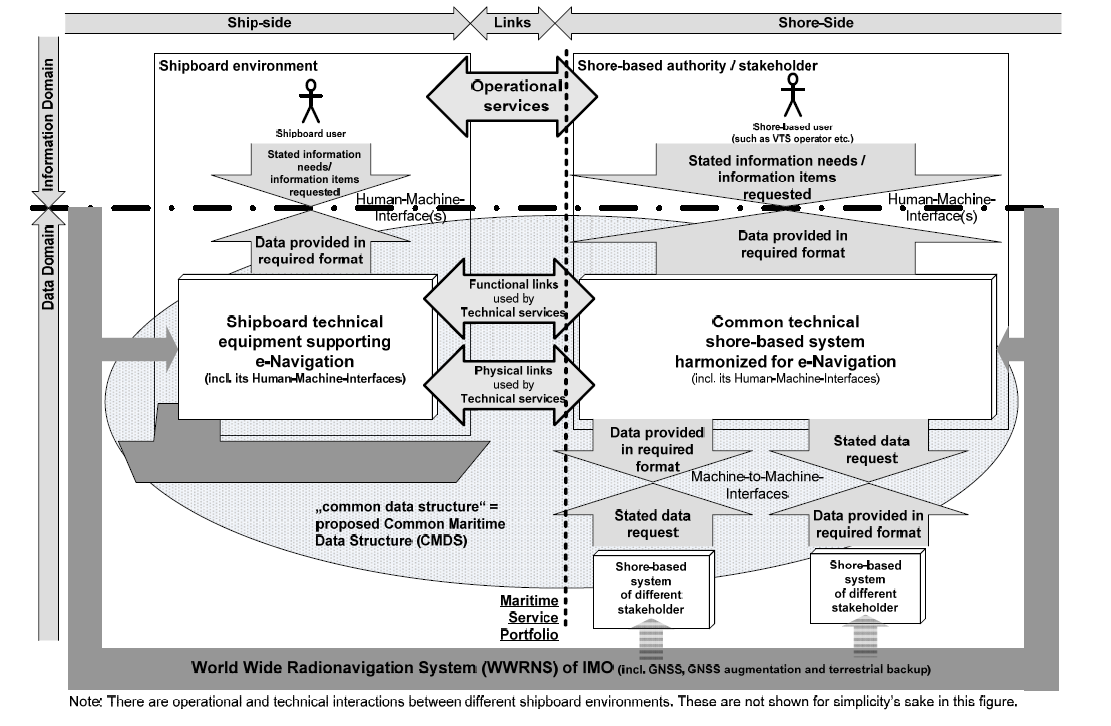


Figure 1 The overarching architecture as adopted by IMO for e-Navigation

Figure 2 shows how R-Mode fits in the overall e-Navigation system architecture. R-Mode will be implemented as a new shore site service which could provide data and ranging information to the ship side. The R-Mode system with its services to provide synchronised ranging signals is part of the overall PNT supporting e-Navigation architecture.



Figure 2: R-Mode embedded in the overarching IMO e-Navigation architecture

## Logical R-Mode System architecture

The R-Mode system consists in general of the following components:

* R-Mode transmitter station: A station that provides R-Mode service. It is intended to use existing maritime radio beacon installations and VHF (AIS/VDES) shore sites.
* R-Mode monitor: Station that monitors broadcasted signals of R-Mode transmitters.
* R-Mode reference time: Time distribution infrastructure that provides in a region the R-Mode reference time which is used for R-Mode service provision.
* Command and control, Security center: Central infrastructure of a region that is used to control and command the complete network. It provides a security services for the R-Mode system and service.
* R-Mode user: User of R-Mode service.



Figure 3 Logical R-Mode architecture

## Physical R-Mode Architecture

Figure 4 provides a common physical R-mode architecture identifying physical elements which are required for both, R-Mode using MF transmissions as well as R\_mode using VHF transmissions.

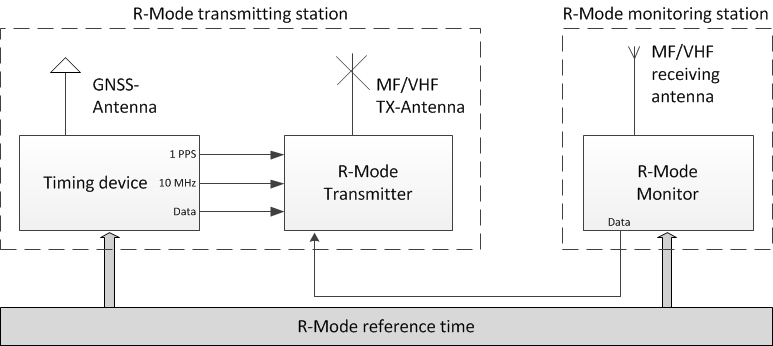


Figure 4 Physical system architecture

## Components of a MF Radio Beacon Transmitting site

The following sketch includes general components of a MF R-mode transmitting site:



Figure 5 General R-Mode Components

## Components of A VHF transmitting site

## Monitoring

## ….

# R-mode Service

## MF R-Mode Service

## VHF R-Mode Service

## Timing Service

## Use cases

# Required Modificationd for R-Mode using MF Transmissions

* Performance requirements
* System architecture
* Modification of MF transmission service including R-Mode modulation
* Timing and Synchronisation
* Technical implementation

# Required Modificationd for R-Mode using VHF Transmissions

* Performance requirements
* System architecture
* Modification of MF transmission service including R-Mode modulation
* Timing and Synchronisation
* Technical implementation

# Timing, Synchronisation and Calibration

# Operational Aspects

## Operation and Maintanance

## Performance Verification

## Monitoring

## Service Provider Aspects in a R-Mode Network

### Exchange of Information

### Memorandum of understanding (MOU)

## Publication of Information

# ACRONYMS & Definitions

## Acronyms

## Definitions

The definition of terms used in this Guideline can be found in the International Dictionary of Marine Aids to

Navigation (IALA Dictionary) at (<http://www.iala‐aism.org/wiki/dictionary>).

# REFERENCES

1. IALA ….
2. Information gathered during the R-mode workshop

IALA R-Mode Workshop 10 Sept 2019

Session 5, Breakout Group 2

Guidelines on Implementation of R-Mode on MF and VHF

Chair: Michael Hoppe

Rapporteur: Harold Kiffer

* Michael gave the welcome and brief overview

**Presentation on R-Mode Implementation**

R-Mode Testbed implementation

* Baltic area is the testbed area
* Plan to implement 4 VHF R-Mode sites in southern Baltic
* Coverage predication, site inspection and selection
  + Identify required modifications
  + Ensure compatibility of new R-Mode equipment with existing installed equipment
* Timing and Synchronization
* Modulation
* Transmitter and antenna systems
* Site calibration
* Operational aspects
* Actors
* System design (MF/AIS)
  + E-nav system architecture to shore systems

Overview of draft guideline

* General outline
* Very little content. Goal is to develop initial content for submission to ENG and NAV committees
* Question related to definitions- one source document for definitions
  + Suggestion to use IALA dictionary (IALA dictionary committee is inactive)
  + Determine how to deal with definitions
  + Cross-reference all sources for definitions
* Add requirement to create new R-Mode site in addition to modification of existing site
* Question regarding reference to GPS/GLONASS/Galileo as satellite based input to R-Mode
* Question about including terminology regarding transceiver abilities
* Question regarding breaking apart R-Mode HF and VHF into separate documents
  + Future may realize ability to have integrated MF/VHF receiver- recommend remain combined

Broke out into workgroups to populate ideas and topics for the draft guideline:

* General expectations of an R-Mode Implementation Guideline
* Operational aspects for an R-Mode service in an area
* Requirements (e.g. 2 hours holdover time… is this enough?)
* Architecture and system design aspects

Re-grouped to review and prioritize workgroup input

* General expectations of an R-Mode Implementation Guideline
  + Better clarifications as to the purpose of this document
  + Who is the intended reader?
  + Need for a separate “signal spec” type document?
  + Collect information in respect to signal specification
* Operational aspects for an R-Mode service in an area
  + Overall authority?
* Requirements (e.g. 2 hours holdover time… is this enough?)
  + Accuracy needs to be there 24/7
  + Independent of GNSS
  + Easily integrated
  + Reliability
  + User driven requirements
  + 2 hours is not enough
  + Various classes of R-Mode holdover times
  + Cost/benefit analysis in the guideline
* Architecture and system design aspects
  + Separate guidance for new stations vice modification
  + Power/UPS
  + Differential mode on R-Mode
  + Scalability
  + Automatic calibration?

Timing and synchronization requirements

**Specific feedback to guide**

Chapter 3 - System Architecture

* Scalability
* Reference to existing installations
* Within architecture, Regional systems need to be interoperable
  + ICD to specify specs to build to
  + Should be able to sail seamlessly from region to region
  + Neighboring regions should not interfere with others transmissions
  + Regional exchange of information

Consider moving Chapter 5 & 6 to annex, possibly simplify these for the body of the document

Chapter 7 – Timing, synchronization and calibration

* Very important, possibly look at automation
* Consider reordering to a different portion of document
* Separate timing and synchronization from calibration
  + Calibration needs to be addressed in both implementation and operation

Chapter 8 – Operational Aspects

* Publication of information should include information exchange
* Monitoring
  + Especially critical between regions
  + Information sharing

Chapter 9 – Acronyms and Definitions

* Consider minimizing lists of definitions, ensure its in proper place

1. Worksop results (Sticky Notes)

