

Final Presentation of the NAVISP EL3-010 Project

Independent Critical Navigation - ICING

25 January 2024

Nader Alagha
European Space Agency

ESA UNCLASSIFIED – For ESA Official Use Only



→ THE EUROPEAN SPACE AGENCY

Enabling the Maritime Sector from Space

Earth
Observation



(Integrated Terrestrial &)
Satellite
Communications



Satellite
Navigation



**Connectivity and Data Exchange:
Essential for
Transformation of Marine Operations**

Maritime Data Exchange in VHF Band

Automatic identification system (AIS) technology has had a great positive impact in maritime safety and security

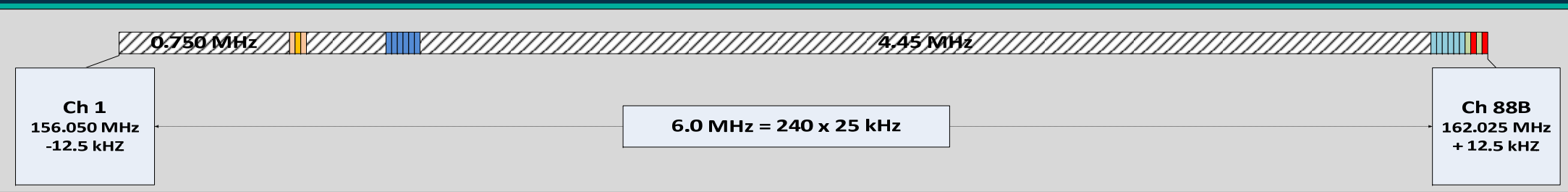
- Occupying less than 1.7% of the entire VHF marine frequency bands
- Relatively affordable equipment and service cost

Increasing AIS Technical Challenges

- Extremely populated AIS network cells close to high traffic zones (busy harbours, popular passages, etc.)
- AIS overload due to exchanging messages

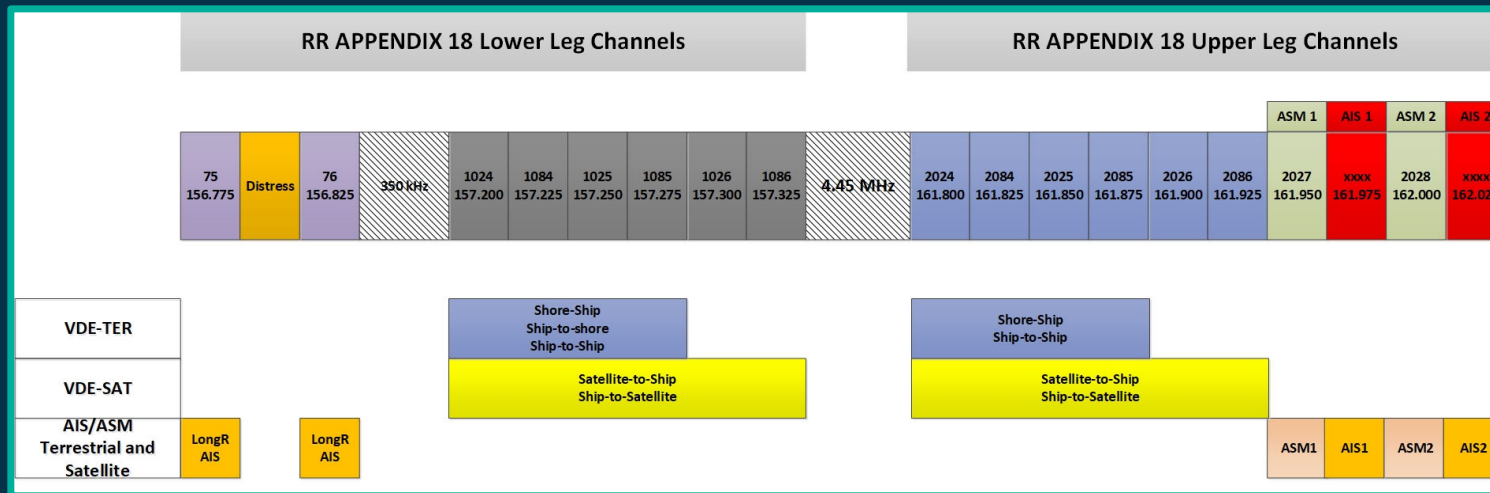
VHF Data Exchange System (VDES):

- Enhanced use of spectrum for data exchange
- Enables two-way communications
- Protection of AIS from overloading (due to the message exchange)
- An integrated use of terrestrial and satellite components



VDES Regulatory Status

- Since WRC-2019, VDES spectrum allocation for satellite and terrestrial components have been finalized.
- Appendix 18 of ITU Radio Regulation specifies channel numbering and their use cases.
- World-wide coverage (AIS, ASM, VDE Channels)
- ITU Effective date: **Jan 2021**
- ECC decision is a gradual deployment and spectrum clean up by Jan 2024.



ESA Activities on VDE-SAT Technology Development and Demonstration



Analyses, Proof of Concept, Measurement Campaign

[VDE-SAT Downlink Verification](#)

[VDE-SAT Validation Platform](#)

Various Measurement Campaigns in support of VDE-SAT Study Report (ITU-R M.2435-0)

[IoT Services using VDE-SAT Uplink](#)

Development of VDES R-Mode Technologies for Alternative PNT

Technology Development

[Space-Based VDE Transceiver](#)

[VDE system on board data processing for CubeSats](#)

[Ship-borne Terminal Integrating VHF Data Exchange Services](#)

[Ship-borne VHF Antenna for enhancing VHF Link Quality](#)

Pre-Operation, Demonstration

VDES pre-operational demonstration for navigation augmentation services

VHF maritime spectrum monitoring

[VDES Demonstration project \(VASP\)](#)

[VDE-SAT for Ranging Demonstration on NORSAT-TD Satellite](#)

- 10 completed VDES-related projects, supported by various ESA Programs (Navigation, General Studies, General Support Technology Program, Telecommunications, Laboratories)
- 7 VDES-related projects ongoing
- 3 Planned Activities in 2024



A satellite view of Earth at night, showing the illuminated landmasses of Europe and Africa against the dark background of space. The Earth's curvature is visible at the top, and the atmosphere glows with a thin blue line. Clouds are visible as white patterns over the dark oceans.

Thank you!

nader.alagha@esa.int