



Brief Results of Feasibility Study of R-Mode using MF-DGPS Transmissions

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The R-Mode Idea

- R-Mode (Ranging Mode) is the add on of accurate synchronized **timing** signals from **existing** terrestrial maritime radio infrastructure
- Use of terrestrial radio links which are standardized and **globally distributed** for **maritime** usage
 - MF: IALA Radiobeacon Service (DGNSS)
 - VHF: AIS-shore based service
- Combination of various terrestrial ranging signals (MF, VHF and LF)

The ACCSEAS R-Mode Feasibility Study

- Part 1: Investigation of R-Mode based on existing **MF IALA radio beacons** infrastructure
- Part 2: Investigation of R-Mode based on existing **AIS shore** infrastructure (VHF)
- Part 3: **Combination** of R-Mode Signals from radio beacon, AIS and eLoran transmissions



First Results

taking into account:

tracking **bit transitions** and **carrier phase**

variance metrics

Propagation conditions

Geometry

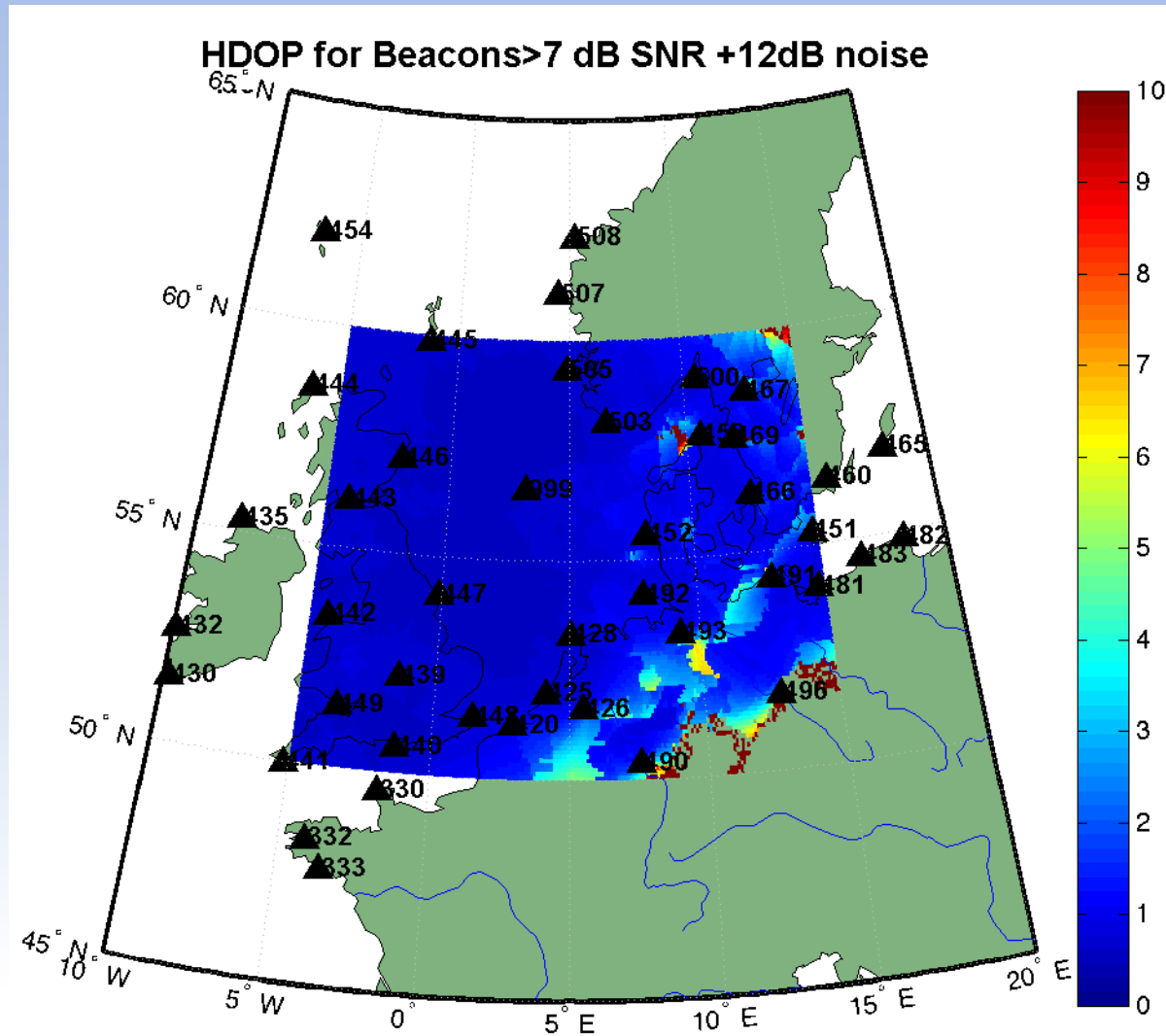
Noise

Interference

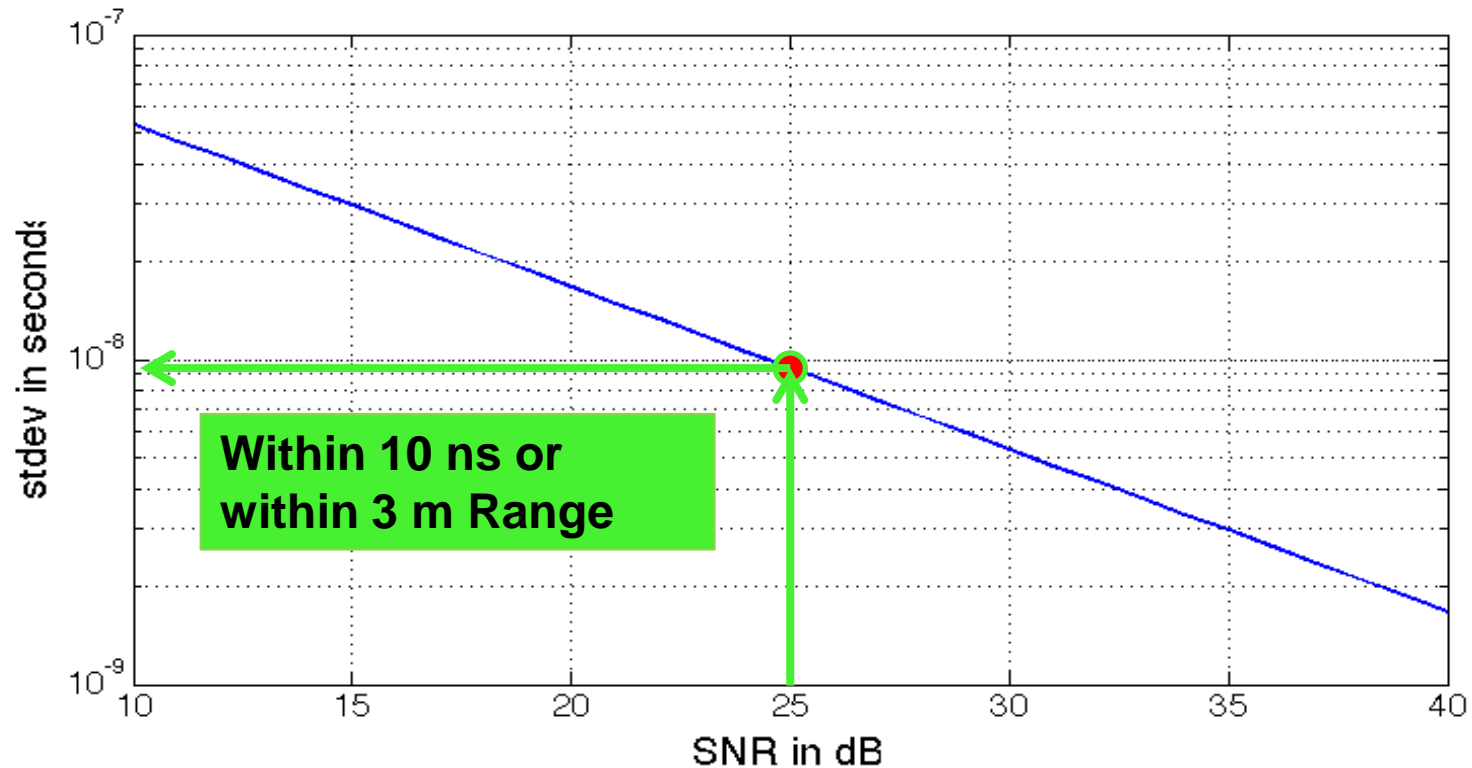
Sky wave



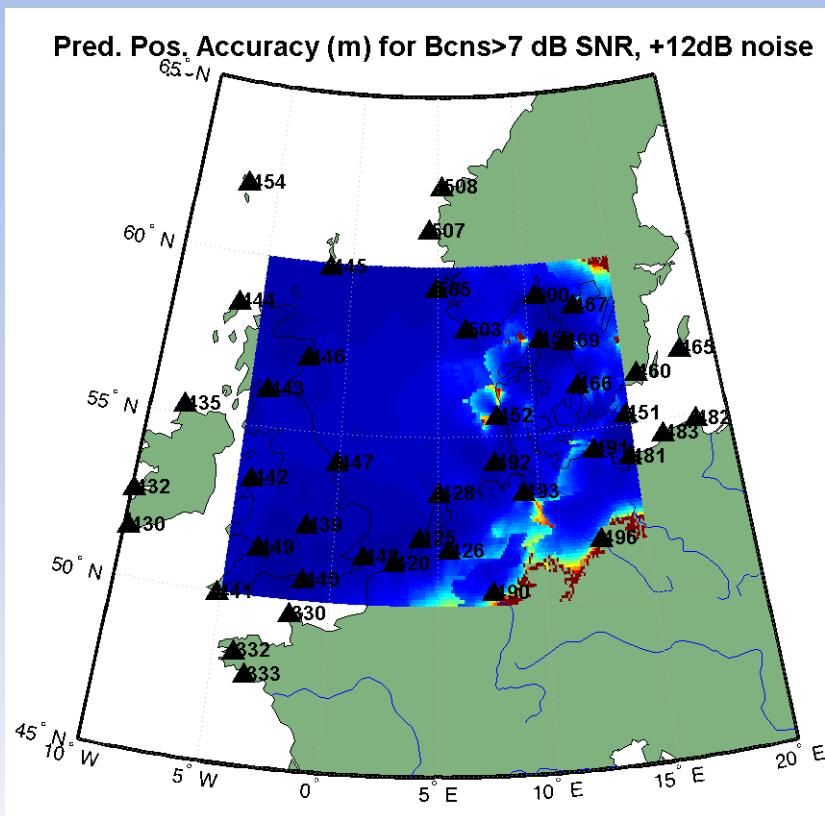
Geometry metric (HDOP) from existing radio beacons in the North sea



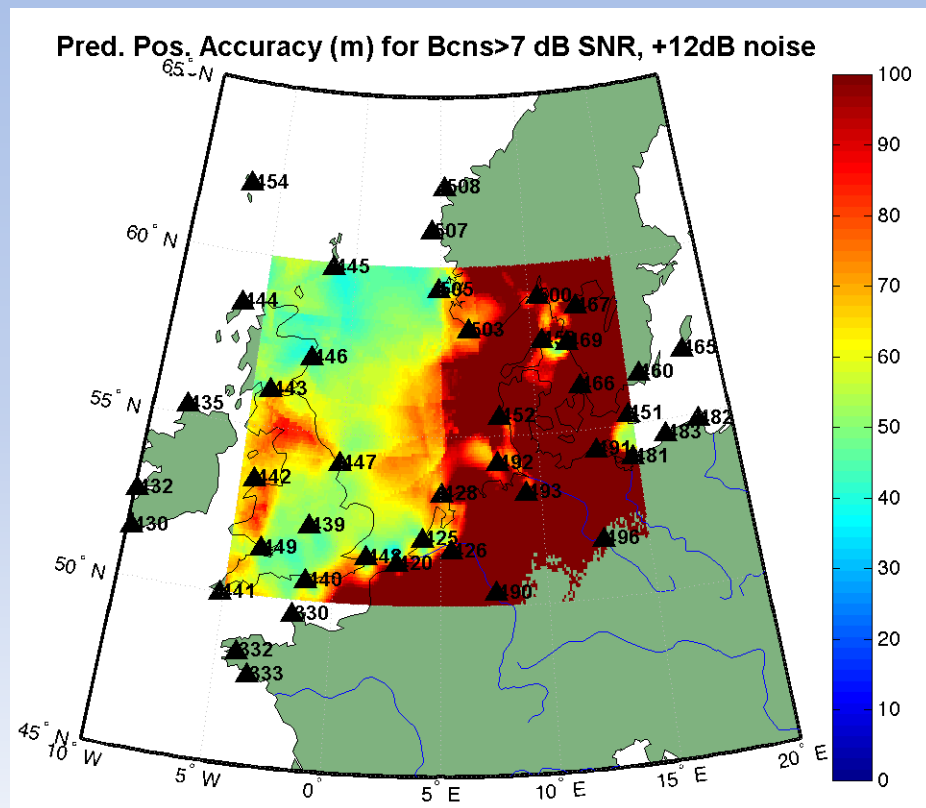
Timing (Ranging) Accuracy



Position Accuracy



Day time



Night time (sky wave interference)

Outlook

- Continue the work regarding
 - Feasibility study of R-Mode based on **AIS transmissions**
 - Feasibility study of R-Mode based on **combinations** of MF, VHF and LF transmissions
 - Perform practical tests (**proof of concept**) within ACCSEAS project



Conclusions

- R-Mode on MF Radiobeacons is feasible
- Existing infrastructure on Radiobeacons in North Sea provide good coverage and geometry
- Only minor modifications required with respect to a stable timing source and a appropriate MSK-Modulator.
- Further improvements can result from a combination with other existing infrastructure (AIS or eLoarn).



Thank you for your attention

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and thanks to



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