



CSL – URN PROJECTS OVERVIEW

SEPTEMBER 2023



PRESENTATION OUTLINE

01 Overview of CSL

02 Ferbec

03 Nukumi

04 MARS

05 Conclusions

CSL OVERVIEW

We are The CSL Group Inc., a world class provider of complex marine solutions with a history that dates back to 1845. We are the world's largest owner and operator of self-unloading vessels, the third largest cement carrier, and a leader in high-efficiency transshipment solutions.

- 1,500 employees
- 97 vessels
- 50+ types of dry bulk commodities shipped globally
- 85+ customers worldwide

CSL FERBEC

02

FERBEC SUMMARY

SHIP OVERVIEW

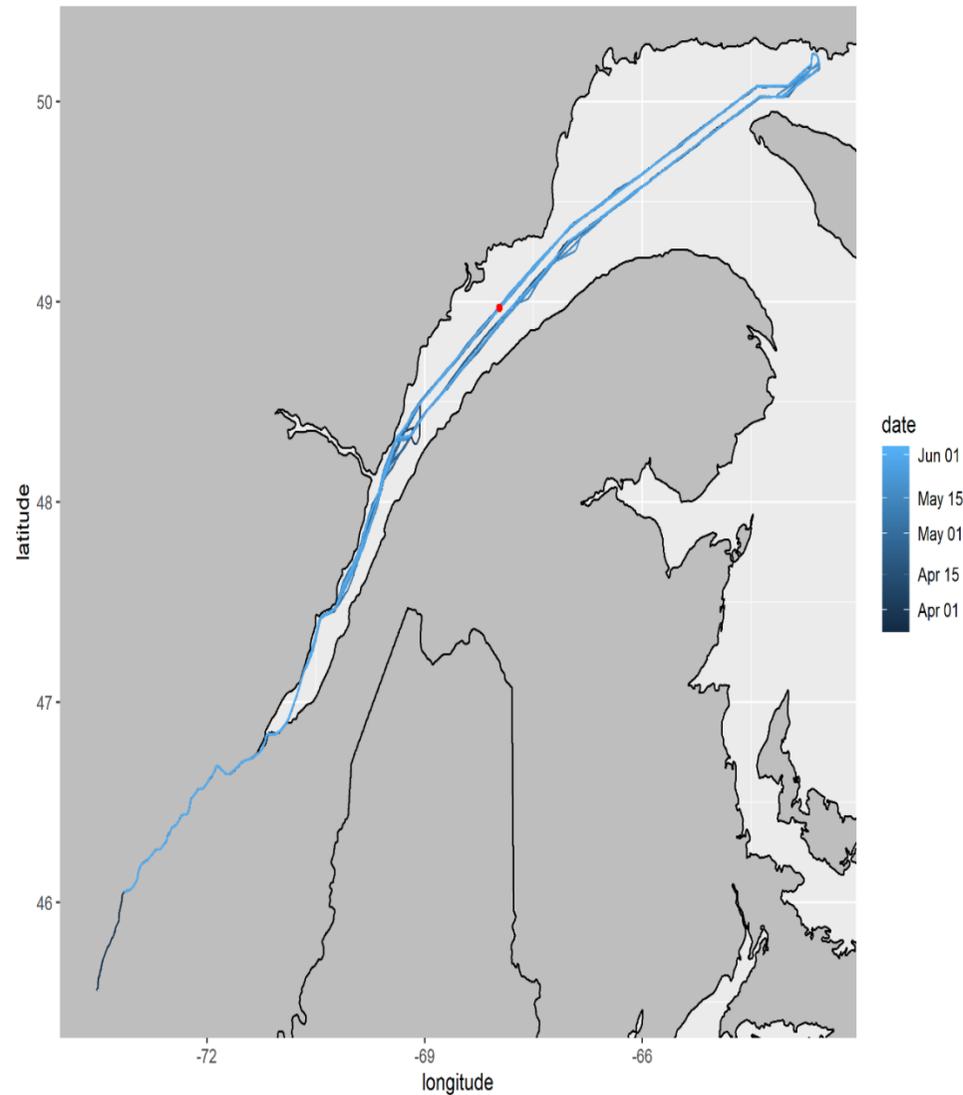
- Geared Bulk Carrier
- 49,502 dwt
- Slow speed 2-stroke ME
- Single screw, fixed pitch propeller
- 3 Gen sets



FERBEC PROJECT

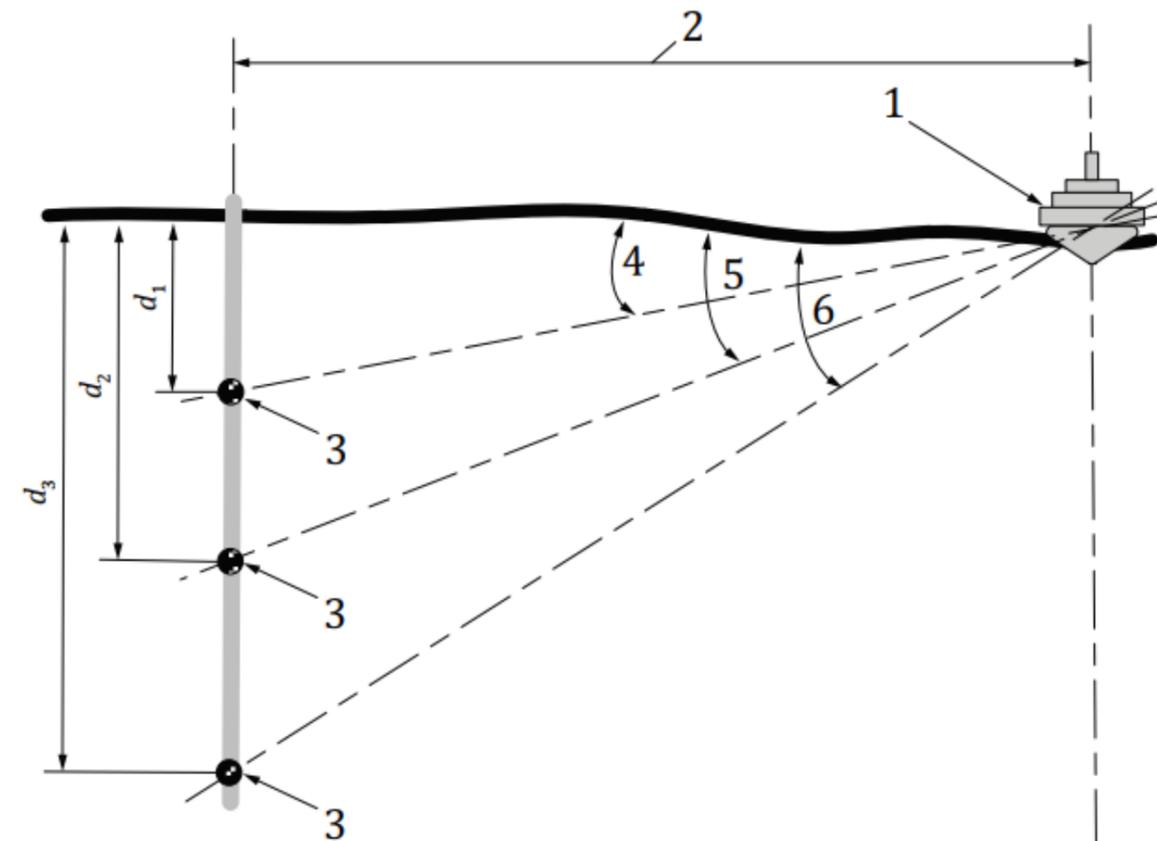
SCOPE

- Evaluate the possibility of a cavitation monitoring system
- Establish a baseline trial at various speeds



PROJECT OVERVIEW

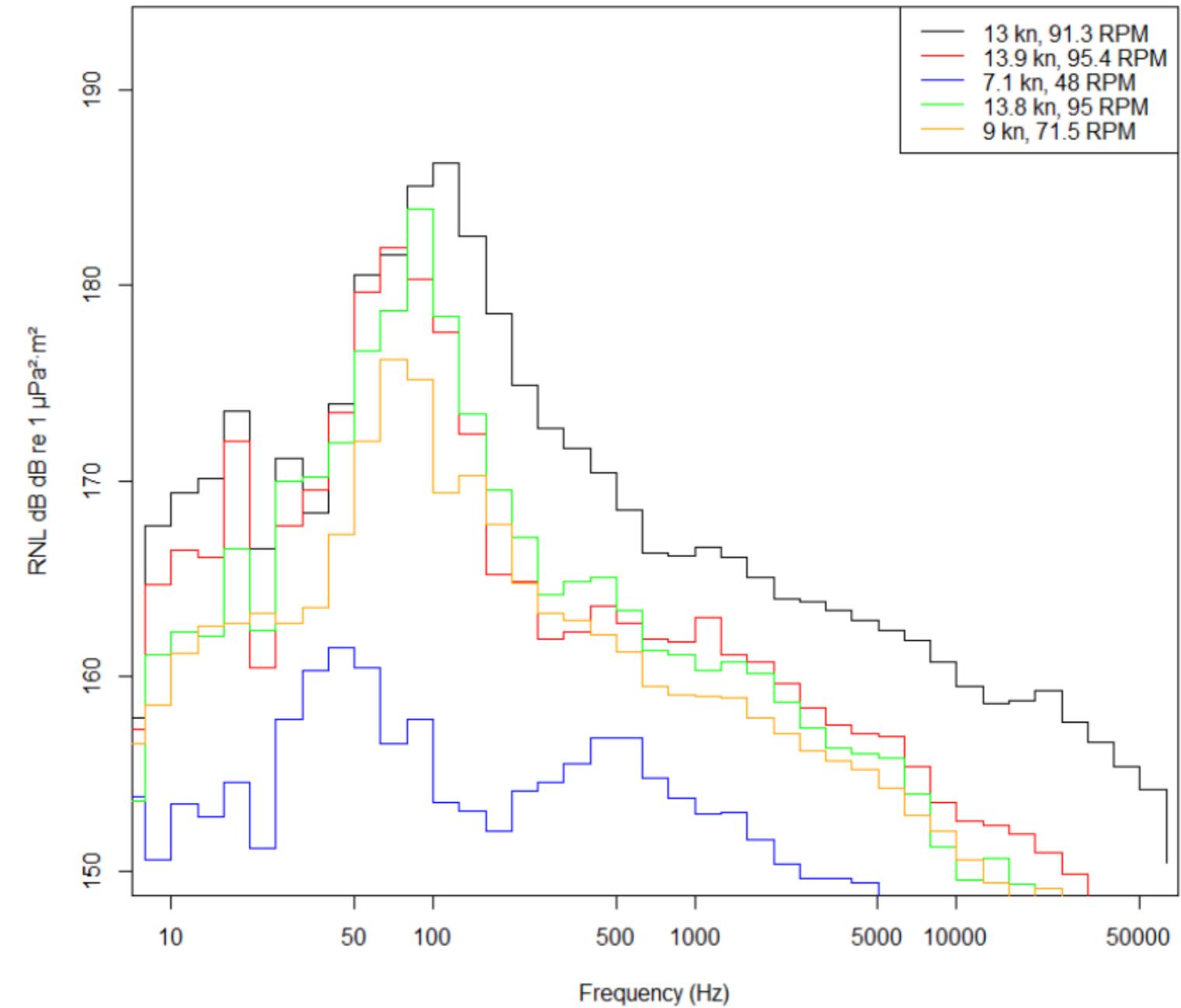
- Installed 3 pressure sensors, an accelerometer and data collection system onboard
- Installed vertical line array
- Passed the array at 7, 9, 11 and 13 kts



FERBEC RESULTS

RESULTS

- Evaluated the possibility of a cavitation monitoring system
- Establish a baseline trial at various speeds
- Cavitation onset at ~6kts
- Cavitation status light integrated into bridge display



CSL NUKUMI

03

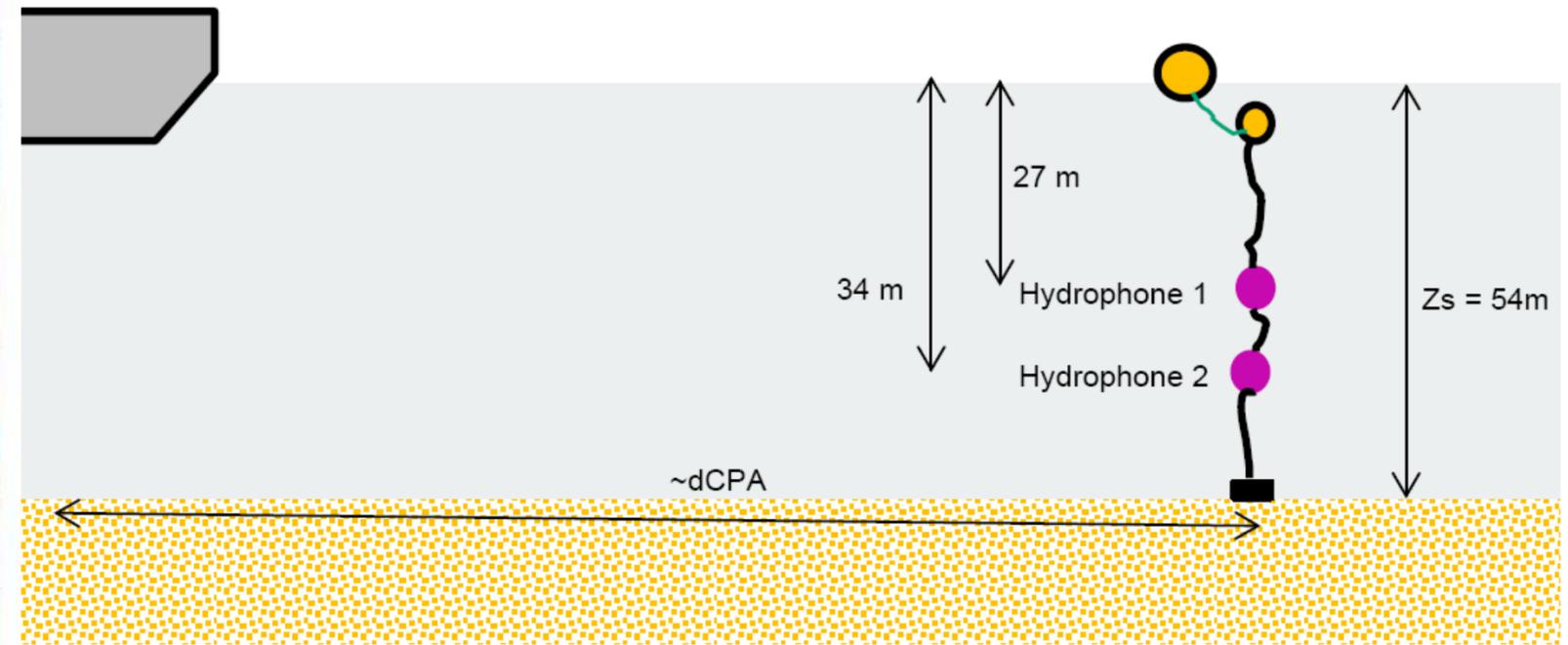
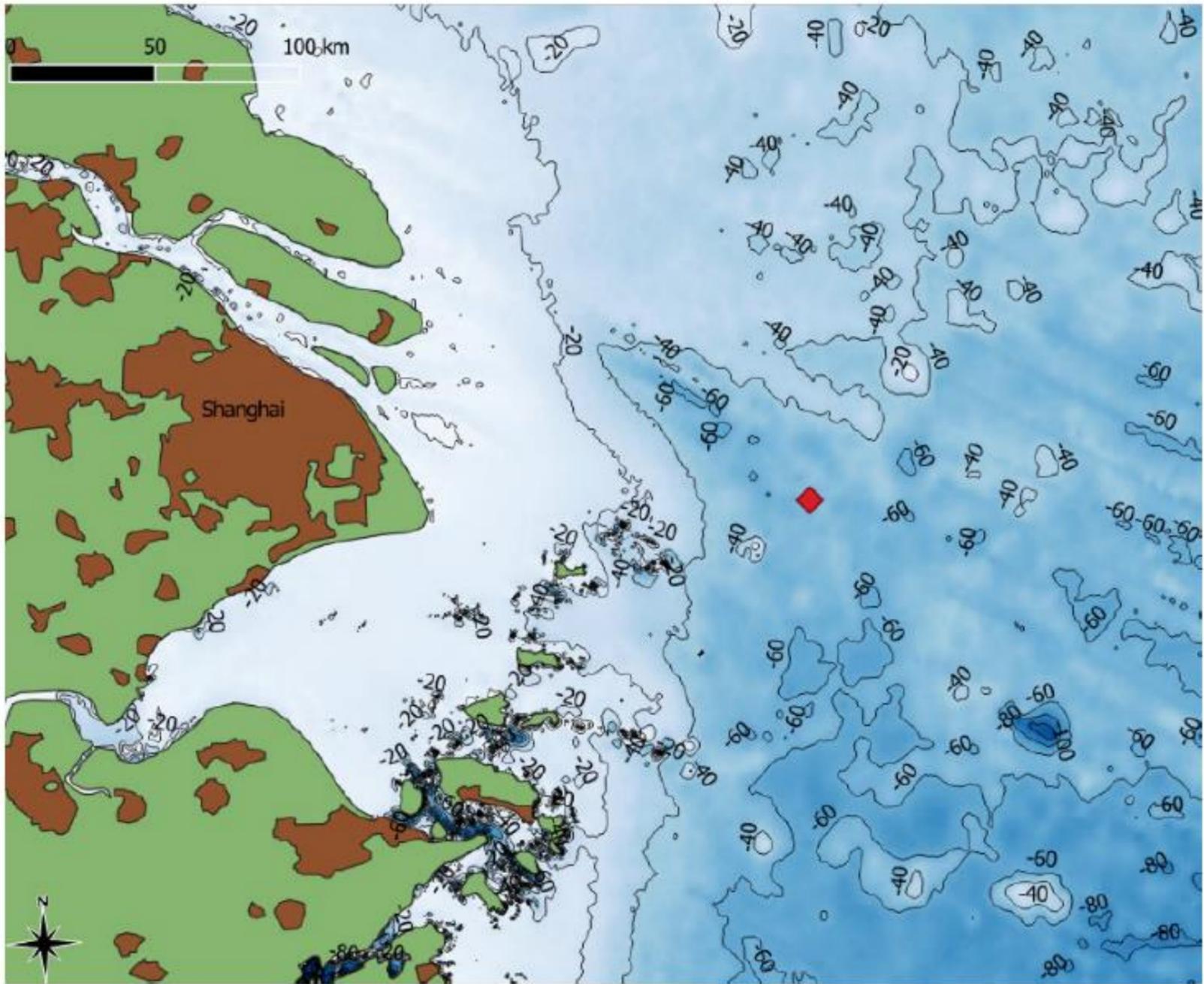
NUKUMI OVERVIEW

SHIP OVERVIEW

- Self Unloading Bulk Carrier
- 31,600 dwt
- Diesel electric
- Twin podded design
- CPP
- 4x medium speed, 4 stroke engines
- URN-M Notation



NUKUMI URN-M

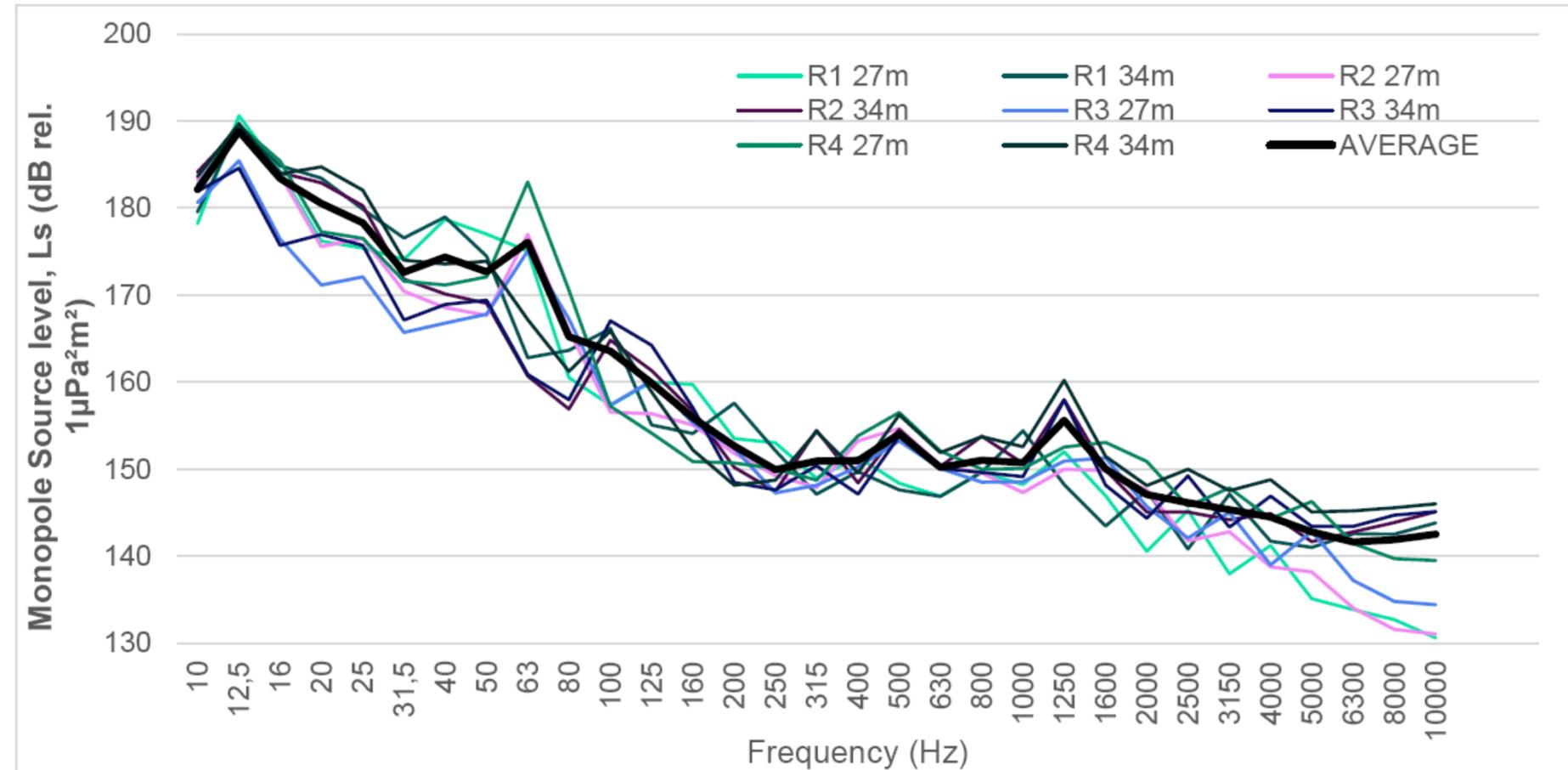


NUKUMI SUMMARY

URN RESULTS

Measured during sea trials for URN-M notation

- 50% MCR
- 12kts
- 190dB maximum at 12Hz
- Challenges:
 - Higher than desired background noise, 130 dB
 - Shallow water depth of 54m (ship LOA is 225m)



MARS PROJECT

04

MARS SUMMARY

MARS (MARINE ACOUSTIC RESEARCH STATION)

The MARS Project is an applied research venture whose purpose is to measure the underwater noise radiated by ships, to understand its origins, and to propose relevant methods for its reduction in collaboration with Canadian navigation professionals and regulators.

Objective 1: design and deployment of instrumentation in the St. Lawrence Estuary near Rimouski

Objective 2: measure and provide information in near real time on the acoustic signatures of partnerships following the ANSI/ASA S12/64-2009 standard and then to study links between radiated noise, environmental parameters, and ship operating conditions

Objective 3: carry out vibration and acoustic diagnostics on board ships to identify and prioritize sources generating underwater noise within the ship.

Objective 4: assemble the knowledge produced by the three previous objectives to propose and test methods to reduce radiated noise that are compatible with ship operational constraints.

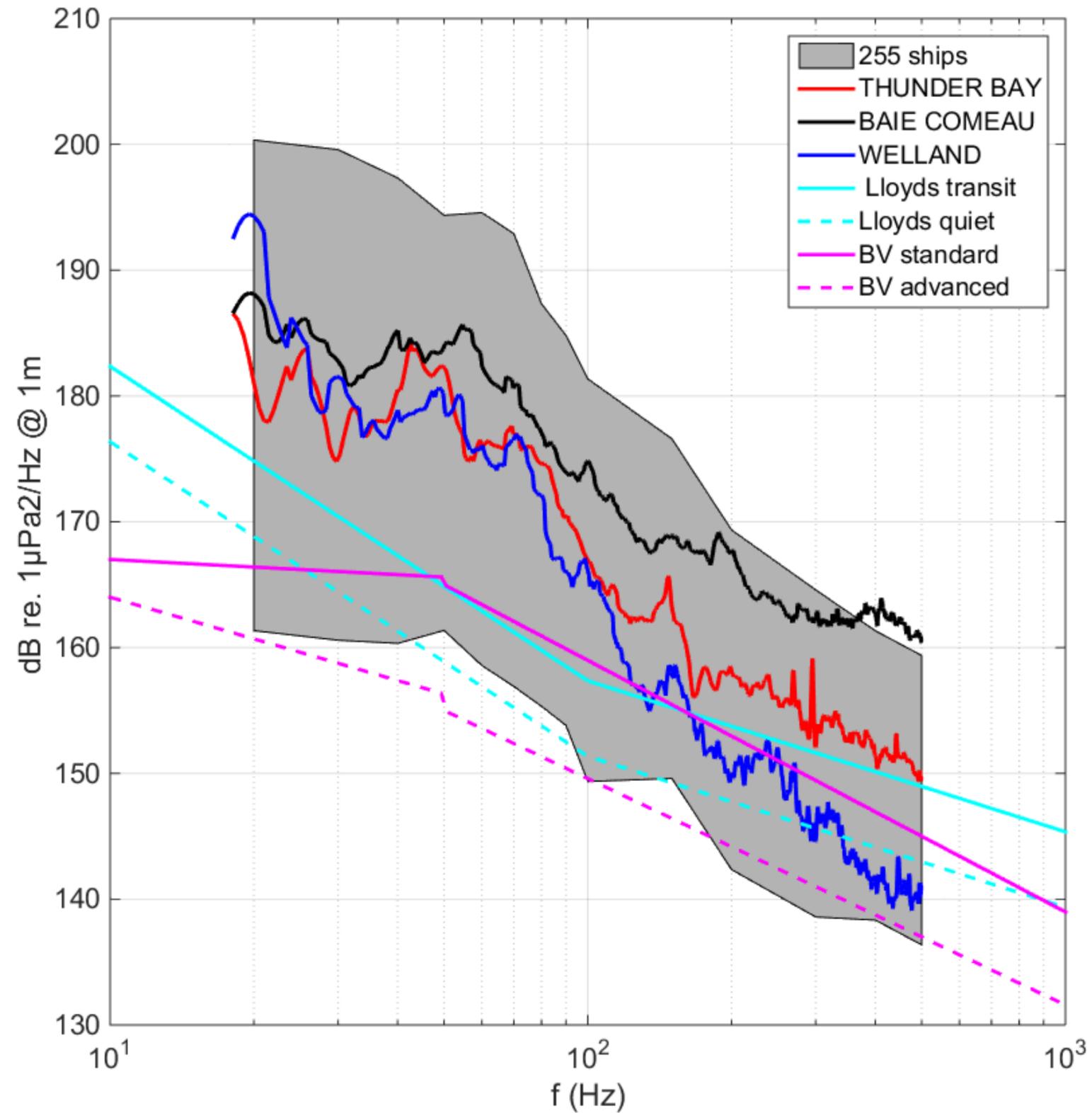
TRILLIUM CLASS

SHIP OVERVIEW

- Self Unloading Bulk Carrier
- 34,490 dwt
- Single screw
- Controllable Pitch Propeller
- 3 Gen sets



TRILLIUM CLASS RESULTS



TRILLIUM VS NUKUMI

SHIP OVERVIEW

	TRILLIUM	NUKUMI
SHIP TYPE	Self-Unloading Bulk Carrier	Self-Unloading Bulk Carrier
DWT (T)	~34,500	31,600
MAIN ENGINE('s)	Slow-Speed 2-Stroke, 8750kW	4x Medium Speed, 6000kW Total
PROPULSION	Direct Drive	Diesel Electric, Podded Design
PROPELLER	4 Blade, Controllable Pitch	4 Blade, Controllable Pitch
RUDDER	Steering Nozzle	2 x High Lift Rudder
GENERATOR ENGINE	3 x Medium Speed, 4-Stroke	N/A
FUEL CONSUMPTION AT 12KTS (MT/D)	20.6	18.3

TRILLIUM VS NUKUMI

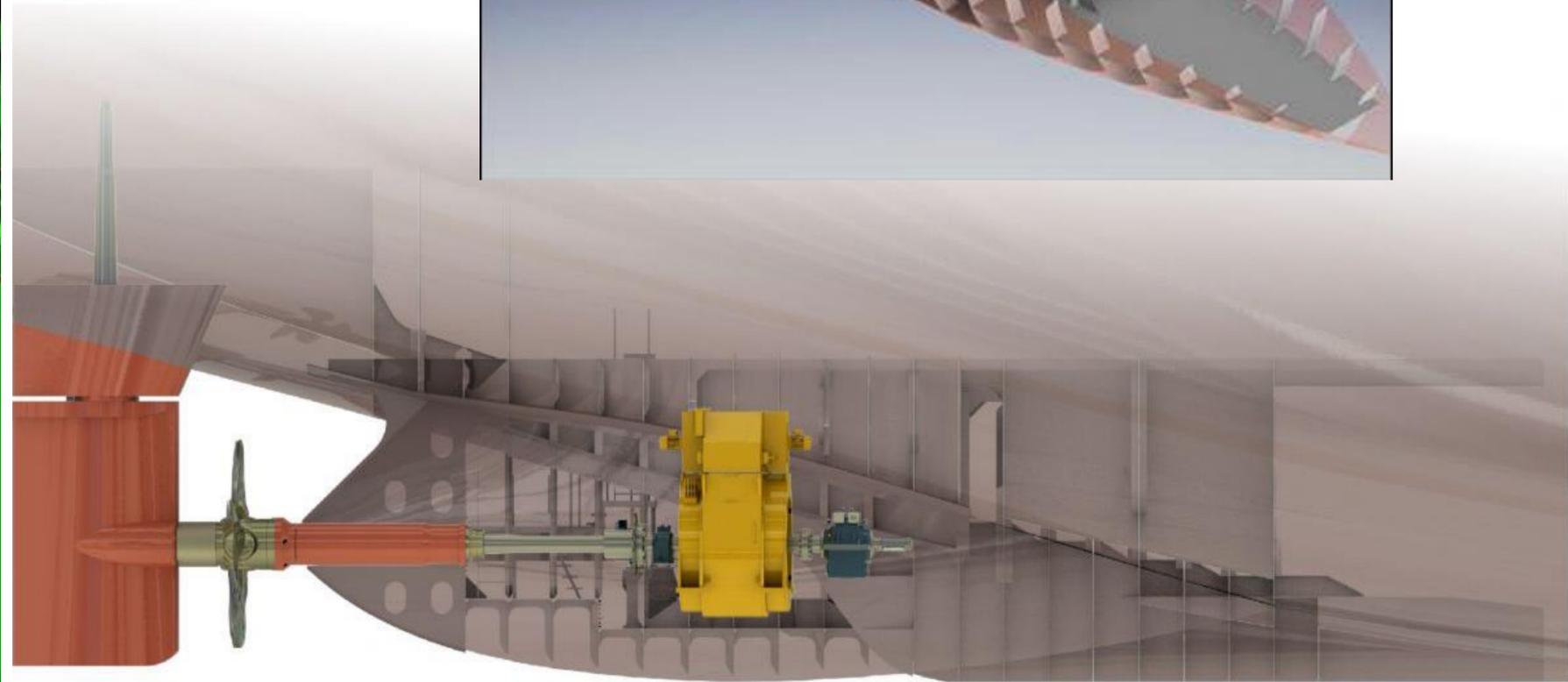
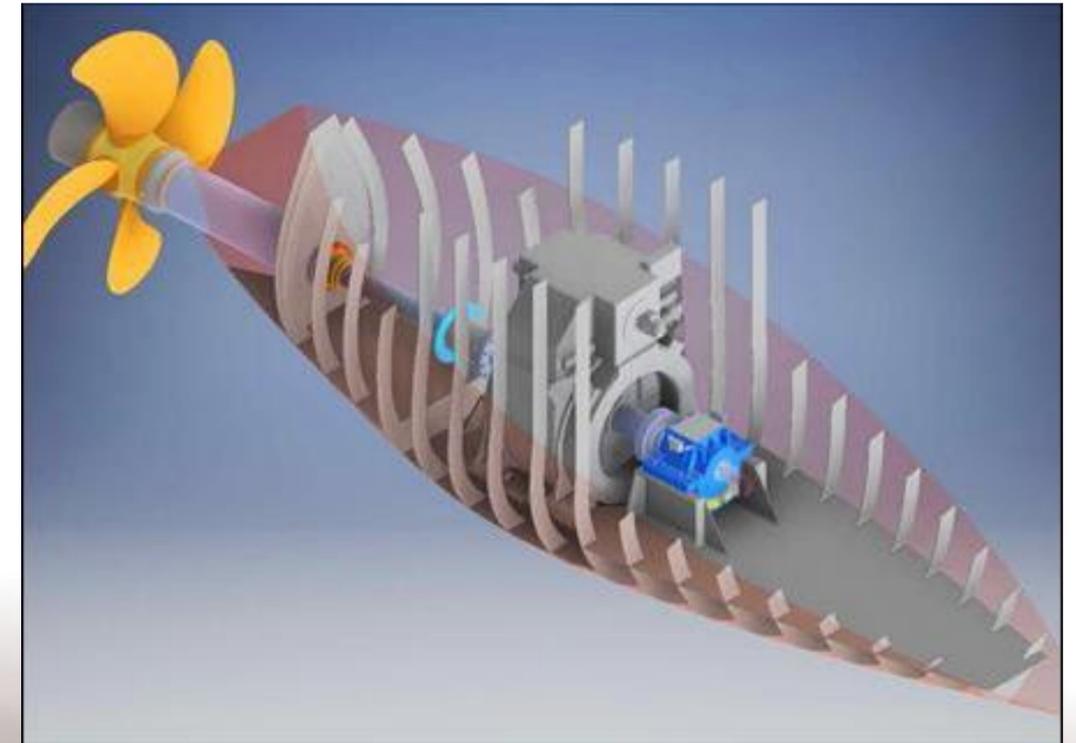


Trillium

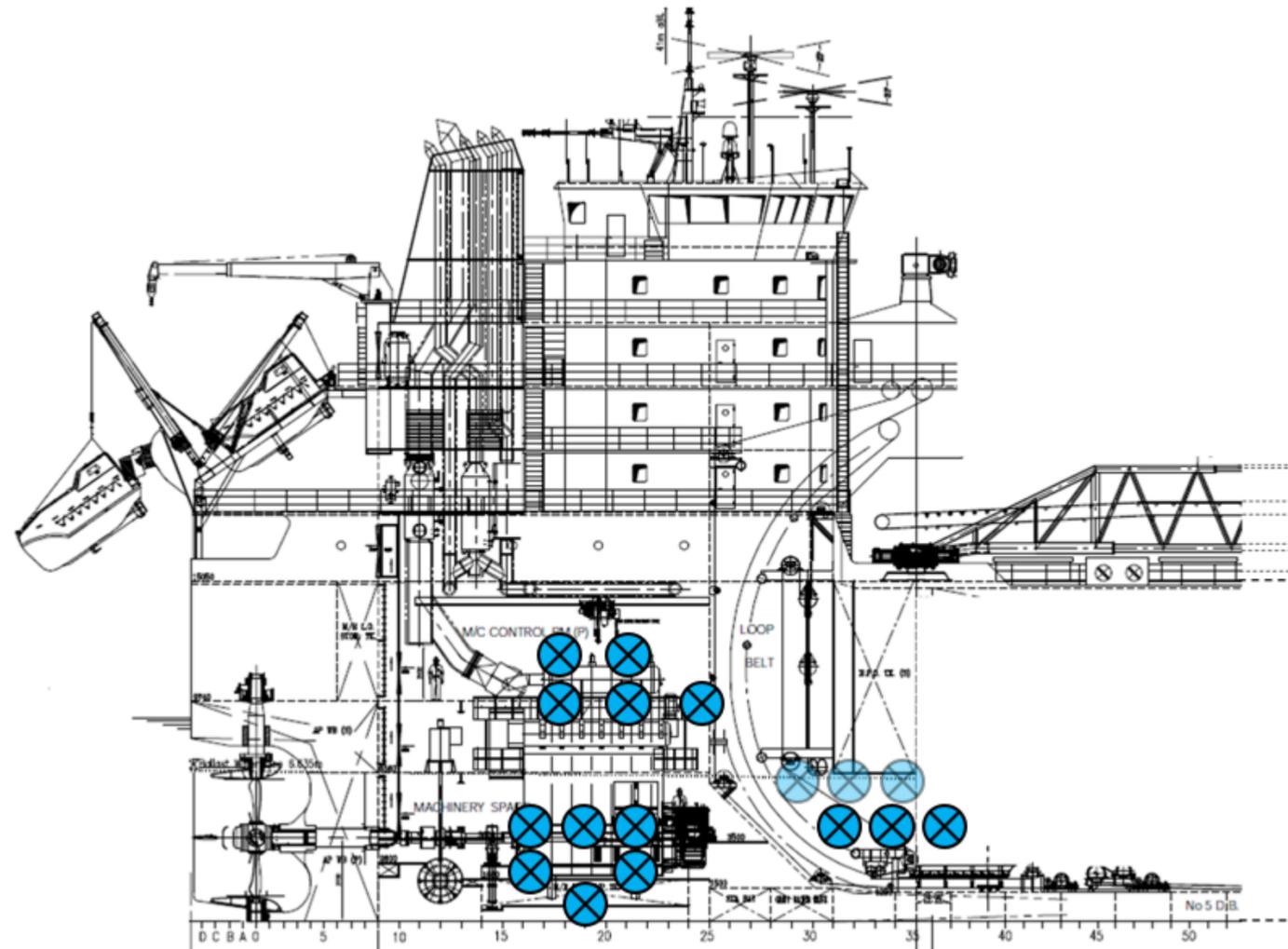


Nukumi

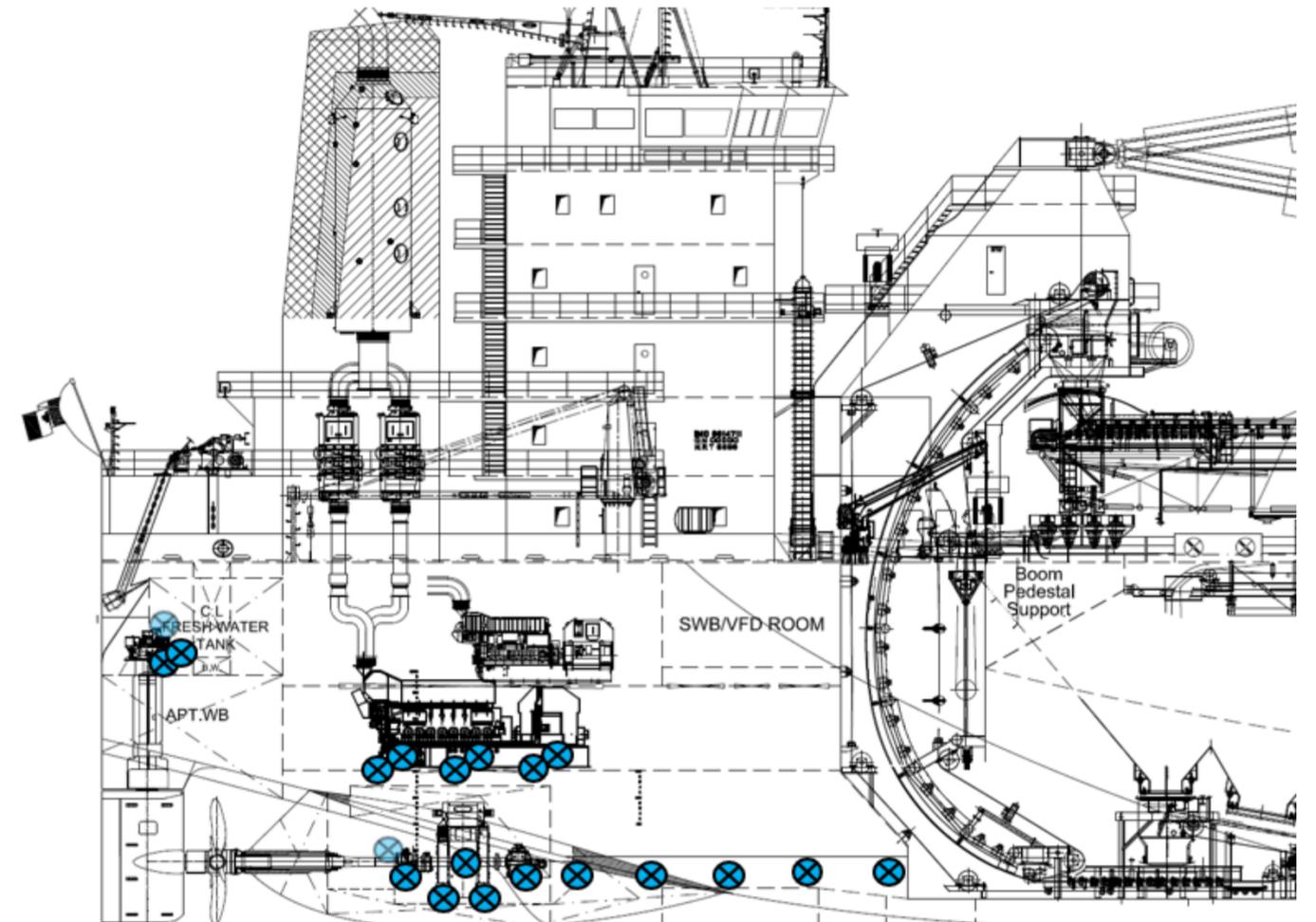
NUKUMI PROPULSION



TRILLIUM VS NUKUMI

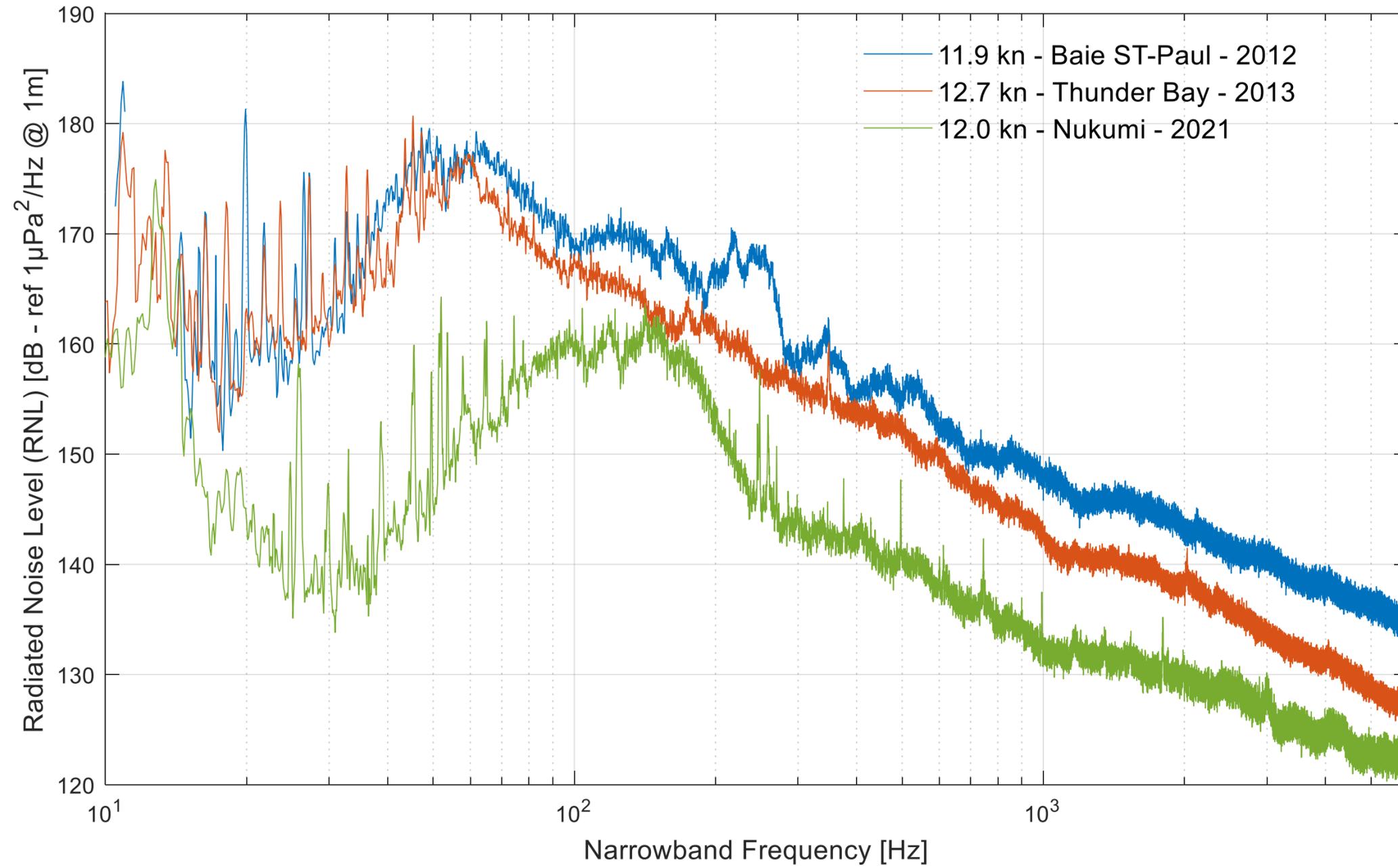


Points of measurement on Trillium Class

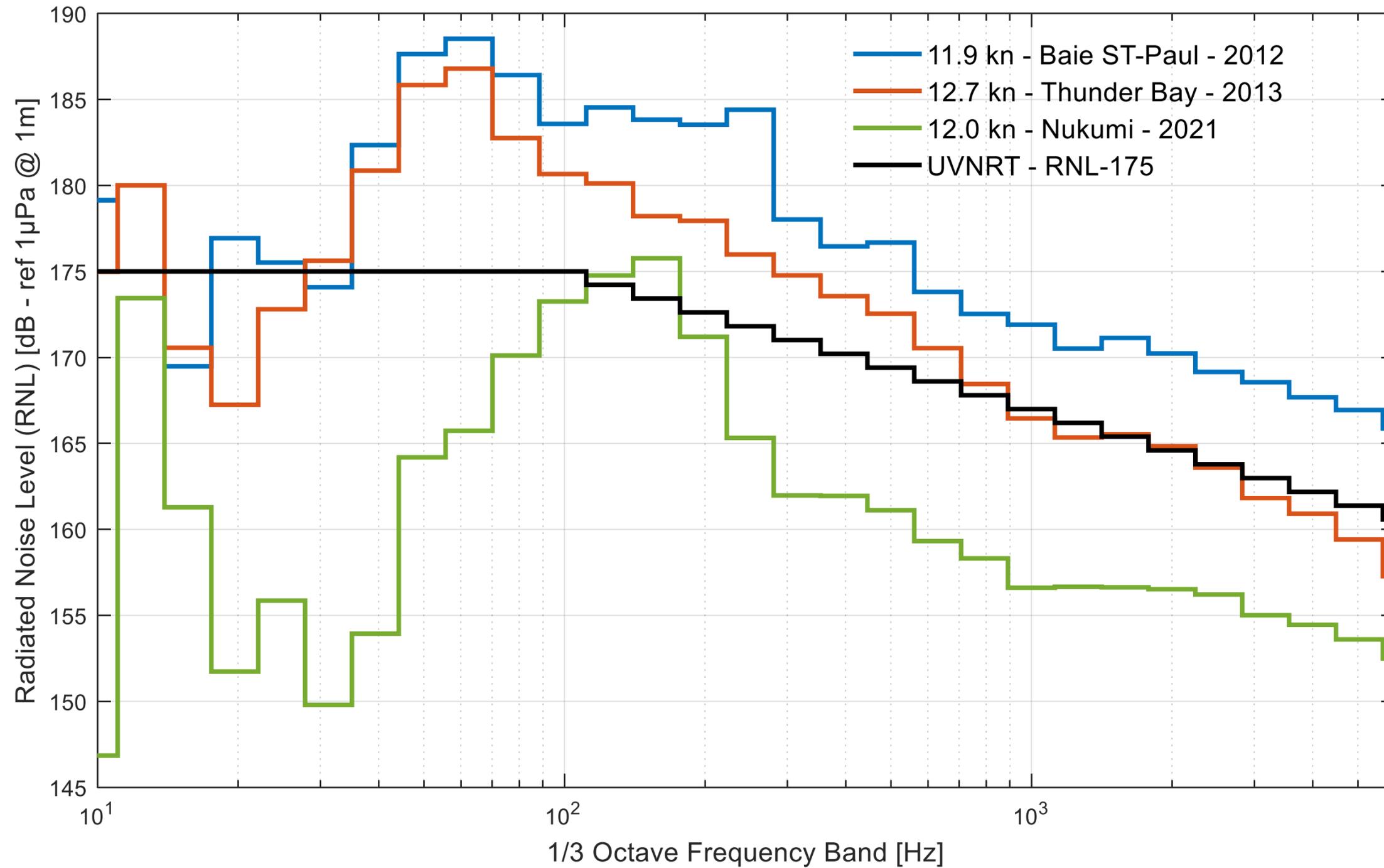


Points of measurement on Nukumi

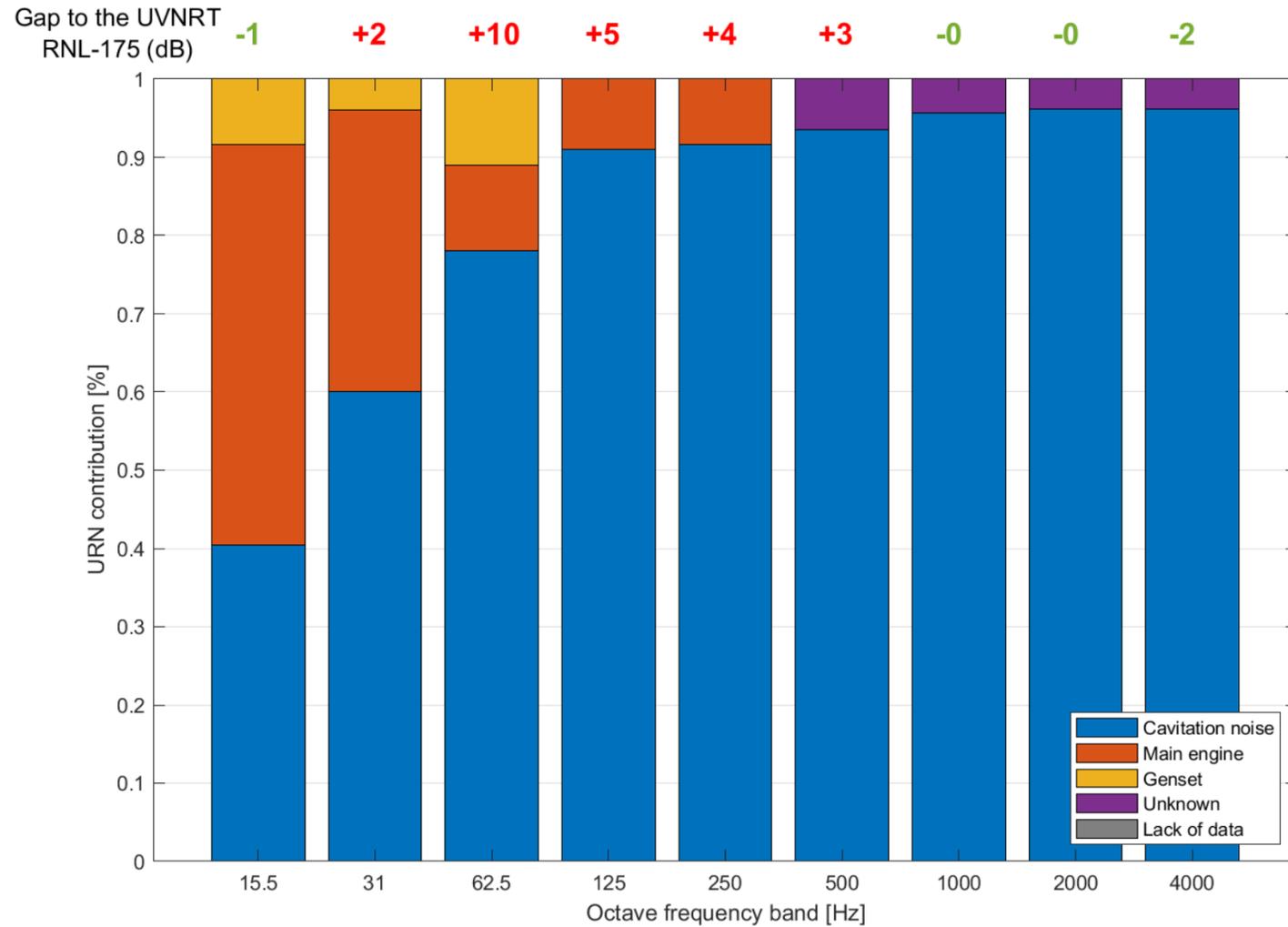
TRILLIUM VS NUKUMI



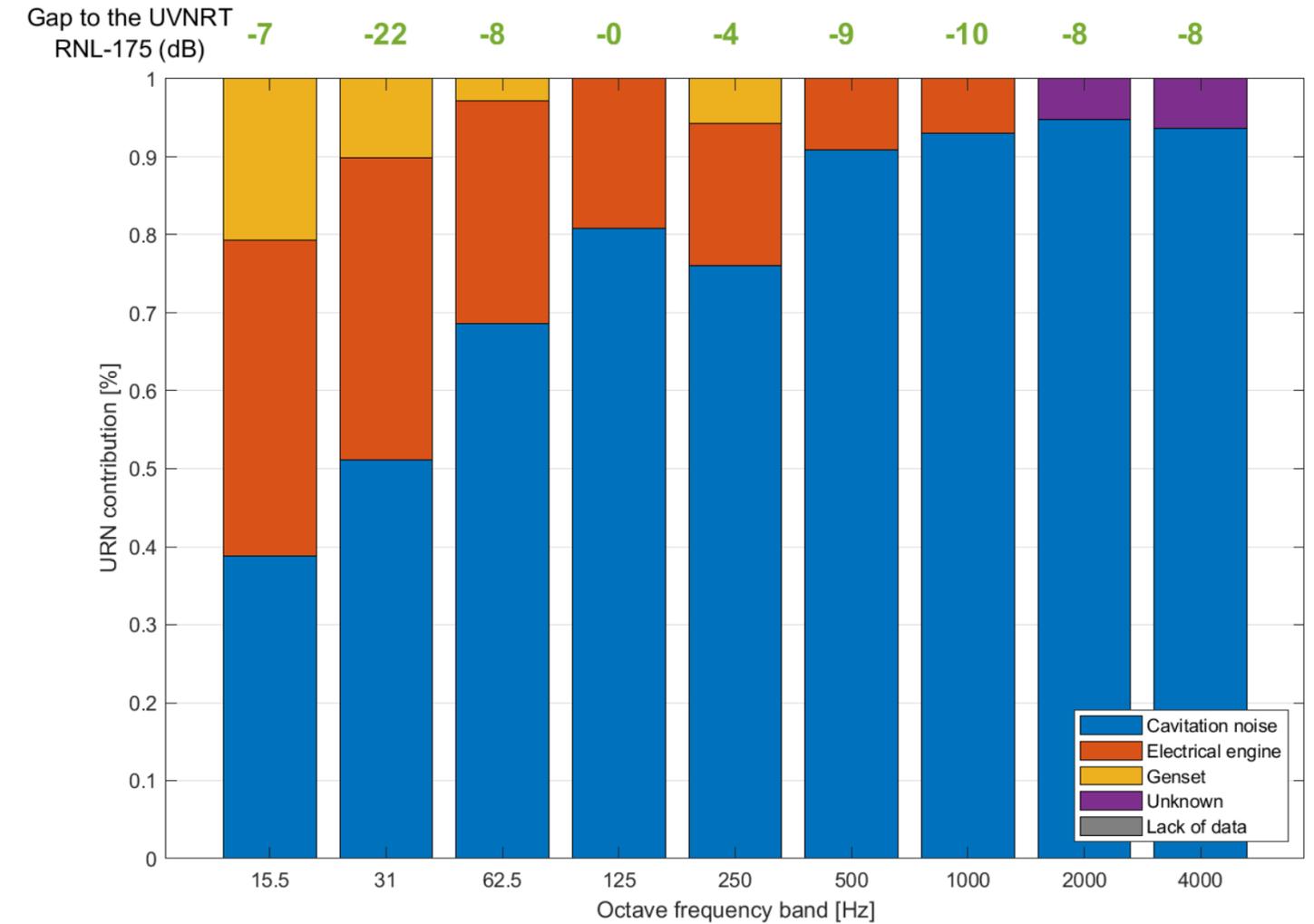
TRILLIUM VS NUKUMI



TRILLIUM VS NUKUMI



Thunder Bay – Passage #2



Nukumi – Passage #2

Conclusions

05

CONCLUSIONS

- Sea Trial URN measurements are challenging
- It is possible to measure the onset of cavitation
- It is possible to measure different sources of ship noise
- It is possible to reduce noise and GHG through design



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