Underwater Sound from Research Vessels

Arctic Waterways Safety Committee

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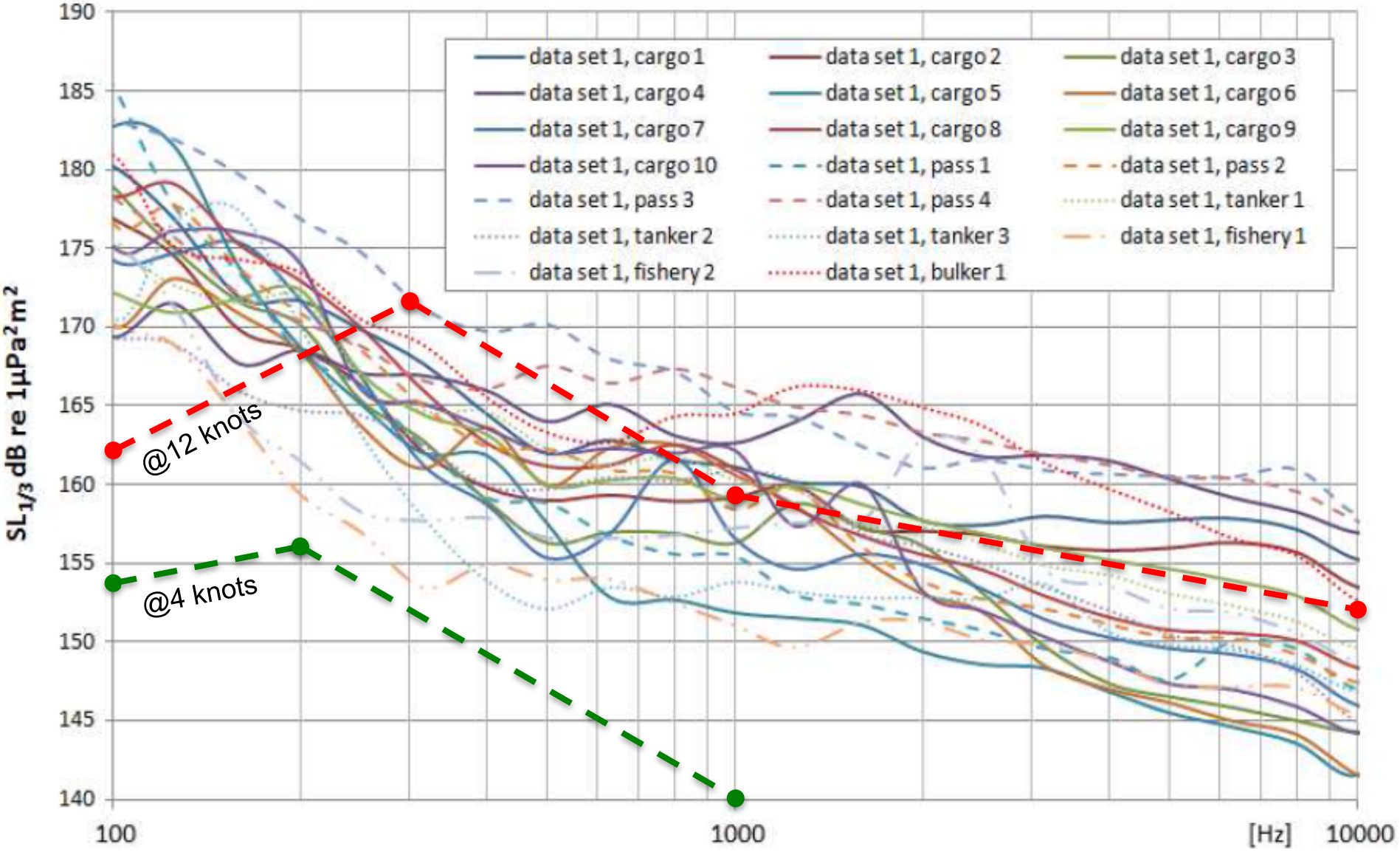
Approach to Noise in Waterways

- Marine Strategy Framework Directive, 2008
- Good Environmental Status (GES)
- Guidelines for assessing and mitigating underwater noise

✧ **Radiation, propagation and perception of underwater sound are *frequency* dependent phenomena.**



Source levels of 20 vessels of different type at a shipping route close to Rotterdam.
(SONIC D2.5, 2015), TNO

Underwater Radiated Ship Noise

- Cavitation inception measured at 9 knots (225 rpm) on both propellers.

- Peak source level during maximum operating conditions, 172 dB (re: 1uPa @ 1m) at 300 Hz

- Mechanical isolation to address noise abatement

Active Sound Sources

- Suite of advanced echo sounding technology
  - Higher frequencies (2 – 200 kHz)
  - Parametric sources
  - Narrow and directional beams

- Adaptive configurations
  - Adjust transmission intervals
  - Reduce source level output
  - Ramping feature (*i.e.* ‘whale’ warning).

Passive Acoustic Monitoring

- Built-in self-noise monitoring system

– 6 calibrated hydrophones integrated into vessel's hull

– PAMGUARD software running 24/7 on dedicated PC

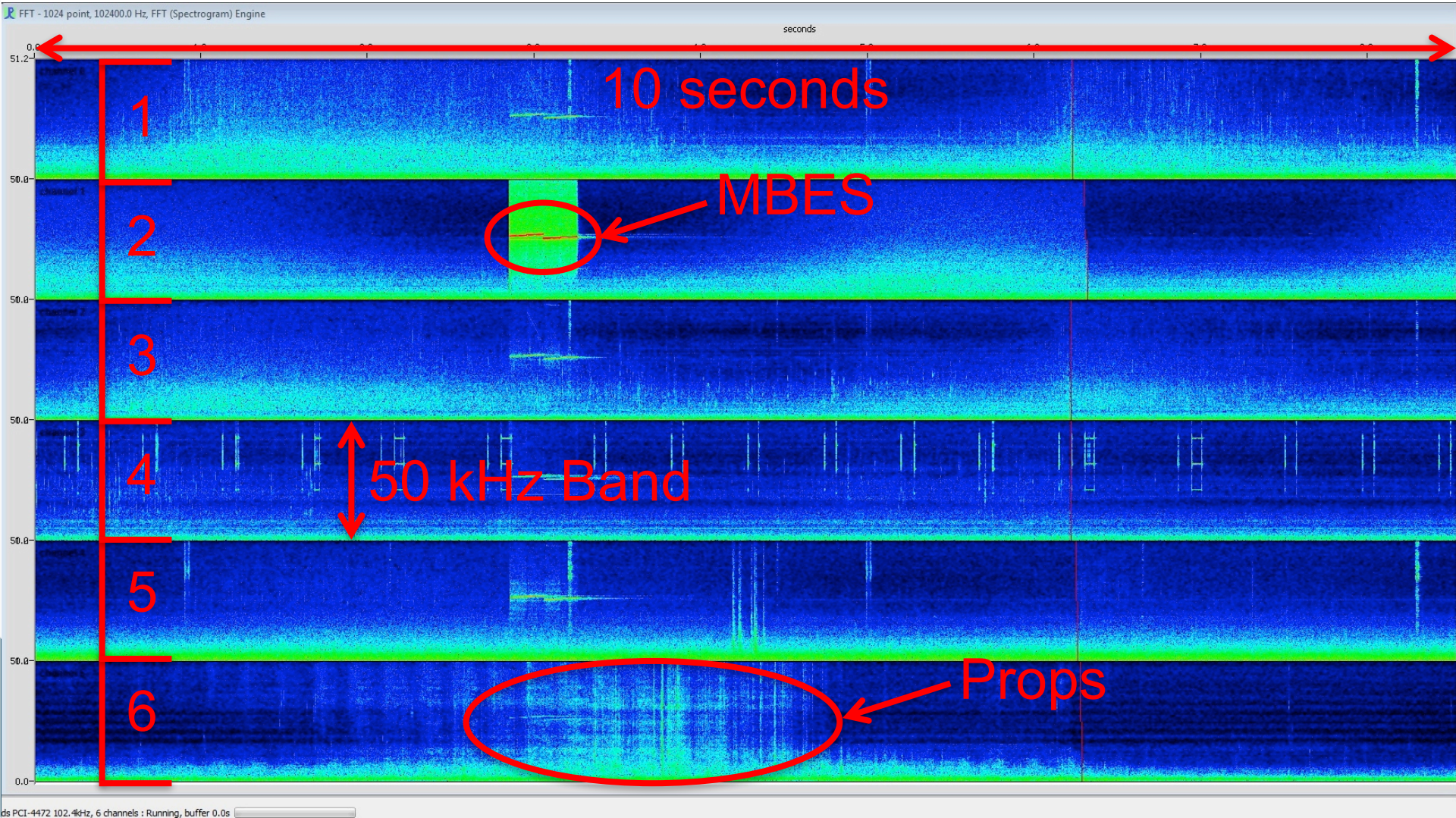
– Data can be recorded and made available to users

– Marine mammal vocalizations have been detected when in close proximity of the ship.

Sikuliaq PAMGUARD

Open source software – www.pamguard.org

Sample Rate = 102.4 kHz



Monitoring & Mitigation

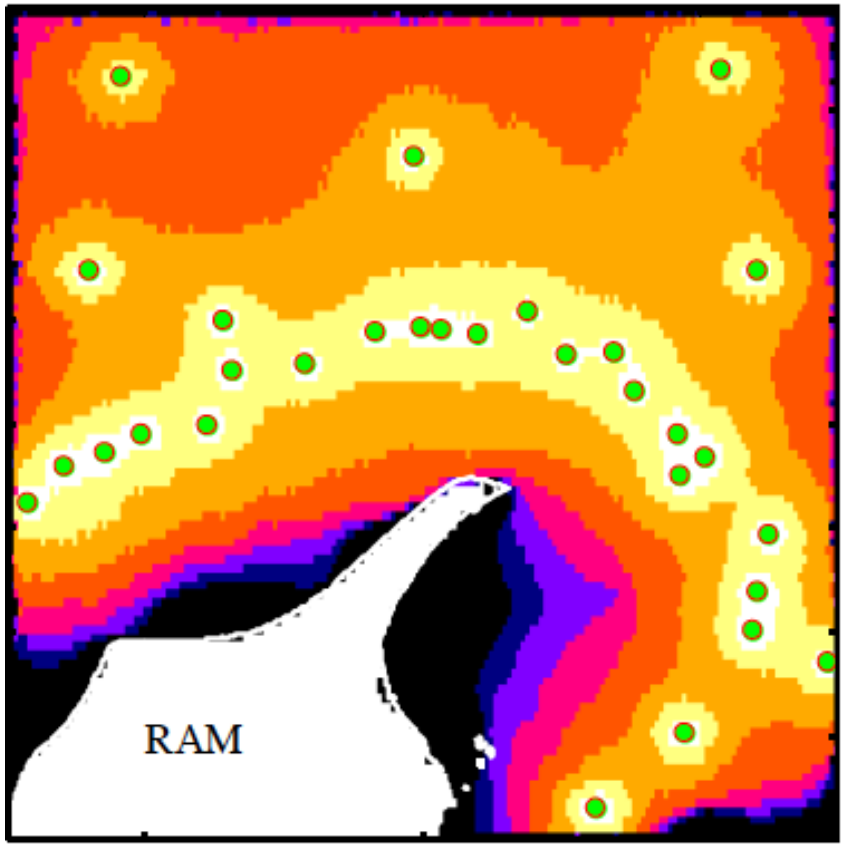
- **Power condition** =

Vessel speed / Design speed

- **AIS ship traffic –**

Noise footprint and sound maps for marine spatial planning tools

- Solutions for:
  1. Propeller noise
  2. Engine & machinery noise



Thank you.
Questions or comments?