



UNDERWATER NOISE POLLUTION BY MERCHANT AND NAVY SHIPS

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BUNDESWEHR

OUTLINE

- WTD 71
- Motivation
- Noise Sources
- Noise Reduction Measures
- Summary

PROMOTION

Technical Centre for Ships and Naval Weapons, Maritime Technologies and Research

Heggernes (NO)

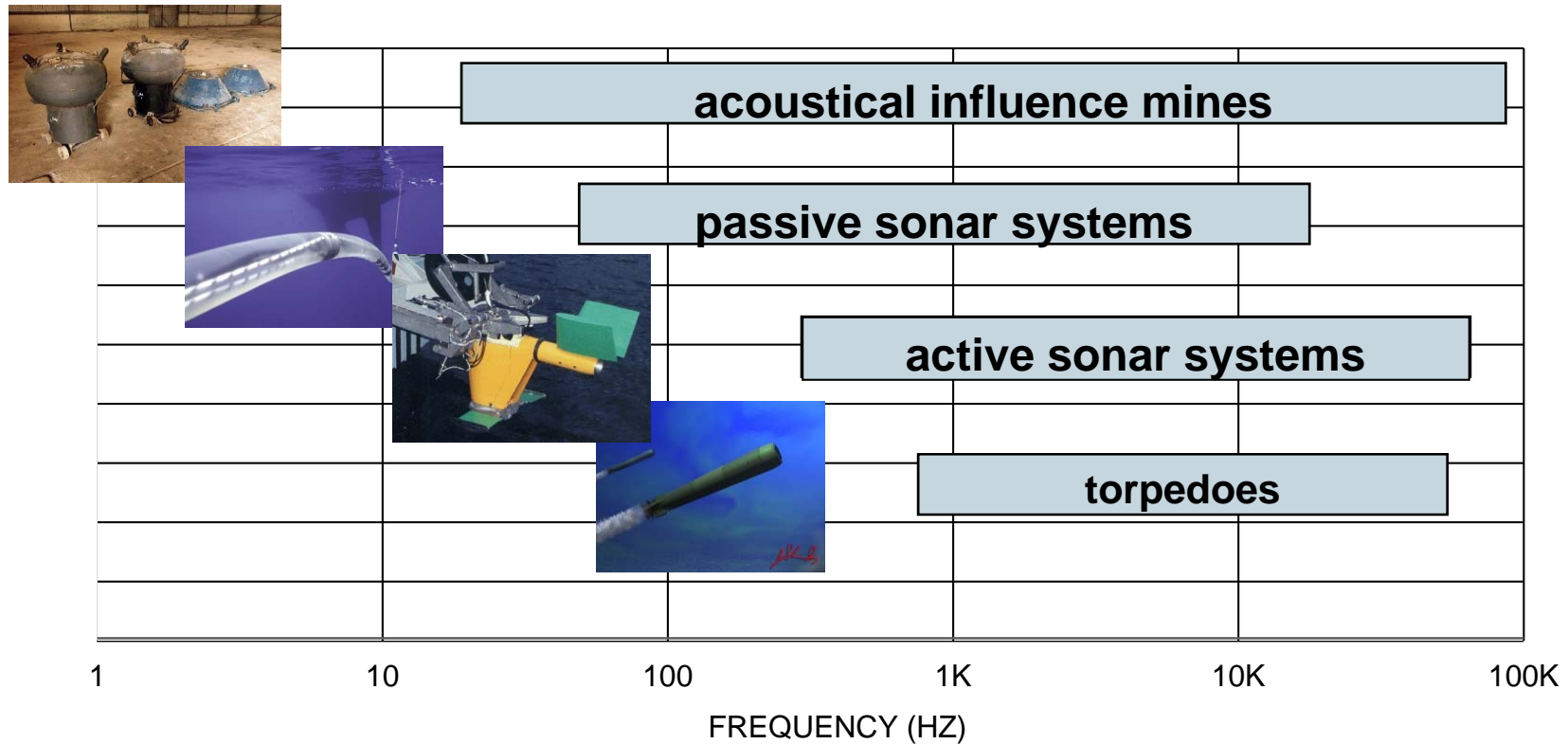


- Employees:
700 Posts at 8 sites
- WTD 71 is involved in all phases of the procurement process of naval ships and systems
- WTD 71 is a federal institution with research tasks.



Motivation

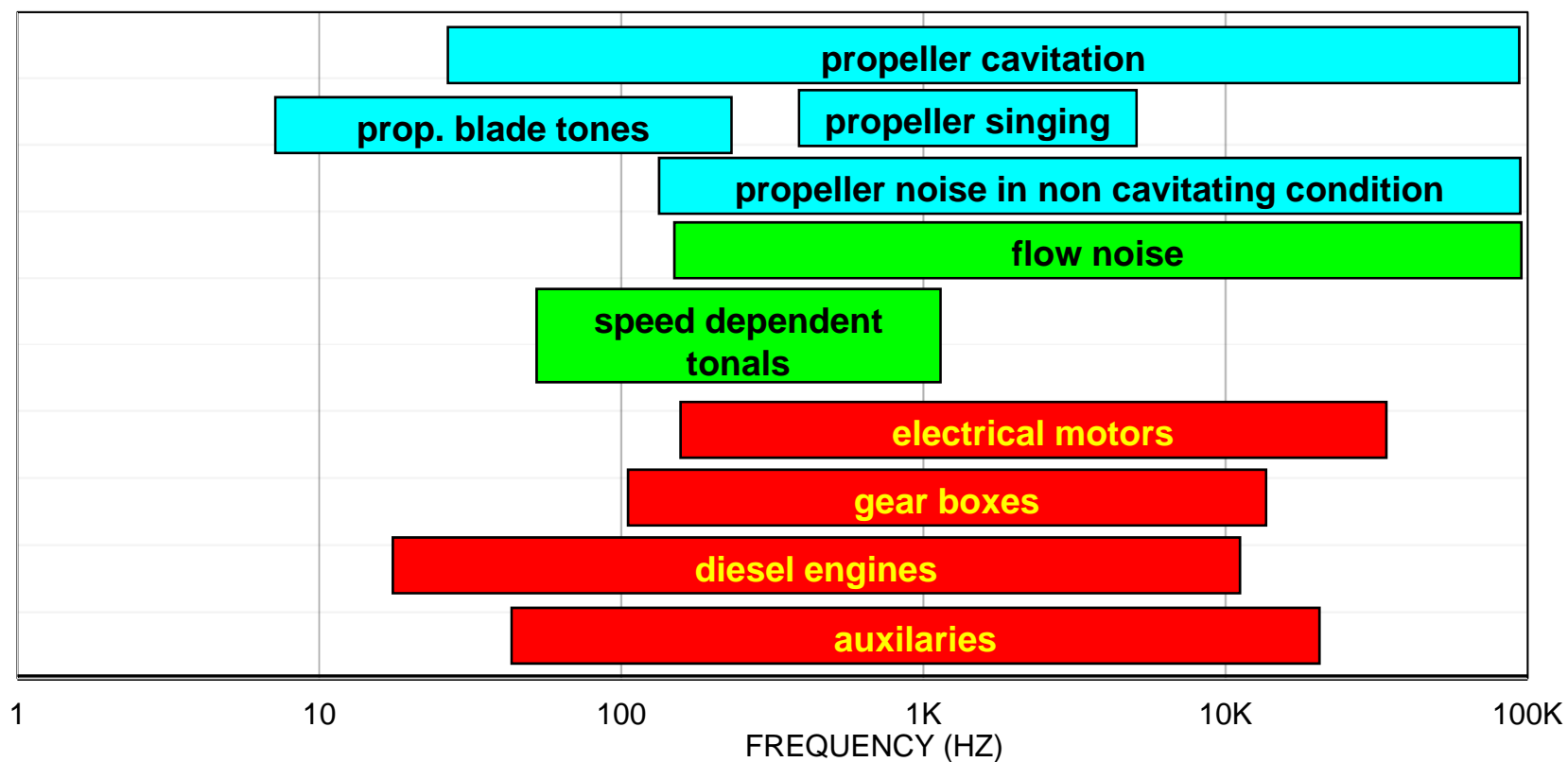
MOTIVATION: UNDERWATER THREAD (NOISE)



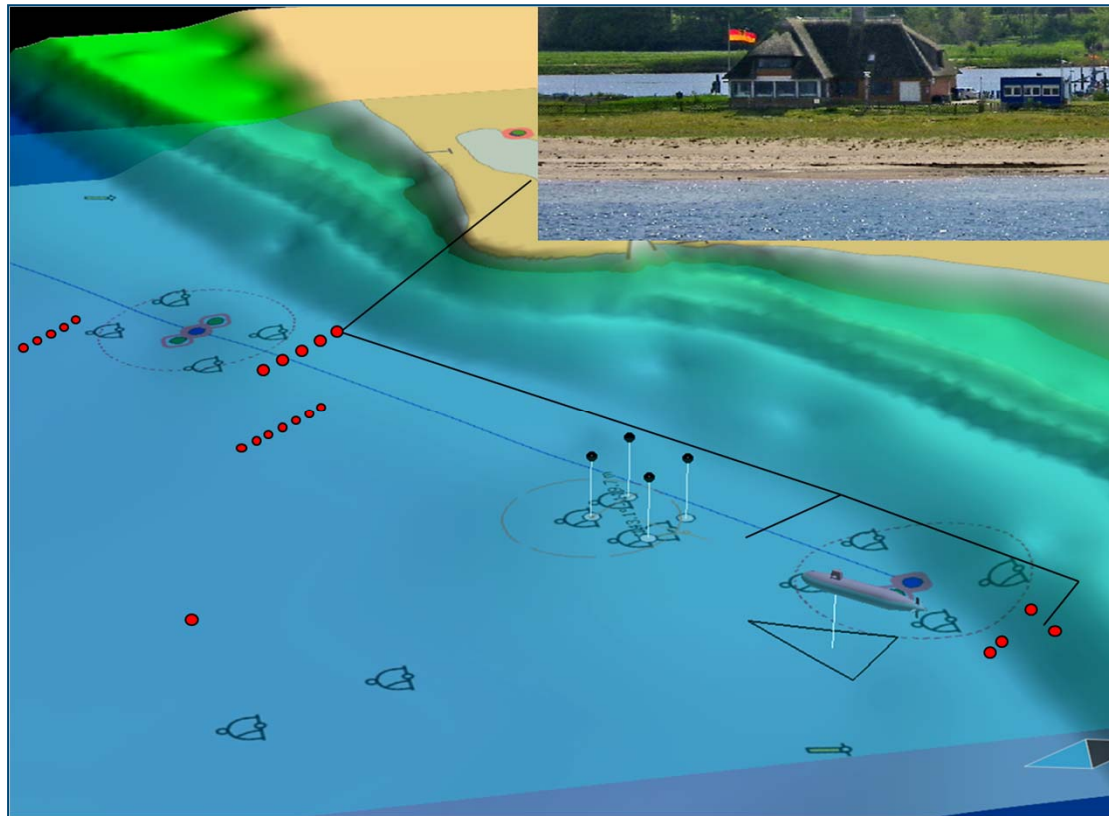


Noise Sources

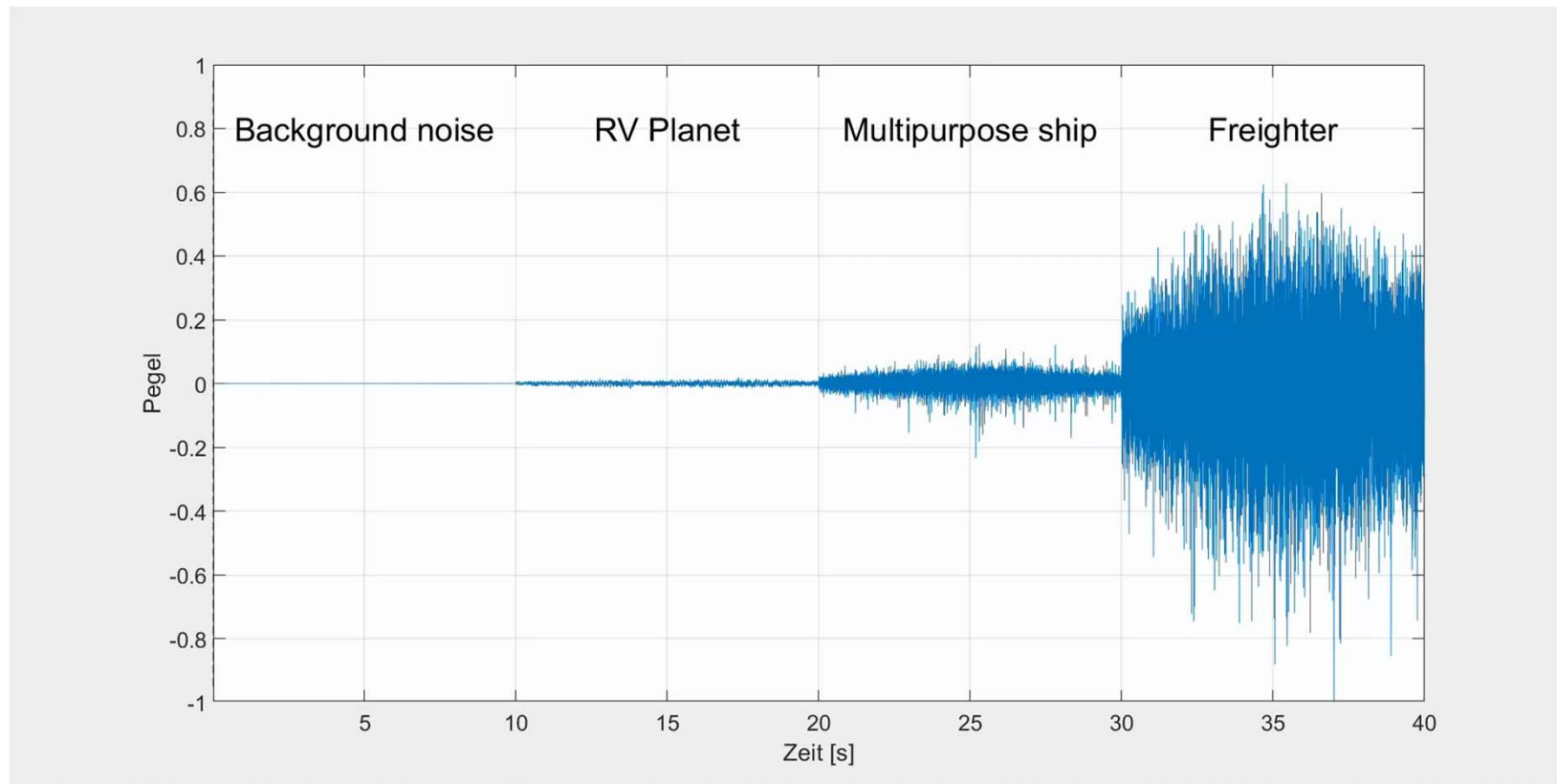
NOISE SOURCES AND MECHANISM



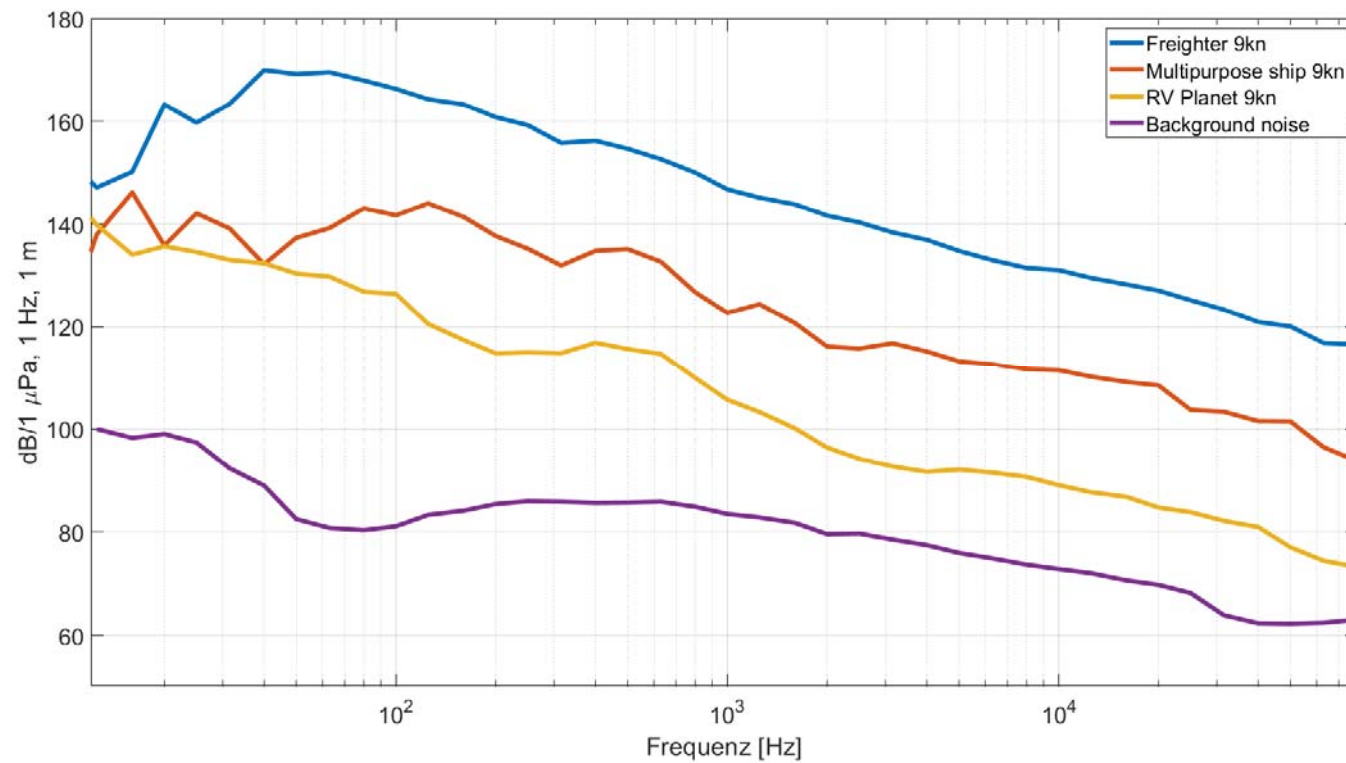
ASCHAU RANGING FACILITY



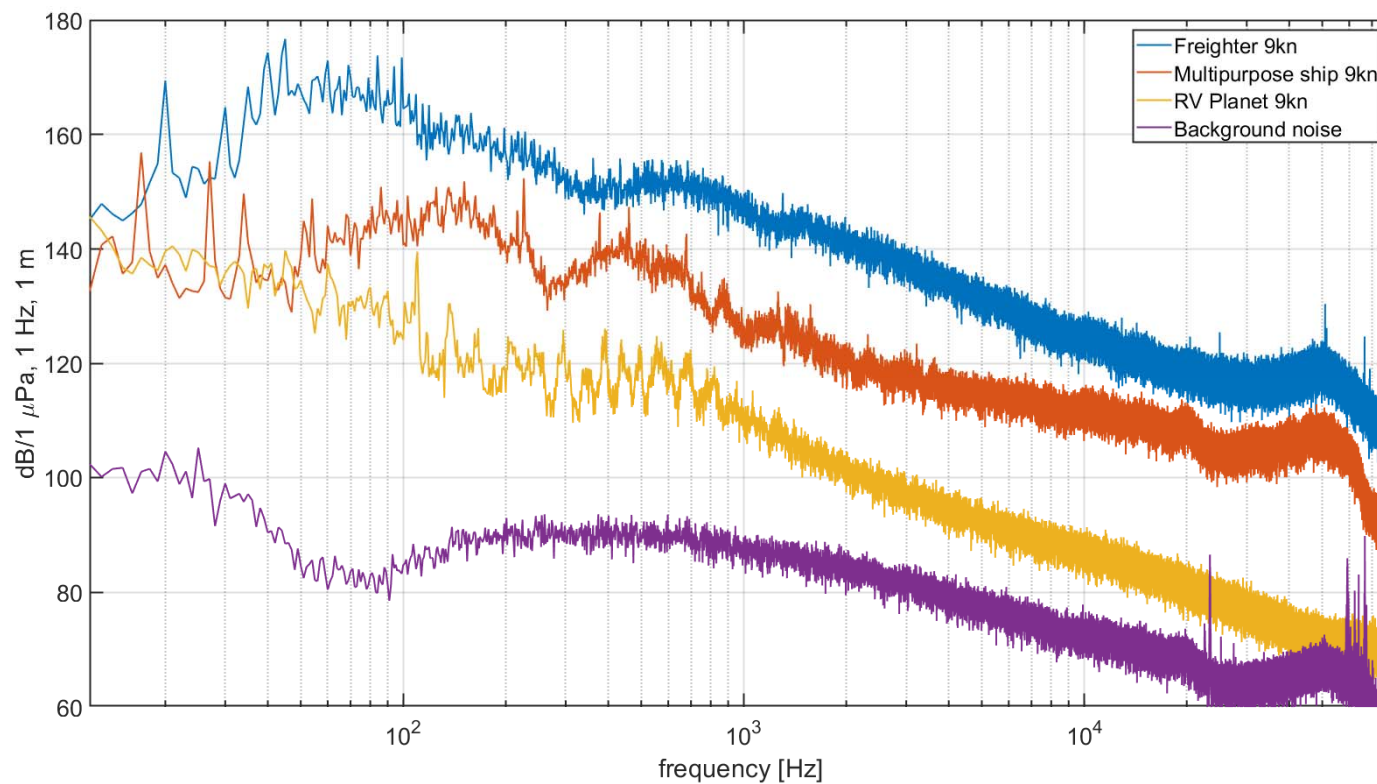
EXAMPLES: „FEEL“ SHIPBORNE NOISE



EXAMPLES: SHIPBORNE NOISE TERZSPEKTREN



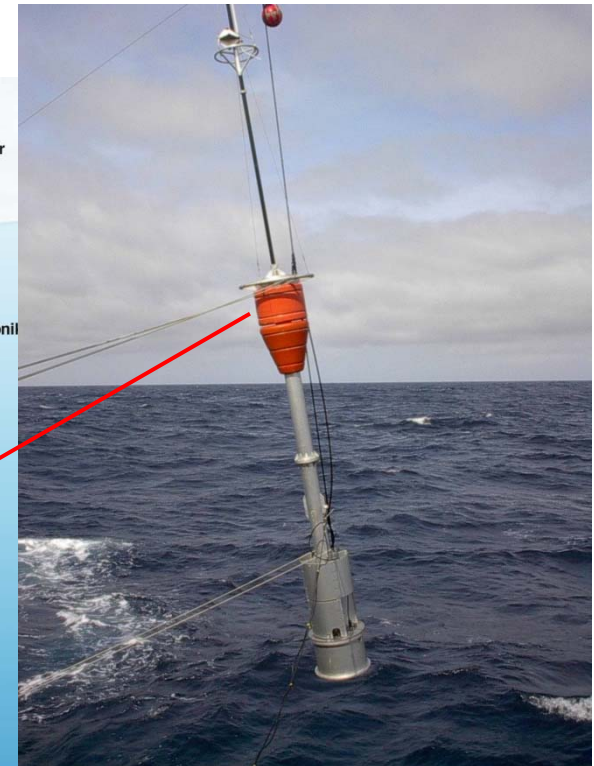
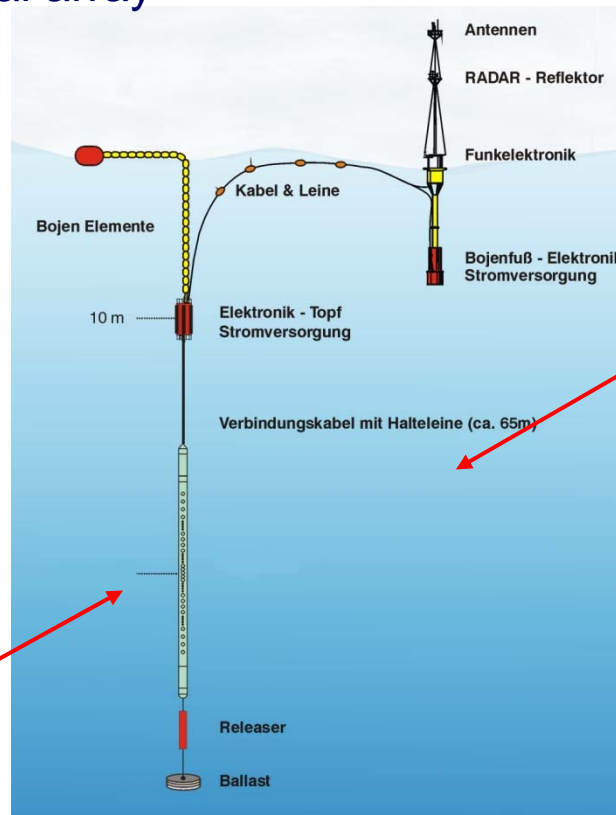
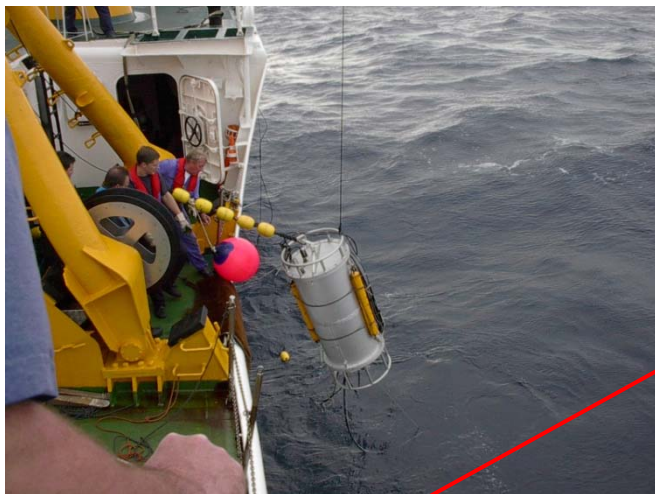
EXAMPLES: SHIPBORNE NOISE (SMALL BAND ANALYSIS)



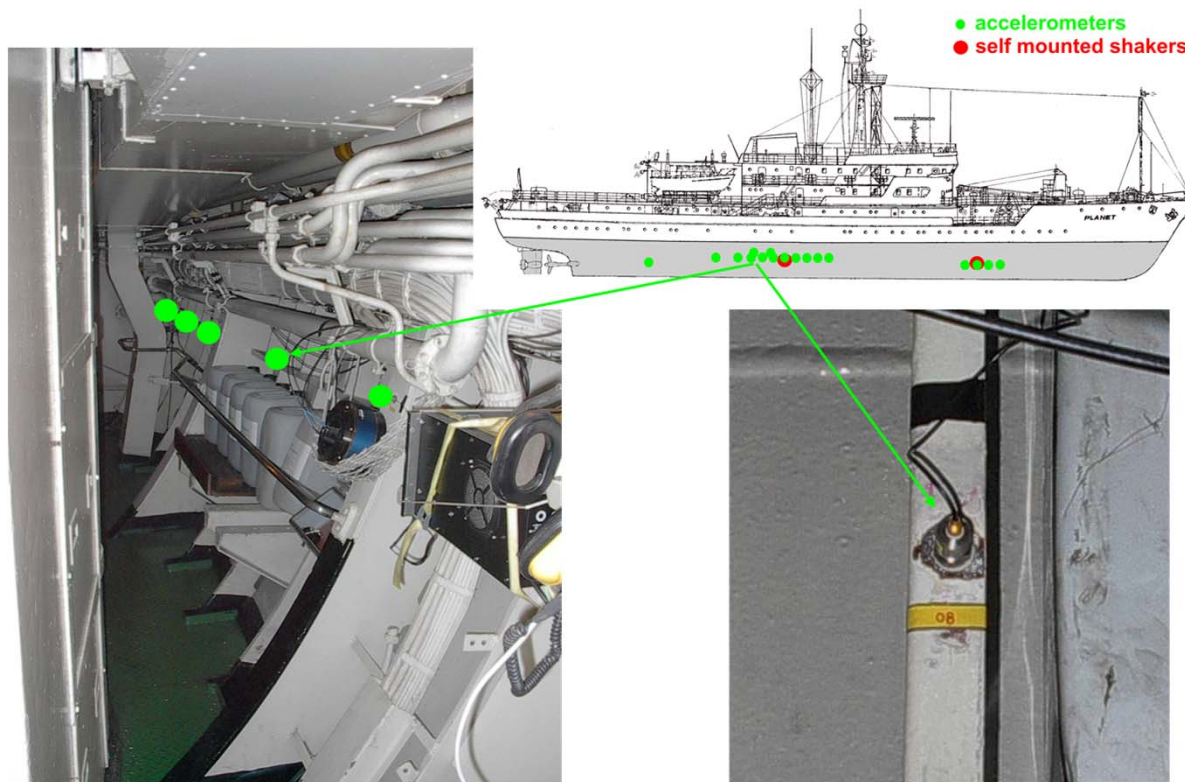
CORRELATION MASCHINERY NOISE- UNDERWATER NOISE EXPERIMENTAL SETUP I

Drifting buoy system with vertical array

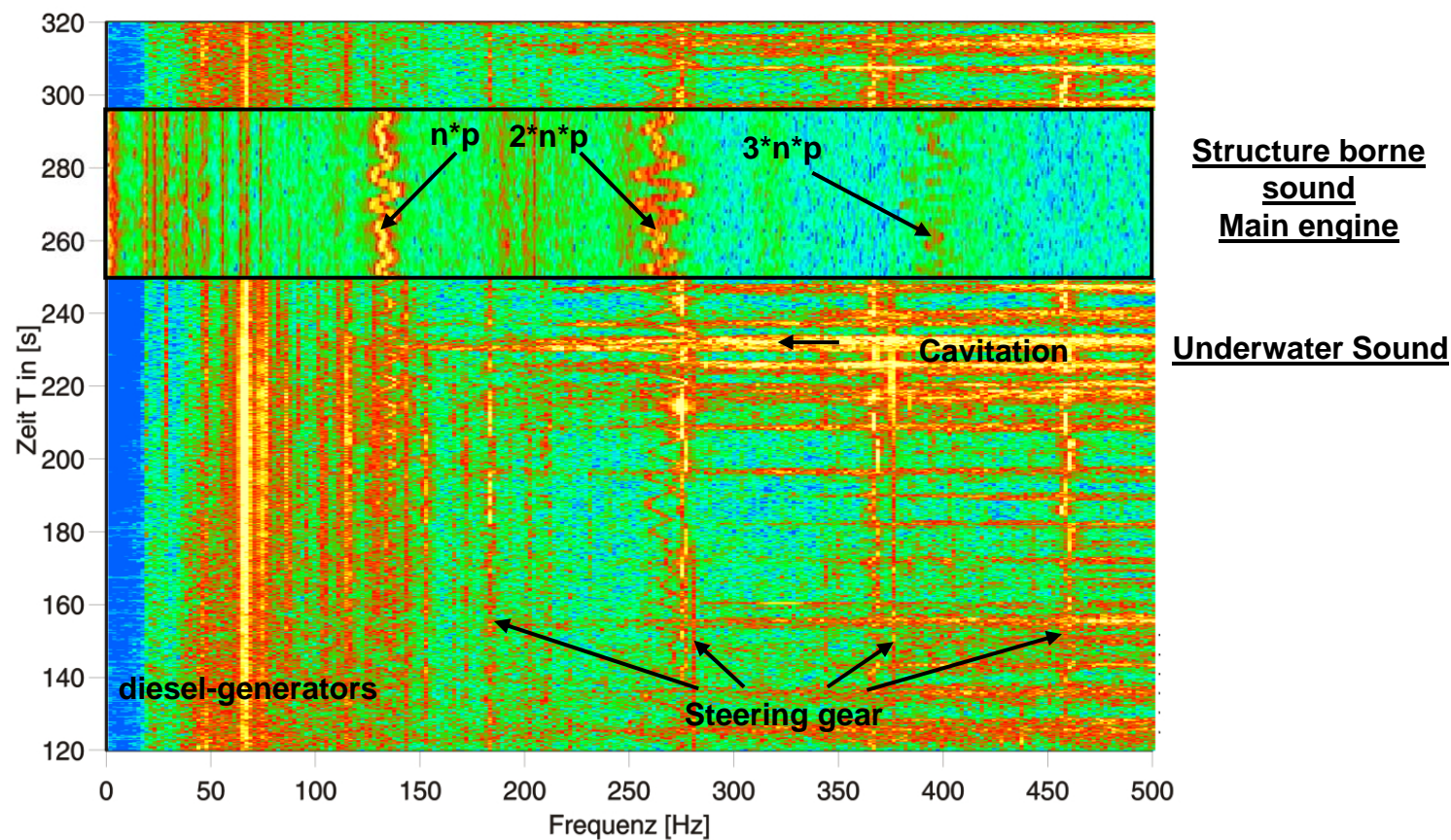
- 128 Hydrophones
- Acoustic Length 38 m
- WiFi, GPS



CORRELATION MASCHINERY NOISE- UNDERWATER NOISE EXPERIMENTAL SETUP II



CORRELATION OF MASCHINERY NOISE AND UNDERWATER SOUND

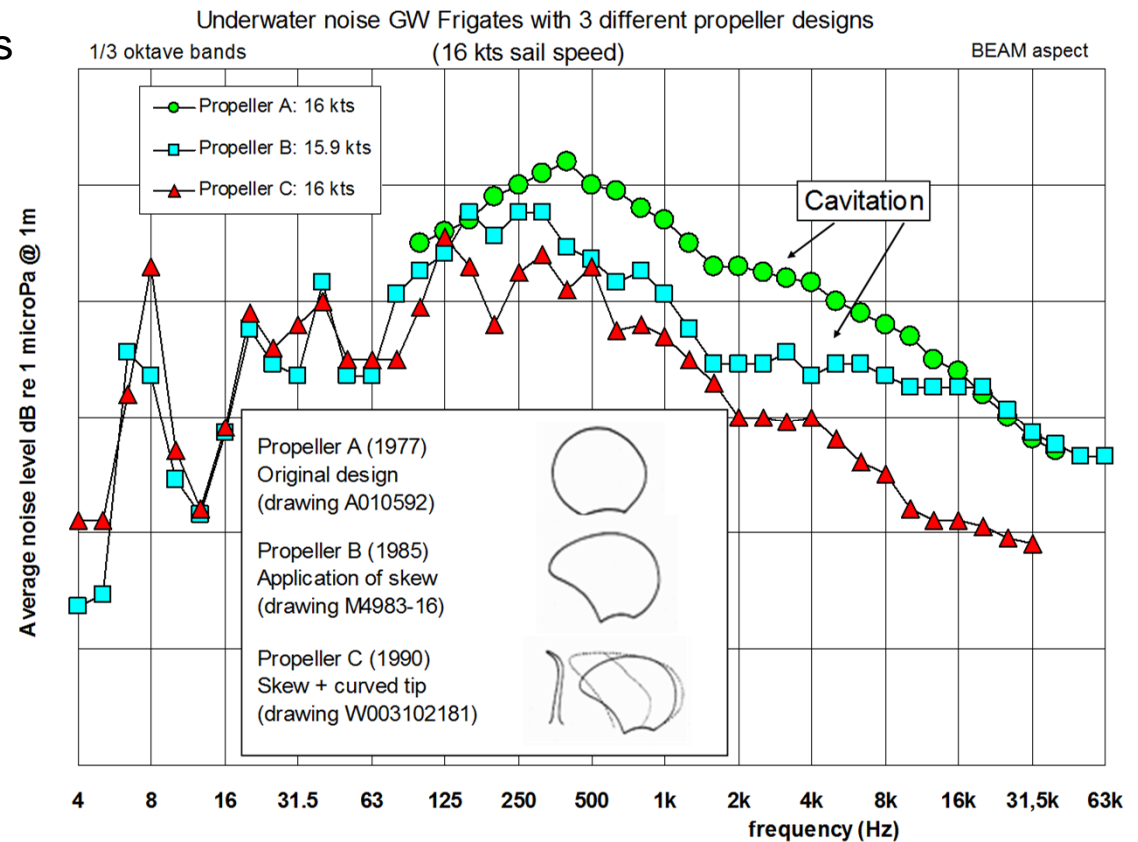




Noise Reduction Measures

REDUCTION MEASURES I: PROPELLER

- Cavitation Inception Speed > 15 kts
- Limit noise levels below CIS

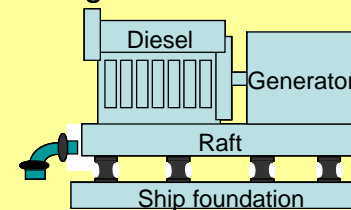


REDUCTION MEASURES II: MACHINERY NOISE

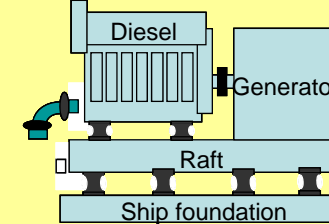
- Structure borne noise path
- Airborne noise
- Fluid borne noise



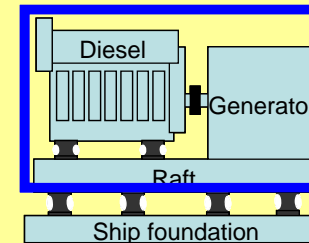
I. Single mounted



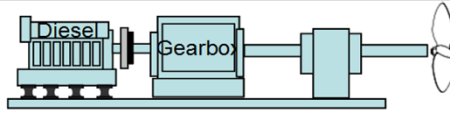
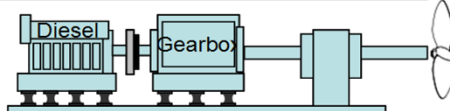
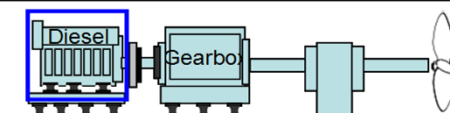
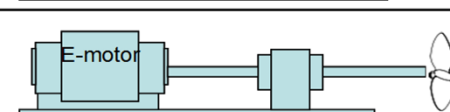
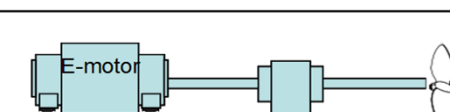
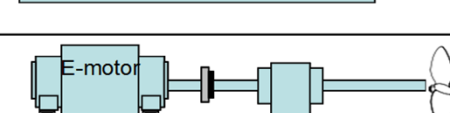
II. Double mounted



III. Double mounted & Enclosed



REDUCTION MEASURES III: PROPULSION CONCEPTS

No	Motor (type)	Reduction measures	Propulsion outline
D1	Diesel	Diesel: single mounted / Gearbox rigidly mounted / CP-propeller. DG sets single mounted.	
D2	Diesel	Diesel: single mounted / Gearbox: hard mounted (25 Hz) mounted / CP – propeller. DG sets single mounted.	
D3	Diesel	Diesel: double mounted & enclosed / Gearbox: hard mounted (25 Hz) mounted / CP- propeller. DG sets double mounted & enclosed.	
E1	DC	Electromotor rigidly mounted Fixed pitch propeller DG sets single mounted & enclosed	
E2	DC	Electromotor hard mounted (25 Hz) Fixed pitch propeller DG sets double mounted & enclosed	
E3	DC	Electromotor single mounted (5 Hz) Fixed pitch propeller DG sets double mounted & enclosed	

M-Frigate

LCF

F123

RV Quest

RV Celtic GO Sars

RV Alliance
RV Planet

ACKNOWLEDGEMENT



- H. Hasenflug, DEU-NLD CSSM



- A. Homm, WTD 71, Branch Head Acoustic Ranges



- V. Nejedi, WTD 71, Branch Head Centre for Waterborne, Structure Borne and Airborne Sound

SUMMARY

- Navy Ships are much quieter than merchant vessels
- Number of Navy Ships are much smaller than merchant vessels

→ Navy ships are less in the focus

But: Learn from the navy to build silent ships

QUESTIONS

