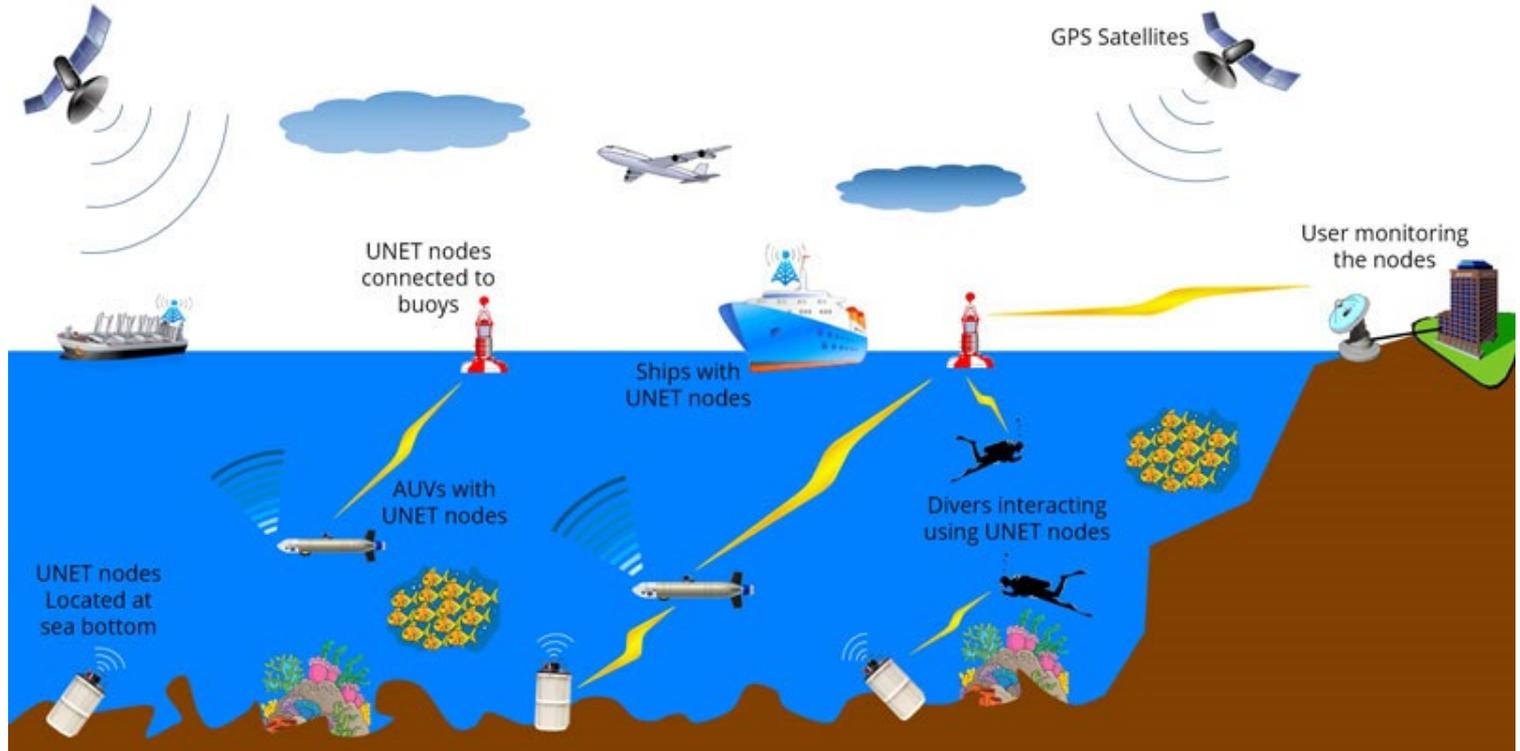


Improved design and manufacturing of low frequency broadband underwater transducers

Speaker: Andreas Behringer, PhD candidate at University of Amsterdam, The Netherlands



Why broadband underwater transducers?



Current transducer technology

Free flooded ring



Image from neptune-sonar.co.uk

Flextensional



Image from massa.com



Image from sensortechcanada.com

Both types are omnidirectional!

How can we improve on this?

- More bandwidth
- Higher output
- Higher efficiency

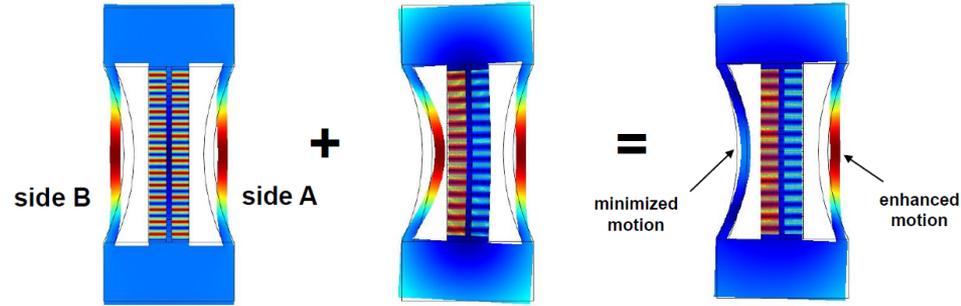
- Directionality improves efficiency!

Getting directionality

Omni Mode

Dipole Mode

Directional Mode

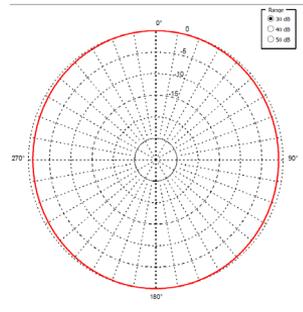


$E_a=1V$
 $E_b=1V$

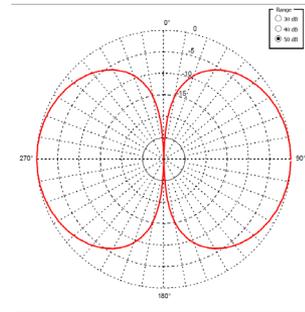
$E_a=1V$
 $E_b=-1V$

$E_a/E_b = \text{Complex Drive}$

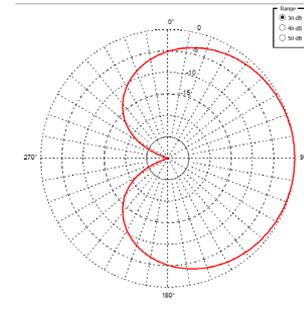
Butler, Comsol Conference 2010



a) Omni Mode

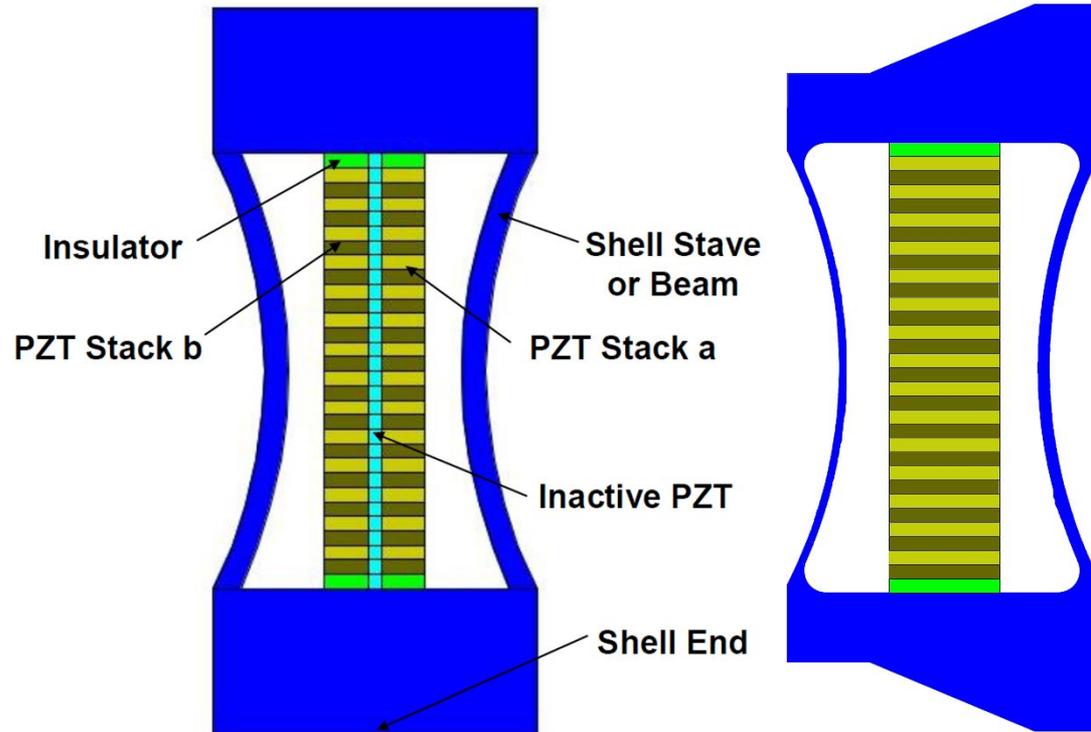


b) Dipole Mode



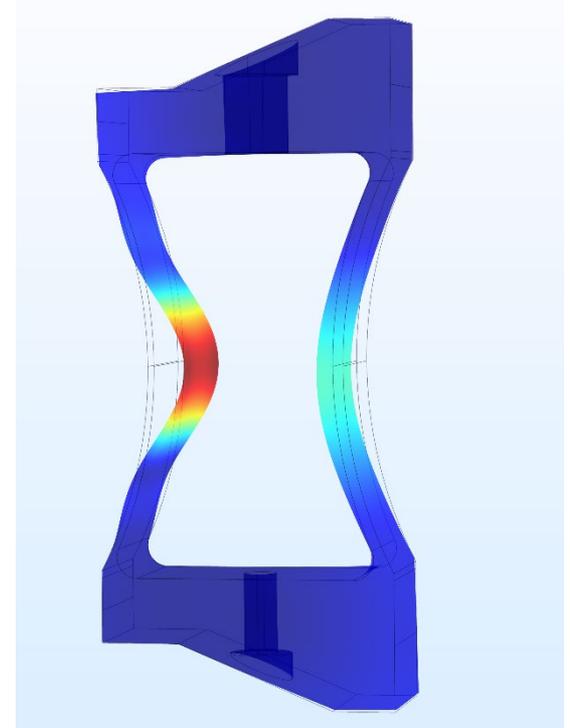
c) Directional Mode

A different approach

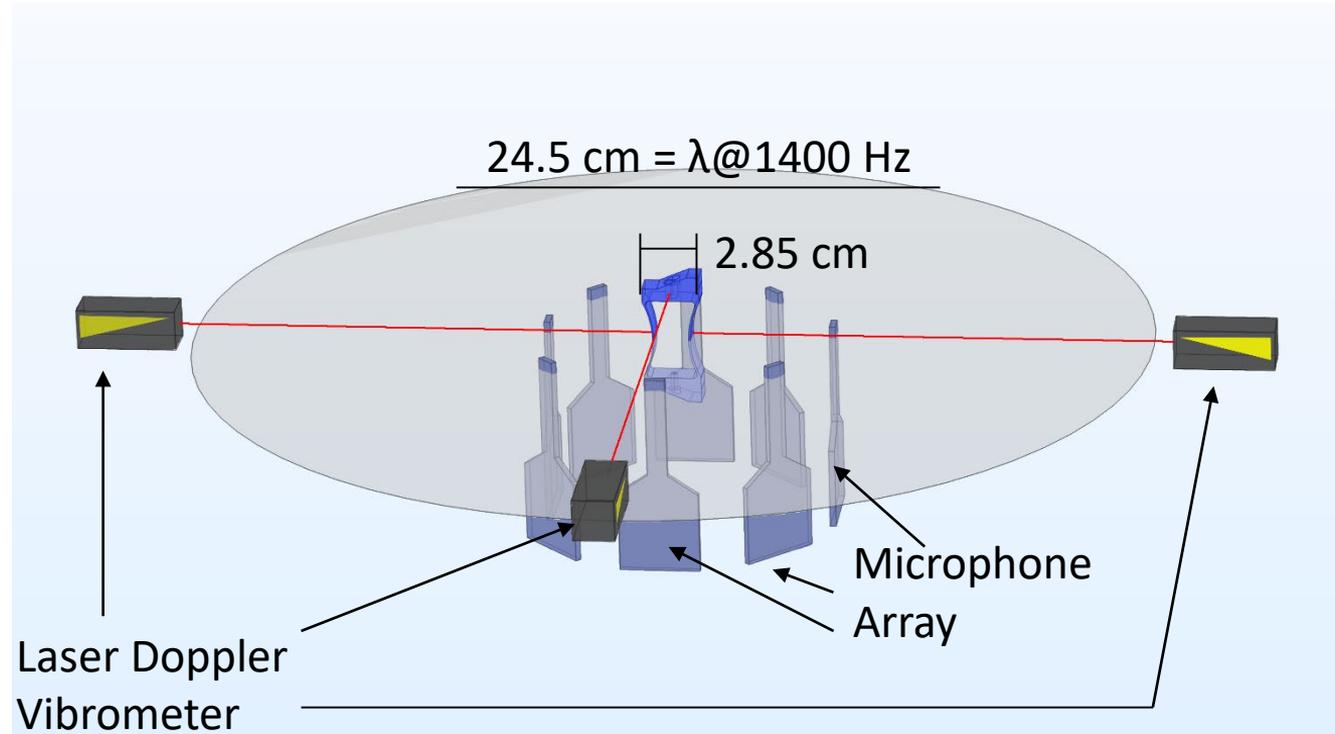


Materializing the idea

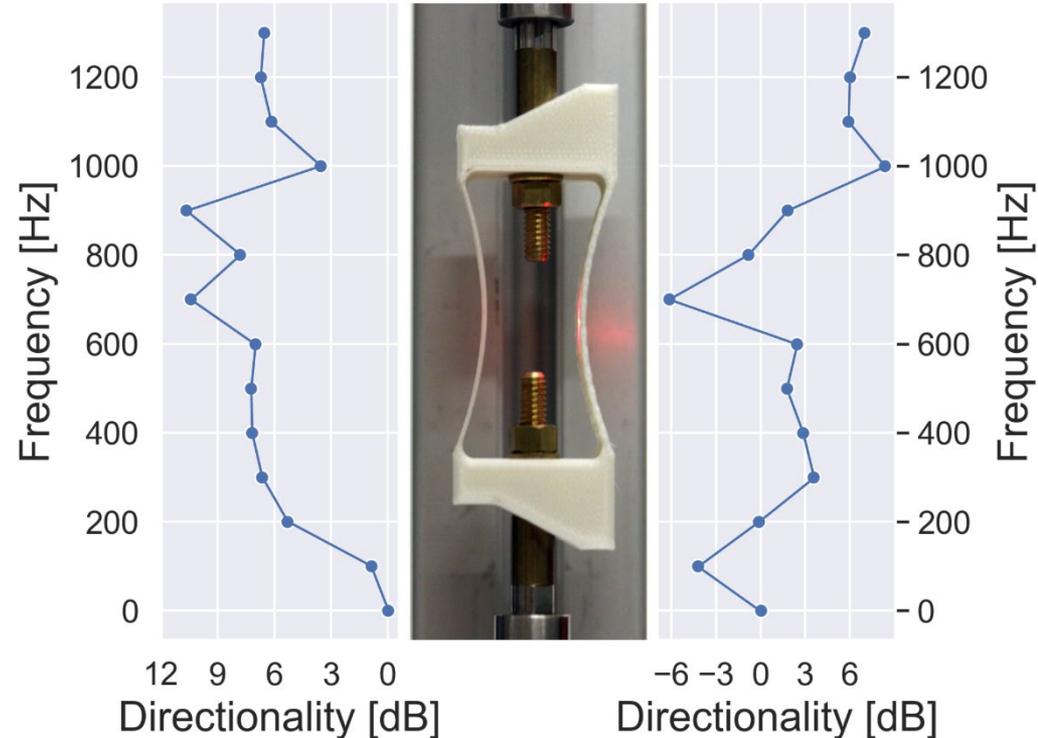
- Simulating the structure in COMSOL
- Exchange the metal for 3D printable plastic
- Scale the structure
- Print and measure



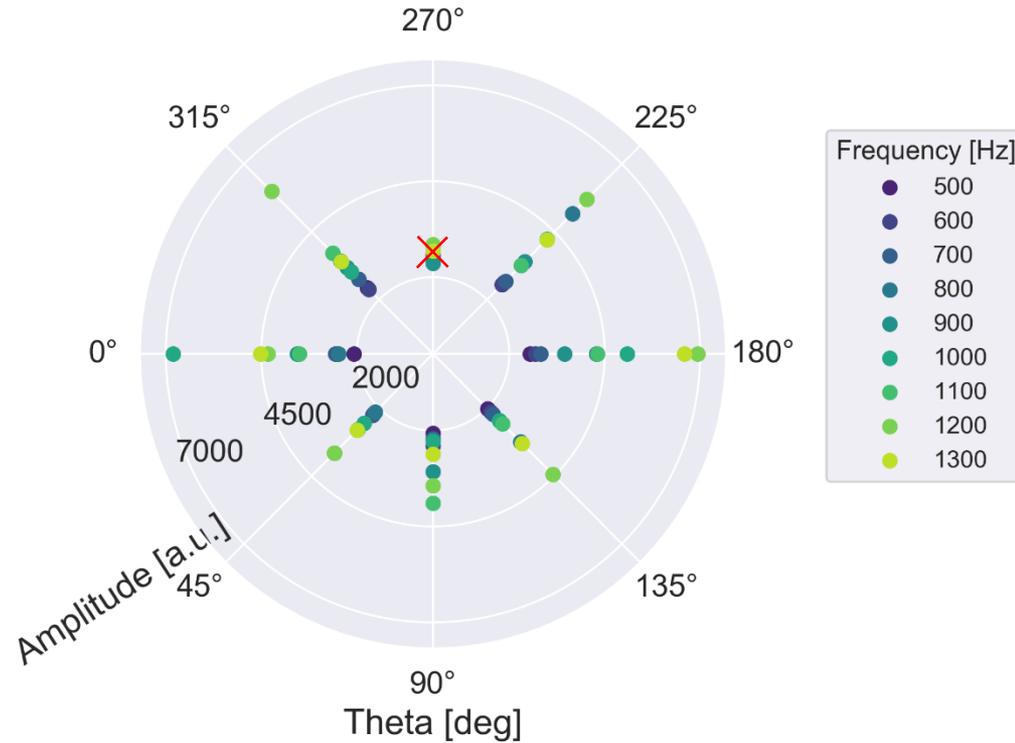
Measurement setup



Results: Laser Doppler Velocimetry



Results: Microphone Array



Conclusions and Outlook

- Asymmetric shell works
- Achieved directionality at subwavelength scale

Further work:

- Build prototype in metal
- Optimize structure for higher bandwidth
- Improve directionality

Thank you for your attention!

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