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Abstract:

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SONAR Technology and Underwater Oil Spill Detection

Detection and tracking of oil is essential for determining the location, transport, and behavior of a spill. Among the biggest questions about the Deepwater Horizon spill is how much oil remains underwater and where it is going. Figuring it out has been frustratingly slow, despite recent advancement in sonar-based oil spill technology. Establishing a reliable acoustic signature of underwater oil can allow accurate mapping of the spread of plumes using sonar aboard ships. Through several examples, this work demonstrates that the Acoustic Systems Trainer (AST) for SONAR is an ideal bench top tool for such investigation, combining education and R&D capabilities. This platform represents a perfect test bed for acoustic studies, producing accurate results, and parameters representative of larger test facilities at a fraction of the cost and setup time that a company working in this field would spend.

The AST is comprised of a control console housing the continuous wave and pulse gating electronics, which can all be adjusted to the required parameters, or switched to a pre-calibrated mode. The acoustic tank is constructed of 15mm and 12mm acrylic material. The tank dimensions are 1,200mm x 600mm x 600mm. A single transducer is set up as a projector, operating in the reversible (transmit and receive) mode, and mounted at one end of the tank, positioned midway across the tank. The transducer used operates at 192 kHz, providing a conical beam shape. An ultrasonic pulse is projected in water at different turbidity conditions. An oil spill is simulated in the sound field from the bottom of the tank, and the spectrogram is registered. Data is processed using a Handyscope HS3 sonar signal analyzer and the effect of the hydrocarbons (present in the water) on the spectrogram is highlighted. Presently, the set of experiments are underway and the results will be available in the next few weeks.

The Acoustic Systems Trainer for SONAR can allow a conceptual implementation of proper techniques for discriminating and localizing leaks from other potential sonar targets, in a cost-effective manner. This ability can significantly advance and help spreading new research avenues on the automatic/instantaneous detection of the smallest of oil and gas leaks over a very wide area, without the need to be in the flow of a leak.