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Abstracts

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PA1.1
Modelling Sonar Performance in Particulate Suspensions and Microbubbles

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Shallow, coastal waters may be characterized by high concentrations of suspended mineral particles and microbubbles, which can have a significant effect on acoustic propagation. These effects may be partially responsible for the observed variability of high frequency sonar performance in coastal environments. Including them in sonar performance predictions may therefore go some way towards improving the accuracy of the models in shallow water environments.

This paper describes how suspended mineral particles and microbubbles increase the acoustic volume attenuation coefficient through thermal and viscous absorption and scattering. The effects of microbubbles on the sound speed and dispersion are also discussed. The additional attenuation and dispersion terms have been incorporated into a sonar performance prediction model based on ray-tracing and results from this model show that the presence of suspended particulate matter and microbubbles can significantly degrade sonar performance.

PA1.2
Predicting the Far-field Directional Response of Underwater Acoustic Transducers from Near-field Measurements

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Manufacturers and users of underwater acoustic transducers often need to know the far-field directional response of their devices. Good quality acoustic measurements in the far-field can be difficult to achieve owing to the long distances over which measurements must be made. In addition, sea-trials can be expensive and time-consuming. There is therefore substantial benefit in being able to predict the far-field directional response from measurements close to the transducer.

The ultrasonics and underwater acoustics section at the National Physical Laboratory (NPL) measures the acoustic fields radiated by underwater acoustic transducers in a state-of-the-art scanning tank. This facility, a 5 metre deep, 5.5 metre diameter wooden tank filled with fresh water, possesses a computer-controlled high-precision positioning system with 10 degrees of freedom and a resolution of 5 microns for translations and 0.005 degrees for rotations about an axis. The low frequency limit of the tank is approximately 1 kHz and its high frequency limit is in the MHz range

We are currently developing software tools for predicting the far field from measurements of complex acoustic pressure in the near field. Our approach is to apply boundary