3aUWc4. Real time sound field visualization in the near field, far field and at absorbing surfaces. Hans-Elias De Bree (Microflown Technologies Inc., PO BOX 300, 6900 AH Zevenaar, Netherlands, debree@microflown.com), Emiel Tijs (Microflown Technologies Inc., PO BOX 300, 6900 AH Zevenaar, Netherlands, tijs@microflown.com), Tom Basten (TNO Science and Industry, Stieltjesweg 1, 2600 AD Delft, Netherlands, tom.basten@tno.nl)

The Microflown is a small sensor that is capable of measuring the acoustic particle velocity. In combination with a small pressure microphone it is possible to measure the complete sound field. If the sound field close to an acoustic material is measured it make sense to measure the particle velocity normal to the surface and the sound pressure. With this, the acoustic impedance and absorption can be measured in real time, and with a high spatial resolution. If the sound field of a sound radiating object is measured, the sound field can be obtained directly. Three applications include: direct acoustic camera, that is the real time display of the sound field (velocity, pressure, intensity). Holography that is the pressure, velocity reconstruction on the surface based on the measured sound field (and other places). And cabin interior noise mapping, that is the visualization of the interior noise perceived on a certain location. With three dimensional sound probes (sound pressure and particle velocity in three dimensions), sources in the free field can be found for both bearings as distance. Most recent developments are presented.

3aUWc5. Measurement of total sound energy density in enclosures at low frequencies. Finn Jacobsen (Acoustic Technology Department, Technical University of Denmark, Ørsted Plads, B352, DK-2800 Lyngby, Denmark, fja@oersted.dtu.dk)

Many acoustic measurements rely on determining the total sound energy in an enclosure; and this quantity is usually estimated by measuring the mean square pressure at a number of discrete positions. Almost 30 years ago it was shown theoretically that the normalised spatial variance of the total sound energy density (potential and kinetic) is one third of the normalised spatial variance of the potential energy density (the mean square pressure) in a reverberant sound field above the Schroeder frequency. About ten years later this prediction was confirmed experimentally. However, until recently measurement of the total sound energy density (in air) has required an elaborate arrangement based on finite different approximations using at least four matched pressure microphones; therefore the method has never come into use. However, with the advent of a three-dimensional particle velocity transducer it has become somewhat easier to measure total rather than only potential energy density in a sound field. This paper examines the spatial uniformity of potential, kinetic and total sound energy density in enclosures theoretically and experimentally with particular emphasis on the frequency range below the Schroeder frequency.

Contributed Papers

3aUWc6. On the usefulness of waterborne measurement of particle velocity in geoacoustic inversion. Jean-Pierre Hermand (Université libre de Bruxelles (U.L.B.) - Environmental hydroacoustics lab, av. Franklin D. Roosevelt 50, CP 194/5, 1050 Bruxelles, Belgium, jhermand@ulb .ac.be), Kevin B. Smith (Naval Postgraduate School/Naval Undersea Warfare Center, Code PH/Sk, Department of Physics, Monterey, CA 93943, USA, kbsmith@nps.edu)

Recent advances in sensor design have led to the development of receiving systems whose elements are vector sensors, i.e., sensors that simultaneously measure the acoustic pressure and fluid motion due to the propagation of acoustic energy at the sensor location. As such, arrays of vector sensors can provide more information about the sound field than arrays made of traditional hydrophones, and thus are attractive for various applications including the inversion for environmental properties. The fundamental question addressed by this paper is: does the use of acoustic vector data versus pressure-only data improve the results of an inversion scheme based on waterborne observations and matched field processing? To our knowledge no experimental data are available yet to allow a detailed comparison of performance between standard (pressure-only) arrays and vector sensor arrays for environmental inversions. For a preliminary study we will simulate the inversion of vector sensor data in the South Elba environment for

which pressure-only inversion results and ground truth data are available following the Yellow Shark'94 and Blue Planet'07 experiments. Broadband signals received on fully-populated and sparse arrays will be considered.

3aUWc7. Characterization of the Near Scattered Acoustic Vector Field. Robert Barton (Naval Undersea Warfare Center, Code 1522 bldg1320, 1176 Howell st, Newport, RI 02841, USA, bartonrj@npt.nuwc.navy.mil), Kevin B. Smith (Naval Postgraduate School/Naval Undersea Warfare Center, Code PH/Sk, Department of Physics, Monterey, CA 93943, USA, kbsmith @nps.edu)

In this study, we investigate the properties of the scattered acoustic vector fields generated by simple geometric objects, including the infinite rigid plate, disk, and sphere. Analytical solutions are derived from acoustic target strength scattering models in the near field region. Of particular interest is the understanding of the characteristics of energy flow of the scattered acoustic vector field in the near to far-field transition region. We utilize the time and space separable instantaneous active and reactive acoustic intensity to investigate the relative phase properties of the scattered field. Numerical results are presented for the near region scattered acoustic vector field of simple objects in both two and three dimensions.