

-Low Frequency seismic source for Ocean tomography and long-range propagation research

There is a growing interest for a very low frequency sound source in the frequency range below 40 Hz for such applications as Arctic under-ice thermometry, long-range navigation, sub-bottom seismic profiling, and etcetera. A coherent ultra-low frequency sound source is a quieter and more benign to marine mammals than air-guns, used for the oil exploration. Teledyne Marine recently developed infrasound source for the Marine Vibrator Joint Industry Project. The coherent source is based on the application of an underwater, gas filled bubble resonator covered by an elastic membrane. The membrane supports high volume displacement. The sources are not sensitive to cavitation and to coupling effects. The fluid dynamics and acoustics of a spherical resonator are defined by the Rayleigh-Plesset equation. The buoyancy deforms the shape of a real bubble from spherical. The 3D simulation and experiments have shown that a cylindrical form is a practical engineering solution. It performs similar to a spherical bubble, keeps its shape and can be towed with a high speed. The Q-factor of a practical bubble resonator is ~ 10 . The experimental bubble resonator has shown good performance with a maximum SPL close to 205 dB and frequency in a range of 5-20 Hz.

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