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Underwater Laser Plasma Acoustic Source Directivity and Frequency Control Demonstration[1] T.G. JONES, M. HORNSTEIN, A. TING, Naval Research Laboratory, Plasma Phys Div, M. NICHOLAS, NRL, Acoustics Div — A remote underwater laser acoustic source is under development at NRL. Sound is generated by intense laser pulses propagating through air and water, followed by underwater optical compression and laser-induced breakdown (LIB). Such an acoustic source would be useful for communications, navigation, and sonar imaging. Recent experiments demonstrated control of the shape of the LIB plasma volume, and thereby control of the acoustic frequency spectrum and sound pressure level as a function of acoustic propagation direction. Femtosecond and nanosecond lasers were used for lens-focused acoustic generation near the water surface. The LIB volume shape was controlled by varying laser pulse length, energy, optical bandwidth, and focusing angle. Aspherical LIB volumes produced strongly anisotropic acoustic sources. Initial results of acoustic propagation studies in a 30,000 gallon bubbly salt water tank suggest both ultrasonic and bubble-induced attenuation. Recent results will be discussed.

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