ACOUSTICS2008/1252
Underwater acoustic generation with narrow and broadband lasers

Theodore Jones[a], Melissa Hornstein[a], Antonio Ting[a], Zachary Wilkes[b] and Dennis Lindwall[c]
[a]U.S. Naval Research Laboratory, Code 6795, 4555 Overlook Ave. SW, Washington, DC 20375, USA
[b]Research Support Instruments, Inc., 4325 Forbes Blvd, Ste B, Lanham, MD 20706, USA
[c]U.S. Naval Research Laboratory-Stennis, Marine Geosciences Division, Code 7432, Stennis Space Center, Stennis, MS 39529, USA

Underwater laser acoustic sources, generated by intense pulsed lasers on above-water and underwater platforms, are under investigation. In a novel configuration, a tailored intense broadband laser pulse can be designed to propagate many meters underwater and compress at a predetermined remote location. Controlled compression of these optical pulses is governed by a combination of optical group velocity dispersion (GVD) and nonlinear Kerr self-focusing, resulting in photoionization, localized heating, and shock generation. Recent and ongoing experiments include near-field acoustic source characterization using lens-focused pulses of a broadband 400 nm Ti:sapphire laser, as well as 1064 nm and 532 nm narrowband YAG laser pulses. Also, the nonlinear optical Kerr index of water at 400 nm was precisely measured. Acoustic source characterization includes measurements of photoacoustic energy conversion efficiency, acoustic power spectrum, and directivity. Experimental results will be presented, and laser sources and techniques for underwater acoustic generation will be compared. [This work is supported by the U.S. Office of Naval Research.]