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Time-Resolved High-Spatial-Resolution Measurements of Underwater Laser Ionization and Filamentation[1] TED JONES, MIKE HELLE, DMITRI KAGANOVICH, ANTONIO TING, JOE PENANO, BAHMAN HAFIZI, Plasma Physics Div., Naval Research Laboratory, Washington, DC, YU-HSIN CHEN, Research Support Instruments, Lanham, MD — Intense underwater laser propagation, filamentation, and ionization are being investigated at NRL for applications including laser-guided discharges, advanced micromachining, and low-frequency laser acoustic generation. Time-resolved spectroscopy of intense underwater propagation and filamentation reveal strong Stimulated molecular Raman Scattering with ps temporal structure and frequency chirp. In addition, fs-time-resolution perpendicular shadowgraph images of ns underwater laser ionization reveal gas microbubble generation throughout the pump beam path. These microbubbles form in ps timescales with remarkably uniform initial diameters of a few-microns. Simulations using the HELCAP 4D nonlinear laser propagation code accurately predict measured filament fluence profiles and propagation, but also indicate complex, time-dependent and axially non-uniform plasma behavior. Results from recent experiments and simulations will be presented.

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