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Exploration of Underwater Laser Breakdown Using Two Synchronized Gated Cameras LUTZ HUWEL, CLAYTON BAUMGART, SUSANNAH BETTS, THOMAS J. MORGAN, Wesleyan University, WILLIAM G. GRAHAM, Queen's University Belfast — Using two synchronized intensified CCD cameras, we have studied spatial and temporal characteristics of optical breakdown in water created by a focused 10 ns pulsed Nd:YAG laser operating at 1064 nm. For three water samples with different impurity content (ultrapure, distilled, and tap water), the plasma evolution was monitored up to 1 ms after breakdown. Images taken by the two cameras, systematically delayed relative to each other, reveal that the center of emission intensity does not remain at a fixed location. In single plasma events, the center first moves, on average, toward the incoming laser beam. Then, at about 100 to 200 ns, the apparent direction of motion reverses and the center returns towards the focal point. On the other hand, in repetitive breakdown the time averaged center moves steadily downstream with each subsequent pulse. Details of this behavior depend on repetition frequency. We will also present shadowgraphy results revealing time resolved speeds of both shockwave and bubble expansion.

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