

Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Underwater Laser Filamentation and Electrical Discharge Guiding¹ T.G. JONES, M.H. HELLE, D. KAGANOVICH, D. GORDON, A. TING, Plasma Phys. Div., Naval Research Laboratory — Techniques to trigger and guide underwater electrical discharges using a laser are currently being developed at NRL. This work may be useful for a variety of applications, including advanced micromachining. As part of this development we are studying underwater optical filaments. Optical filamentation is the extended propagation of a small diameter high-power laser beam, thought to result from a balance between Kerr self-focusing and ionization-induced defocusing, and typically includes a coincident plasma column. Laser heating and hydrodynamic expansion can also result in subsequent vapor channel formation. Both the plasma column and vapor channel can be useful structures for guiding electrical discharges. Our group has for the first time demonstrated and characterized ns underwater filaments. Using a 60 mJ, 5 ns, 532 nm laser, we measured filament diameters of $\sim 100 \mu\text{m}$ and propagation > 30 Rayleigh lengths. Underwater optical filament measurements, as well as results from ongoing laser-guided underwater discharge experiments, will be presented.

¹This work is supported by ONR Base Funds.

T. G. Jones
Plasma Phys. Div., Naval Research Laboratory

Date submitted: 19 Jul 2011

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