Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Coupling of an exploding plasma to a magnetized ambient plasma measured with LIF[1] JEFFREY BONDE, STEPHEN VINCENA, WALTER GEKELMAN, University of California, Los Angeles — The coupling of plasma jets to ambient media near young stellar objects, Herbig-Haro objects, and supernova remnants is of considerable interest to the astrophysical community. In this work, we study the interaction of a laboratory scale jet formed by a carbon laser-produced plasma (LPP) with the ions of a magnetized argon background plasma ($n_{jet}/n_{Ar} < 30$,$v_{jet}/c_s = 20$,$v_{jet}/v_A \leq 1$) using laser-induced fluorescence (LIF). The excitation light was provided by a planar beam of a pulsed dye laser which, by tuning to the Doppler-broadened 611.5 nm absorption line, sampled the distribution function of metastable Ar-II separating the background from the components of the jet. A fast shutter (≥ 3 ns) CCD camera captured the 461 nm fluorescence with 40 ns time and .6 mm^2 spatial resolutions. The distribution functions obtained from the LIF diagnostic reveal significant density enhancement and a subsonic parallel drift localized at the LPP-ambient interface. Within the jet region, the background ion signal indicates the formation of a density void and suggests a lateral snow-plow effect. To our knowledge, this is the first LIF measurement of a supersonic jet coupling to an ambient plasma. Supplemental Langmuir probe measurements characterize the jet's dimensions and dependence on magnetic field strength and background ion mass up to 6 meters from the LPP source.

[1]This experiment was conducted in the Large Plasma Device at the Basic Plasma Science Facility and funded by grants from the US Department of Energy and the National Science Foundation.

Jeffrey Bonde
University of California, Los Angeles

Date submitted: 12 Jul 2013 Electronic form version 1.4