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Background density channel generation by axial plasma jets[1] JEFFREY BONDE, STEPHEN VINCENA, WALTER GEKELMAN, University of California, Los Angeles — The supersonic expansion of a dense plasma into an ambient plasma can be observed in phenomena ranging from coronal mass ejections and protostellar outflows to astrophysical jets. To produce a supersonic plasma jet in a laboratory setting, a laser-produced plasma explodes into an ambient argon plasma ($n \sim 5 \cdot 10^{12} cm^{-3}$,$c_s \sim 6 \cdot 10^5 cm/s$,$v_A \sim 1.2 \cdot 10^7 cm/s$) in the Large Plasma Device at UCLA. This study focuses on the initial formation and evolution of the jet and its effects on the background magnetized plasma. Using a laser-induced fluorescence diagnostic of Ar-II ions at their 611.5nm transition, the jet is seen to perturb the equilibrium population of the target argon ions. A CCD camera with a fast ($\geq$ 3ns) shutter spatially and temporally resolves images of the fluorescence. Time-lapsed imaging shows an axially aligned channel of depleted fluorescence form near the source and travel with an undiminished speed characteristic of the jet ($v/c_s \sim 20$) while remaining highly collimated. Langmuir probe measurements show a large ion flux moving in conjunction with the excited argon depletion after traveling more than an ion inertial length.

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