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High Repetition Rate Mapping of the Interaction Between a Laser Plasma and a Magnetized Background Plasma via Laser Induced Fluorescence

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The coupling of energy between a laser-produced plasma (LPP) and a background magnetized plasma was investigated via a planar laser induced fluorescence (LIF) diagnostic and magnetic flux probes. The recent experiments performed on the Large Plasma Device at the University of California, Los Angeles mapped out the 2 dimensional spatio-temporal evolution of the laser ion velocity distribution function (VDF) in order to asses coupling in a sub-AlfvÃľnic regime. The acquisition of this data necessitates high repetition rate (1 Hz) as each data set is the accumulation of thousands of laser shots, which would not be feasible in slower experiments. Fully kinetic, 3D particle-in-cell (PIC) simulations are compared to the measured VDFâĂŹs to provide a framework in which we can understand the coupling of a sub-AlfvÃľnic plasma flow through a preformed, magnetized plasma.