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Spatial and temporal measurements of electrostatic fields of a field-aligned, magnetized laser-produced plasma expansion[1] JEFFREY BONDE, STEPHEN VINCENA, WALTER GEKELMAN, Univ of California - Los Angeles — Laser-produced plasmas (LPPs) in laboratory environments form supersonic and super-Alfénic flows that, when properly scaled, can model naturally occurring phenomena such as shock structures in supernovae and astrophysical jets. Our interest lies in understanding the evolution of these flows and how they interact with ambient, magnetized plasma. An LPP was generated using a $10^{11} W/cm^2$ laser pulse on a solid target. It expanded into a pre-formed, magnetized plasma and was directed along the background magnetic field ($c_s << v_{\rm exp} \leq v_A$). The total electric field was acquired during the expansion of the LPP and its transition to a collimated, field-aligned jet using magnetic field and emissive probe measurements. The electrostatic component, which arises from charge separation during the expansion, had a peak strength of $|\underline{E}| \sim 200V/cm$ and is 10 times larger than the inductive component associated with the diamagnetic cavity. Particle orbit solvers indicate these fields can accelerate ambient ions to sound speed velocities on short time scales, $t << \omega_{ci}^{-1}$, and small spatial scales, $r \sim c/\omega_{pe} << c/\omega_{pi}$. The strength, scale size, and non-zero divergence of the electrostatic fields suggest MHD and hybrid codes may have difficulty resolving some of the key physics. Data on potentials, electric fields, and associated $\underline{E} \times \underline{B}$ drifts will be presented.

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