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8.34 Characterization of Biermann-Battery field advection in NIF cylindrical geometry targets

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Lasers incident on solid targets produce B-fields around the laser spot due to orthogonal ne and Te gradients that develop near the target surface[1]. Simulations show that these fields are produced in hohlraum experiments at the NIF[2], and that the presence of B-fields can affect particle and energy transport. Little work exists comparing simulated fields predicted by MHD models to data at scales relevant for NIF hohlraum experiments (˜10 ns, ˜few mm)[3]. In particular, the relative contributions of frozen-in and Nernst advection of the field away from the hohlraum wall is not well understood. We have developed a new target platform for measuring B-field topology in a NIF-relevant geometry. Using NIF outer cones, a 2.5 mm long, 5.4 mm diameter Au ring is illuminated with a similar beam pattern to that of a ring of beams in a hohlraum. This provides a clear line of sight for probing through the ring by protons from an imploded D3He-filled capsule 2.5 cm below the ring. Proton deflection is recorded on CR39, allowing estimates of E- and B-field strength and topology in the target and contributions from different advection mechanisms. This work performed under auspices of US DOE by LLNL under Contract DE-AC52-07NA27344 with LDRD support.
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