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Proton deflectometry characterization of Biermann-Battery field advection[1] BRADLEY POLLOCK, ALASTAIR MOORE, NATHAN MEEZAN, DAVE EDER, JAVE KANE, DAVID STROZZI, SCOTT WILKS, HANS RINDERKNECHT, LLNL, ALEX ZYLSTRA, LANL, SHINSUKE FUJIOKA, ILE, GREGORY KEMP, JOHN MOODY, LLNL — Laser-foil interactions are well known to produce azimuthal magnetic fields around the laser spot due to the orthogonal density and temperature gradients that develop near the foil surface (the Biermann-Battery effect). Simulations show that these fields produced inside hohlraums used for indirect drive experiments at the National Ignition Facility (NIF); however, modeling these fields and their advection is very computationally expensive on the temporal and spatial scales relevant for typical NIF hohlraum experiments (~10 ns, ~few mm). The hohlraum geometry also makes directly probing the fields somewhat challenging, limiting the available experimental data on these fields under NIF conditions. In particular, the relative contributions of frozen-in and Nernst advection of the field away from the hohlraum wall is not currently well understood. We have developed a new target platform for direct measurements of the field topology in a NIF-relevant configuration. Using a single cone of NIF, a 2.5 mm long, 5.4 mm diameter Au ring is illuminated with a similar beam geometry to that of one ring of beams in a full-scale hohlraum experiment. The ring target has no end caps, providing a clear line of sight for probing through the ring. A D^3He filled exploding pusher placed ~5 cm below the ring is illuminated by an additional 60 beams of NIF to produce protons, some of which propagate through the ring.

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