Abstract Submitted
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Dynamics of laser-driven proton beam focusing and transport into solid density matter J. KIM, C. MCGUFFEY, F. BEG, Univ of California - San Diego, M. WEI, General Atomics, D. MARISCAL, Lawrence Livermore National Laboratory, S. CHEN, J. FUCHS, Laboratoire pour l'Utilisation des lasers Intenses — Isochoric heating and local energy deposition capabilities make intense proton beams appealing for studying high energy density physics and the Fast Ignition of inertial confinement fusion. To study proton beam focusing that results in high beam density, experiments have been conducted using different target geometries irradiated by a kilojoule, 10 ps pulse of the OMEGA EP laser. The beam focus was measured by imaging beam-induced Cu K-alpha emission on a Cu foil that was positioned at a fixed distance. Compared to a free target, structured targets having shapes of wedge and cone show a brighter and narrower K-alpha radiation emission spot on a Cu foil indicating higher beam focusability. Experimentally observed images with proton radiography demonstrate the existence of transverse fields on the structures. Full-scale simulations including the contribution of a long pulse duration of the laser confirm that such fields can be caused by hot electrons moving through the structures. The simulated fields are strong enough to reflect the diverging main proton beam and pinch a transverse probe beam. Detailed simulation results including the beam focusing and transport of the focused intense proton beam in Cu foil will be presented. This work was supported by the National Laser User Facility Program through award DE-NA0002034

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