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Ultrathin Target Laser Ion Acceleration At Oblique Incidence[1]
G.E. COCHRAN, The Ohio State University, P.L. POOLE, Lawrence Livermore National Laboratory, T. COWAN, T. KLUGE, J. METZKES, L. OBST, I. PRINCIPE, H.-P. SCHLENVOIGT, U. SCHRAMM, K. ZEIL, Helmholtz-Zentrum Dresden-Rossendorf, D.W. SCHUMACHER, The Ohio State University — Oblique laser incidence allows separate identification of target normal and laser axis ion acceleration mechanisms. A recent high-contrast experiment using the Draco laser ($\sim$3 J, 10^{21} W/cm^2) at 45 degrees angle of incidence on liquid crystal targets showed predominantly target normal directed ions for all target thicknesses from 10 nm to $>$ 1 μm, with peak proton energies up to 26 MeV. We present 3D particle-in-cell simulations of this experiment which reproduce both the dominance of target normal acceleration as well as the transparency onset as a function of target thickness, with ion spectral and optical reflectivity trends in agreement with experimental observations. We find that high energy ions from the thinnest targets are accelerated volumetrically, in contrast to originating at the rear surface as in thicker targets. We discuss the acceleration mechanisms at play and the dominance of target normal ions.

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