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Enhanced Hot-Electron Production from Compound Parabolic Concentrator Targets on a Short-Pulse, High-Contrast Laser System

DEAN RUSBY, Lawrence Livermore National Lab, PAUL KING, LLNL, ANDREA HANNASCH, University of Texas, NUNO LEMOS, ARTHUR PAK, SHAUN KERR, G. COCHRAN, LLNL, I. PAGANO, H. QUEVEDO, G. TIWARI, University of Texas, M. MANUEL, Z. GAVIN, A. HAID, General Atomics, JACKSON WILLIAMS, SCOTT WILKS, ANDREAS KEMP, ANDREW MACPHEE, ANDREW MACKINNON, LLNL — The production of hot-electrons from high-intensity laser interactions is the key to the development of high energy particle and photon sources. The acceleration of the hot-electron population is proportional to the incident laser intensity. The highest intensities are often achieved via a final short focal length focusing optic. However, the development of miniature targetry and 3D printing has opened the door to a cheap and effective alternative. Cone targets can therefore be fabricated such they operate as a plasma optic. We on compound parabolic concentrator (CPC) [1] targets that geometrically increase the intensity on target. Experimental measurements were made at the Texas Petawatt laser facility with a short-pulse (150 fs) high-intensity (10^{18} W/cm2) and long focal length (F/40). We report a hot-electron temperature enhancement of approximately a factor of 7 from the CPC target when compared to planar target. Using PIC simulations, we describe this hot-electron enhancement from a purely geometric intensity enhancement and existing temperature-intensity scaling laws.

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