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Direct Measurements of Hot-Electron Preheat in Inertial Confinement Fusion A.R. CHRISTOPHERSON, R. BETTI, J. HOWARD, A. BOSE, Laboratory for Laser Energetics and Fusion Science Center, U. of Rochester, C.J. FORREST, W. THEOBALD, E.M. CAMPBELL, J.A. DELETTREZ, C. STOECKL, D.H. EDGELL, W. SEKA, A.K. DAVIS, D.T. MICHEL, V.YU. GLEBOV, Laboratory for Laser Energetics, U. of Rochester, M.S. WEI, General Atomics — In laser-driven inertial confinement fusion, a spherical capsule of cryogenic DT with a low-Z (CH, Be) ablator is accelerated inward on low entropy to achieve high hot-spot pressures at stagnation with minimal driver energy. Hot electrons generated from laser–plasma instabilities can compromise this performance by preheating the DT fuel, which results in early decompression of the imploding shell and lower hot-spot pressures. The hot-electron energy deposited into the DT for direct-drive implosions is routinely inferred by subtracting hard x-ray signals between a cryogenic implosion and its mass-equivalent, all-CH implosion. However, this technique does not measure the energy deposited into the unablated DT, which fundamentally determines the final degradation in hot-spot pressure. In this work, we report on experiments conducted with high-Z payloads of varying thicknesses to determine the hot-electron energy deposited into a payload that is mass equivalent to the amount of unablated DT present in typical DT layered implosions on OMEGA. These are the first measurements to directly probe the effect of preheat on performance degradation. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0001944.

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