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Hot-Electron Preheat in Hydrodynamically Scaled Direct-Drive Implosions at the National Ignition Facility and OMEGA M.J. ROSENBERG, A.A. SOLODOV, A.R. CHRISTOPHERSON, R. BETTI, P.B. RADHA, C. STOECKL, C.J. FORREST, V.YU. GLEBOV, F.J. MARSALL, S.P. REGAN, T.J.B. COLLINS, D.H. FROULA, J.P. PALASTRO, V.N. GONCHAROV, Laboratory for Laser Energetics, University of Rochester, M. HOHENBERGER, B. BACHMANN, G. HALL, P. MICHEL, LLNL, C. KRAULAND, General Atomics — The scaling of hot-electron preheat with capsule size or laser energy has been studied in warm polar-direct-drive implosions at the National Ignition Facility (NIF) and OMEGA. The experiments were designed to produce hydrodynamically equivalent implosion conditions despite differences of a factor of 3.4 in capsule diameter and 40 in laser energy (2.3 mm, 720 kJ on the NIF; 0.69 mm, 18 kJ on OMEGA). Hard x-ray emission from Ge-doped layers was used to infer the hot-electron energy deposited in the unablated shell. Although the hot-electron mechanism is different at each scale—two-plasmon decay on OMEGA and stimulated Raman scattering on the NIF—both experiments demonstrate 0.2% of laser energy deposited as hot-electron preheat in the inner 80% of unablated shell at a hard-sphere intensity of 1.2 10^{15} W/cm^2 despite more hot-electron generation on the NIF. This result is partially attributed to electron stopping in the thicker shell on the NIF. Implications for scaling of direct-drive cryogenic implosion performance on OMEGA to NIF scales will be discussed. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0003856.

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