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Modeling Laser–Plasma Interactions at Direct-Drive Ignition-Relevant Plasma Conditions at the National Ignition Facility A.A. SOLODOV, M.J. ROSENBERG, J.F. MYATT, R. EPSTEIN, W. SEKA, M. HOHENBERGER, R.W. SHORT, J.G. SHAW, S.P. REGAN, D.H. FROULA, P.B. RADHA, Laboratory for Laser Energetics, U. of Rochester, J.W. BATES, A.J. SCHMITT, NRL, P. MICHEL, J.D. MOODY, J.E. RALPH, D.P. TURNBULL, M.A. BARRIOS, LLNL — Laser–plasma interaction instabilities, such as two-plasmon decay (TPD) and stimulated Raman scattering (SRS), can be detrimental for direct-drive inertial confinement fusion because of target preheat by generated high-energy electrons. The radiation–hydrodynamics code *DRACO* has been used to design planar-target experiments that generate plasma and interaction conditions relevant to direct-drive–ignition designs ($I_{\mathrm{L}} \sim 10^{15}\,\mathrm{W/cm^2}$, $T_{\mathrm{e}} > 3\,\mathrm{keV}$, density gradient scale lengths of $L_{\mathrm{n}} \sim 600\,\mu\mathrm{m}$). The hot-electron temperature of $\sim 40\,\mathrm{to}\,50\,\mathrm{keV}$ and the fraction of laser energy converted to hot electrons of $\sim 0.5\,\mathrm{to}\,2.3\%$ were inferred based on comparing the simulated and experimentally observed x-ray emission when the laser intensity at the quarter-critical surface increased from $\sim 6\,\mathrm{to}\,15 \times 10^{14}\,\mathrm{W/cm^2}$. The measured SRS energy was sufficient to explain the observed total energy in hot electrons. Implications for ignition-scale direct-drive experiments and hot-electron preheat mitigation using mid-Z ablators will be discussed. 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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