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Effects of Long- and Intermediate-Wavelength Nonuniformities on Hot-Spot Energetics of Hydrodynamic Equivalent Targets A. BOSE, R. BETTI, K.M. WOO, A.R. CHRISTOPHERSON, Fusion Science Center and Laboratory for Laser Energetics, U. of Rochester, D. SHVARTS, Nuclear Research Center — The impact of intermediate- and low-mode nonuniformities on the performance of inertial confinement fusion (ICF) implosions is investigated by a detailed study of hot-spot energetics. It is found that low- ($1 \sim 2$) and intermediate-mode ($1 \geq 10$) asymmetries affect the hot-spot hydrodynamics in very different ways. It is observed that for low-mode asymmetries, the fusion yield decreases because of a significant reduction in hot-spot pressure while the neutron-averaged hot-spot volume remains comparable to that of unperturbed (clean) simulations. On the other hand, implosions with moderate-amplitude, intermediate-wavelength modes, which are amplified by the Rayleigh–Taylor instability (RTI), exhibit a fusion-yield degradation primarily caused by a reduction in the burn volume without significant degradation of the pressure. For very large amplitudes, the intermediate modes show a "secondary piston effect," where the converging RTI spikes compress a much smaller volume, allowing for a secondary conversion of the shell's kinetic energy to internal energy at a central region. Understanding the effects of nonuniformities on the hot-spot energetics provides valuable insight in determining the causes of performance degradation in current ICF experiments. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0001944 and DE-FC02-04ER54789 (Fusion Science Center).

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