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Three-Dimensional Hydrodynamic Simulations of the Effects of Laser Imprint in OMEGA Implosions I.V. IGUMENSHCHEV, E.M. CAMPBELL, V.N. GONCHAROV, S.P. REGAN, A. SHVYDKY, Laboratory for Laser Energetics, U. of Rochester, A.J. SCHMITT, NRL — Illumination of direct-drive implosion targets by the OMEGA laser introduces large-amplitude broadband modulations in the absorbed energy from the largest (target size ~900-μm) to smallest (speckle size ~2-μm) spatial scales. These modulations "imprint" perturbations into a target that are amplified because of the secular and Rayleigh–Taylor growths during acceleration and deceleration of the target. The degradation of performance of room-temperature and cryogenic OMEGA implosions caused by these perturbations were simulated in three dimensions using the code *ASTER*. The highest-resolution simulations resolve perturbation modes as high as $\ell \sim 200$. The high modes $\ell \sim 50$ to 100 dominate in the perturbation spectrum during the linear growth, while the late-time nonlinear evolution results in domination of modes with $\ell \sim 30$ to 50. Smoothing by spectral dispersion reduces the linear-phase mode amplitudes by a factor of ~ 4 and results in substantial improvements in implosion performance that is in good agreement with measurements. The effects of imprint on implosion performance are compared with the effects of other implosion asymmetries, such as those induced because of laser beam imbalance, mistiming and mispointing, and target offset. 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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