Three-Dimensional Simulations of Direct-Drive Implosions on OMEGA

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The performance of direct-drive implosion experiments on the OMEGA laser can suffer from low- to high-mode nonuniformities that are introduced by various sources including laser illuminations asymmetries, laser imprint, and target-surface defects. The effects of these nonuniformities were simulated using the 3-D hydrodynamic code ASTER. Simulations find the critical importance of the initial target shell compression stage (before the shell acceleration), at which dominant imprinting modes, determining the subsequent evolution of a target, are developed. Surface defects are predicted to develop holes in implosion shells and to result in injection of the ablator mass inside the hot spot. This injected mass causes an undercompression of targets. ASTER simulations help to improve the performance of OMEGA implosions by identifying and finding ways to mitigate effects of most-damaging nonuniformities.

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