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The effects of 3D asymmetries in ICF capsule implosions on the National Ignition Facility JEREMY CHITTENDEN, SHAUN TAYLOR, BRIAN APPELBE, NICHOLAS NIASSE, Imperial College — We report on investigations into the effect of asymmetry on thermonuclear yield in ICF implosions on the NIF. 3D radiation hydrodynamics calculations of the entire capsule volume are presented which attempt to predict the structural form of the perturbations at the stagnation phase, based upon initial capsule defects, dust particles, radiation drive asymmetries, etc. Asymmetries arising at the interface between the hotspot and the cold dense fuel layer are further amplified by the Rayleigh-Taylor instability during the deceleration phase. Where multi-mode asymmetries interact in three dimensions, not all of kinetic energy is dissipated effectively. Low mode asymmetries which change the overall shape of the hotspot increase the surface area leading to increased thermal conduction. Higher mode asymmetries promote mixing of the cold fuel layer into the hotspot at stagnation. This essentially acts as an increased rate of ablation of the dense fuel at the hotspot surface, pulling material with low specific enthalpy into the hotpot, lowering the average hotspot temperature and quenching the burn. Signatures of the form of the perturbations are revealed in synthetic neutron spectra, X-ray images and radiography data.

Jeremy Chittenden
Imperial College

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