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Suppressing Intermediate Wavelength Perturbation Growth and Feedthrough in Double Shell Targets with Extended Density Gradients.

ERIC LOOMIS, DAVID STARK, DAVID MONTGOMERY, RYAN SACKS, JOSH SAUPPE, BRIAN HAINES, IRINA SAGERT, SASI PALANIYAPPAN, PAUL KEITER, Los Alamos Natl Lab, PETER AMENDT, Lawrence Livermore Natl Lab, HONGWEI XU, HAIBO HUANG, General Atomics, TANA CARDENAS, SEAN FINNEGAN, JOHN KLINE, Los Alamos Natl Lab — Hydrodynamic stability is perhaps the most challenging physics issue confronting double shell inertial confinement fusion (ICF) targets from the achievement of robust thermonuclear burn. Double shell implosions at the National Ignition Facility (NIF) utilize the x-rays created by laser heating of Au hohlraums to drive the inward acceleration of the outer ablator shell toward an interior high-density (e.g., W) shell containing the DT fuel. At implosion speeds of 200 km/s, the high-Atwood-number inner shell quickly becomes Rayleigh-Taylor unstable to all perturbation wavelengths except those short enough to experience viscous dissipation. Previous simulations [J.L. Milovich et al., Phys. Plasmas 11 (2004)] have predicted that engineered density gradients can stabilize high-modes (>200), however, their use for suppressing mid-mode (30-100) growth and feedthrough is unknown, which our simulations suggest are most damaging to shell integrity during stagnation. In this talk we will present computational results of enhanced in-flight aspect ratio (IFAR) double shell designs in terms of areal density growth factor using extended density gradients and designs for experiments at the National Ignition Facility (NIF) to validate the computational results.

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