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Stabilization of Thin-Shell Implosions Using a High-Foot Adiabat-Shaped Drive on the National Ignition Facility MARION LAFON, PASCAL GAUTHIER, CEA DAM DIF, Arpajon, France, LAURENT MASSE, LLNL, Livermore, USA — The High Foot (HF) campaign on the National Ignition Facility (NIF) has improved the neutron yield by an order of magnitude as compared to the implosions reported during the National Ignition Campaign (NIC) while dramatically lowering the ablation-front instability growth. However, this yield increase came at the expense of reduced fuel compression due to higher fuel adiabat. Thinner shell adiabat-shaped HF implosions have been designed to combine the ablation front stability benefits of the current HF pulses with the demonstrated high fuel compressibility of the NIC implosions and increased implosion velocity. This is accomplished by using a hybrid adiabat-shaping technique which both lowers the laser power between the first and second pulses to enhance the ablative stabilization at early times and precisely tailors the rise-to-peak drive to prevent undesired shocks from propagating in the fuel and depositing additional entropy. Ablation front growth factor spectra are generated from two-dimensional simulations with the FCI2 radiation hydrodynamics code. Linear analysis of the instability growth demonstrates that adiabat-shaped pulses provide a path to control and reduce ablation front instability growth while placing the fuel on a lower adiabat to achieve the alpha-heating-dominated regime. Adiabat-shaped pulses without picket are also investigated as a potential way to enhance the stability of the holhraum walls at early times.

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