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A NIF 3-D high Mach number feature experiment*

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Some ICF ignition capsule designs for the National Ignition Facility (NIF) require localized features such as fill tubes, holes, and waist joints, which break the ideal spherical symmetry of the capsule. Simulations have been employed to explore the robustness of capsules to perturbations from such features. An experiment using the first four beams of NIF experiment has been designed to test modeling of features. This experiment examines the hydrodynamic response of a pusher void to a high Mach number shock in a mini-shock tube. The shock is generated by direct illumination of a CH ablator by a 5 kJ 1.5 ns NIF laser pulse. The pressure of the ablator drives a blast wave through a 250 μm thick planar aluminium pusher into density 0.1 g/cm^3 carbon foam enclosed in a CH tube. The shock pressure in the Al is 20-60 Mb, the lower value applying at breakout into the foam. The Mach number of the shock in the Al at breakout is about 8. We will compare the behavior of a 2-D axisymmetric feature to a 3-D feature. The 2-D feature is a cylindrical void of 160 μm diameter and 150 μm depth penetrating into the Al from the interface with the foam. Shock passage over the void launches a jet of Al into the foam, which will be diagnosed with x-ray backlighting. We have considered 3-D feature options including a void of square cross-section and a tilted cyclinder. The final 3-D design has not been chosen at the time of submission of this abstract. We shall present 3-D simulations using the ALE code Hydra and early experimental data.

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