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Measurements of the non-uniformities seeded by NIF ignition capsule ablator materials

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Current NIF ignition target designs contain the DT fuel inside spherical capsules made of either Cu-doped Be or high density C (HDC). Both candidate materials are polycrystalline, and are expected to respond anisotropically to the initial compression wave of the NIF compression sequence. In the case of Be the non-uniformities seeded during the initial compression will be suppressed by shock-melting the ablator on the first shock, while in the HDC case significant spatial averaging is expected to take place over the nm-scale length of the grain structure. Estimates of the amplitudes of the non-uniformities seeded by each type of ablator suggest that these capsules should remain stable during the subsequent implosion; however, experiments are needed to verify these estimates. We describe experiments designed to measure shock front perturbations induced by the microscopic polycrystalline non-uniformities of these two ablator materials. The measurement method employs a time-resolved two-dimensional imaging VISAR illuminated by a 2 ps laser pulse, which captures spatial variations in the velocity across the shock front transmitted through the ablator. The measurement is carried out over an 800 μm field of view with relative velocity sensitivity $\Delta V/V \sim 10^{-4}$, and over perturbation wavelengths in the range of 3-4 μm to 50 μm. This work was performed under the auspices of the U.S. Department of Energy by LLNL under contract number W-7405-ENG-48.

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