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Recent results from the first polar direct drive plastic capsule implosions on NIF

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Polar direct drive (PDD) offers a simplified platform for conducting strongly driven implosions on NIF to investigate mix, hydro-burn and ignition-relevant physics. Its successful use necessitates a firm understanding and predictive capability of its implosion characteristics including hydro performance, symmetry and yield. To assess this capability, the first two PDD implosions of deuterium filled CH capsules were recently conducted at NIF. The P2 Legendre mode symmetry seen in these implosions agreed with pre-shot predictions even though the 700kJ drive energy produced intensities that far exceeded thresholds for both Raman and Brillouin stimulated scattering. These shots were also the first to employ image backlighting driven by two laser quads. Preliminary results indicate that the yield from the uncoated 2.25 mm diameter, 42 μm thick, CH shells was reduced by about a factor of two owing to as-shot laser drive asymmetries. Similarly, a small (sim50 μm) centroid offset between the upper and lower shell hemispheres seen in the first shot appears to be indicative of the laser quad energies. Overall, the implosion trajectories agreed with pre-shot predictions of bangtime. The second shot incorporated an 80 ?m wide,10 ?m deep depression encircling the equator of the capsule. This engineered feature was imposed to test our capability to predict the effect of high-mode features on yield and mix. A predicted yield reduction factor of 3 was not observed.

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