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Progress towards a one-dimensional layered DT implosion using HDC capsules at the NIF[1]

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Using a 0.8x scale HDC capsule (D=1.6 mm) in a full scale DU hohlraum (D=5.75 mm) filled with relatively low He gas (0.3mg/cc), we have been able to achieve a high (C=26) convergence layered DT implosion that is diagnosed within 10 percent of round at all measured times. An adiabat-2.5, 3-shock, 1MJ-7ns laser pulse was used to achieved velocities >350 km/s, neutron yield $\approx$ 3e15 with a down scattered ratio $\approx$ 0.03. This platform shows minimal laser plasma interaction (no measurable hot electrons, $>$ 97% coupling, no cross beam energy transfer required). A direct control of the laser cone fraction vs. time was used to obtain 3-shock-breakout symmetry (keyhole target), in flight symmetry (radiography at convergence 2-4) and symmetric hot spot/rebound shock at convergence 12 (gas-filled capsule) and 26 (layered DT). Further repointing of laser cones demonstrated control of higher modes (P4). 4 layered DT implosions allowed to compare the effect of W-dopant, symmetry and velocity on performance. We will show using experimental results and simulations that the W-doped HDC implosion behaves as expected and reaches 40% of Yield Over Clean (YOC), with the fill-tube perturbation being a possible cause of the reduced yield. The undoped HDC capsule has a YOC $<$ 0.3, showing more sensitivity to X-ray preheat than expected. The path towards an equivalent scale 1 implosion capable of large alpha-heating will be discussed.

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