THE DIAMOND IMPLOSION CAMPAIGN ON THE NATIONAL IGNITION FACILITY

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This poster provides an overview of our quest for a suitable design (hohlraum + capsule + laser pulse) to study alpha-heating using high-density carbon (HDC, or diamond) ablator on the National Ignition Facility (NIF) [1]. We will describe how the campaign evolved over the past 3 years from a 4-shock low adiabat 11ns laser pulse driving a standard He-filled ($\rho_{He} \geq 0.9$ mg/cm^3) hohlraum to compress a 1mm HDC capsule [2] towards shorter (< 9 ns) laser pulses driving a 2-3 shock implosion at moderate adiabat in a near-vacuum hohlraum [3,4] ($\rho_{He} < 0.1$ mg/cm^3). This campaign relies on using various hohlraum scales and case-to-capsule ratios to improve our control (and understanding) of implosion symmetry, coupled with very short tuning loops leading to high-convergence cryogenic DT layer implosions [4,5]. While we have demonstrated high coupling in near-vacuum hohlraums (with negligible Laser-Plasma Interaction signatures), along with good modeling capabilities for the overall capsule drive, symmetry control (and prediction) remains a challenge. We will describe the entire campaign so far, with emphasis on the latest experimental results (up to summer 2015), as well as the near term plan forward.

[1] A. J. MacKinnon et. al., "High-density carbon ablator experiments on the National Ignition Facility," Phys. Plasmas **21**, 056318 (2014).
[2] J. S. Ross et. al., "High-density carbon capsule experiments on the national ignition facility," Phys. Rev. E **91**, 021101(R) (2015).
[3] S. LePape et. al., "Observation of a Reflected Shock in an Indirectly Driven Spherical Implosion at the National Ignition Facility," Phys. Rev. Lett. **112**, 225002 (2014).
[4] L. F. Berzak Hopkins et. al., "First high-convergence cryogenic implosion in a near-vacuum hohlraum," Phys. Rev. Lett. (accepted 2015).
[5] N. B. Meezan et. al., "Cryogenic THD and DT layer implosions with high density carbon ablators in near-vacuum hohlraums," submitted to Phys. Plasmas (2015).

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