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Progress in High Capsule-Energy-Coupling Studies on the NIF Using Advanced Hohlraums[1]

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A key requirement for improving the ignition prospects on the NIF is increased capsule absorbed energy E_{cap}. Three approaches toward this goal include the use of advanced hohlraums, implementing laser direct drive, and increasing the laser energy. This talk focuses on the first option to achieve 2-3x higher E_{cap} >0.5 MJ with use of innovative hohlraums on the existing NIF laser. In contrast to the extensively used cylinder hohlraum, two non-standard geometries toward high E_{cap} are considered: the "Frustraum" (or double-cone hohlraum) [1] and the rugby-shaped hohlraum [2]. Both shapes can accommodate ˜50% larger capsules without sacrificing drive symmetry and peak drive, according to recent favorable NIF data. By significantly increasingE_{cap}, ignition can be achieved at lower fuel convergence and higher implosion adiabat. Experiments with cylinder hohlraums and nominal scale (˜1 mm radius) capsules to date have shown less fuel compression than expected [3], which is consistent with sources of degrading preheat and mix that hinder ignition. Operating with a high-volume and -adiabat capsule ("HVAC") potentially provides a novel path towards ignition at the acceptable price of reduced energy gain. The HVAC mode of ignition conveniently spans a spectrum of states from near hot-spot to volume ignition, defined as when (1) the entire fuel is the hot spot and (2) the ablator provides the majority of inertial confinement of the igniting fuel. This talk covers in detail the close coupling of validated advanced hohlraum performance with prospects for realizing the HVAC ignition concept on the NIF. [1] P. Amendt *et al.*, PoP **26**, 082707 (2019); https://doi.org/10.1063/1.5099934 [2] Y. Ping, V. Smalyuk, P. Amendt *et al.*, Nature Phys.; https://doi.org/10.1038/s41567-018-0331-5 [3] A.L. Kritcher *et al.*, PoP **23**, 052709 (2016).

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