EFFECT OF CONVERGENCE ON IMPLOSION SYMMETRIES AND YIELDS

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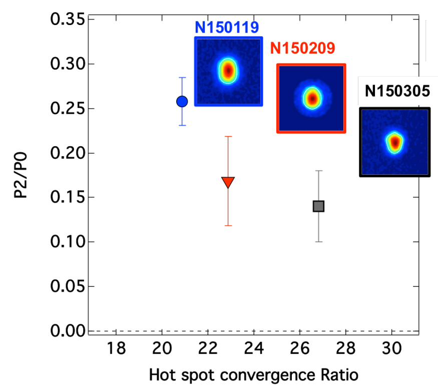
We present results of a series of ICF implosion experiments at NIF in which the hot-spot convergence ratio was varied in otherwise identical symmetry-capsule (Symcap) targets. Increased convergence is expected to amplify any performance degradation due to asymmetry, as equivalent mode amplitudes represent an increased fractional change in surface area. While it is difficult to vary the convergence of a layered DT implosion, the convergence of a Symcap implosion is easily adjusted by varying the capsule fill pressure.

Because of the overhead associated with fielding a high-yield implosion of a layered DT target, surrogate experiments are used to assess non-yield performance characteristics. In Symcaps, the DT fuel is replaced by an equivalent mass of CH, and the capsule is filled with a high-pressure gas that forms the basis of the stagnated hotspot. These targets are designed to assess low-mode asymmetries of the stagnated core by observation of x-ray self-emission images. Consequently, the chief observable differences from layered implosions are a) lower neutron yield and b) lower convergence to facilitate high-accuracy image analysis. Here we aim to quantify the difference in implosion performance due to this lower convergence.

Our experiments used four-shock, adiabat-shaped, 0.9MJ laser pulses into a 4.69 mm diameter, 8.26 mm tall room-temperature *hohlraum*, containing a 1.8 mm diameter, 170 micron thick, Si-doped CH capsule filled with deuterated propane. By varying the initial propane density from 3 to 0.6 mg/cc, we observed an increase in hot-spot convergence ratio from 20 to 30. At higher convergence, we find that the stagnated core is more prolate and that the ion temperature of the hotspot increases slightly. We discuss the effect of convergence on absolute x-ray and neutron yields and time-dependent asymmetries. We interpret our results to improve our understanding of hot-spot formation at stagnation, and we compare our results to the differences between otherwise identical Symcap - DT layer pairs.



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