DPP13-2013-001536

Abstract for an Invited Paper
for the DPP13 Meeting of
the American Physical Society

The Hohlraum Drive Campaign on the National Ignition Facility[1]

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The Hohlraum drive effort on the National Ignition Facility (NIF) laser has three primary goals: 1) improve hohlraum performance by improving laser beam propagation, reducing backscatter from laser plasma interactions (LPI), controlling x-ray and electron preheat, and modifying the x-ray drive spectrum; 2) improve understanding of crossbeam energy transfer physics to better evaluate this as a symmetry tuning method; and 3) improve modeling in order to find optimum designs. Our experimental strategy for improving performance explores the impact of significant changes to the hohlraum shape, wall material, gasfill composition, and gasfill density on integrated implosion experiments. We are investigating the performance of a rugby-shaped design that has a significantly larger diameter (7 mm) at the waist than our standard 5.75 mm diameter cylindrical-shaped hohlraum but maintains approximately the same wall area. We are also exploring changes to the gasfill composition in cylindrical hohlraums by using neopentane at room temperature to compare with our standard helium gasfill. In addition, we are also investigating higher He gasfill density (1.6 mg/cc vs nominal 0.96 mg/cc) and increased x-ray drive very early in the pulse. Besides these integrated experiments, our strategy includes experiments testing separate aspects of the hohlraum physics. These include time-resolved and time-integrated measurements of cross-beam transfer rates and laser-beam spatial power distribution at early and late times using modified targets. Non-local thermal equilibrium modeling and heat transport relevant to ignition experiments are being studied using sphere targets on the Omega laser system. These simpler targets provide benchmarks for improving our modeling tools. This talk will summarize the results of the Hohlraum Drive campaign and discuss future directions.

[1]This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA2-344.