DPP15-2015-000120

Abstract for an Invited Paper
for the DPP15 Meeting of
the American Physical Society

First Beryllium Capsule implosions on the National Ignition Facility

JOHN KLINE, Los Alamos National Laboratory

The first implosion experiments using Beryllium (Be) capsules have been conducted at the National Ignition Facility (NIF) to confirm the superior ablation properties and to elucidate possible Be-ablator issues. Since the 1990s, Be has been the preferred Inertial Confinement Fusion (ICF) ablator because of its higher mass ablation rate compared to that of carbon-based ablators. This enables ICF target designs with higher implosion velocities and improved hydrodynamic stability through greater ablative stabilization. Recent experiments to demonstrate the viability of Be ablator target designs have measured the laser energy backscatter, shock velocities, capsule implosion velocity, core implosion shape from self-emission, and in-flight capsule shape from backlit imaging. The laser backscatter is similar to that from comparable plastic (CH) targets. Implosion velocity measurements from backlit streaked radiography show that laser energy coupling to the hohlraum wall is comparable, if not better, for Be than for plastic ablators. The measured implosion shape indicates no significant reduction of laser energy from the inner laser cone beams reaching the hohlraum wall as compared with plastic and high-density carbon ablators. These results demonstrate good coupling of laser energy to the target and control over the implosion shape indicating the feasibility of Be capsule design opening up a larger design space for ICF. In addition, this data, together with data for low fill-density hohlraum performance, indicates that laser power multipliers, required to reconcile simulations with experimental observations, are likely due to our limited understanding of the hohlraum rather than the capsule physics since similar multipliers are needed for both Be and CH capsules.