Results from the Pushered Single Shell Campaign

Ryan SACKS, Eduard DEWALD, Frank GRAZIANI, Steve MACLAREN, Jesse PINO, Joseph RALPH, Jay SALMONSON, Robert TIPTON

Lawrence Livermore National Laboratory, USA

E-mail: sacks2@llnl.gov

The Pushered Single Shell (PSS) campaign on the National Ignition Facility (NIF) aims to investigate the influence of the mixing of non-fully ionized material on capsule performance. The PSS design (see Figure 1) is based on the successful Two Shock experiments [1], with a 15% larger capsule radius, a 167 µm CH outer ablator with a uniform 1% Si dopant, and a 4 µm inner layer of either CH or CD that is doped with 2% Ge or not to study the impact of mid-Z dopant on mix. For mix yield studies [2] with vs without Ge dopant, the gas fill of the capsule is 75%/25% HT with a deuterated or undeuterated inner layer to measure the mix figure of merit (MFoM), defined as:

$$MFoM = \frac{(DT/TT)_{CD}}{(DT/TT)_{CH}} - 1$$

Whereas the DT yield is generated by both the core and ablator-gas mixing while the TT yield is given by the core only. Undeuterated capsule experiments provide the core TT yield and DT background yield from the gas fill due to contamination. Simulations have shown a significant change in the MFoM with vs without Ge dopant at core temperatures ≥ 3 keV, accounting for the change in the laser profile compared to 2-Shock experiments.

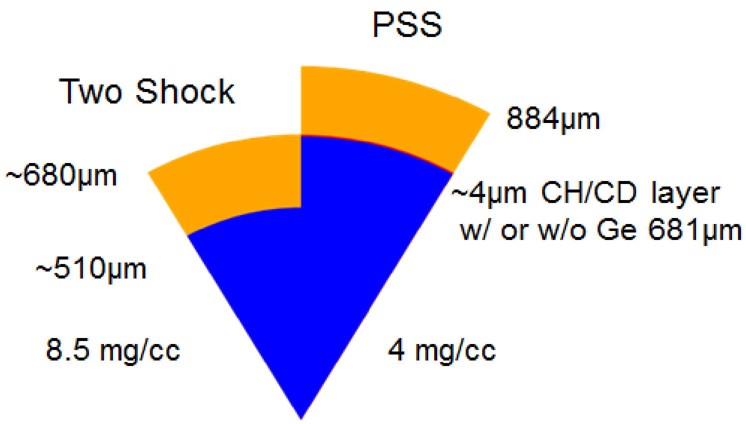

Figure 1: Comparison of the two-shock and PSS capsule designs.

The first PSS implosion experiment have confirmed core Tion ≥ 3 keV as well as 0.5 keV cooling due to the Ge dopant. They have recorded the fastest implosion velocity with a CH ablator at 411 m/ns, capture of the shock flash before bang time, tunable symmetry with laswer pointing and con fraction, and reasonable agreement with computational simulations. This paper will summarize the first PSS results. This work was performed under the auspices of the US Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC-52-07NA27344, Lawrence Livermore National Security, LLC. IM release number LLNL-ABS-728767.

References

[1] S.F. Khan, S.A. MacLaren *et al.,* Phys. Plasmas **23**, 042708 (2016)

[2] D.T. Casey *et al.,* Phys. Plasmas **21**, 092705 (2014)