PROPOSED PUSHERED SINGLE SHELL CAPSULE DESIGNS FOR THE INVESTIGATION OF HIGH Z MIX ON THE NATIONAL IGNITION FACILITY

R.F. Sacks, R.E. Tipton, F.R. Graziani
Lawrence Livermore National Laboratory, Livermore, CA, USA
sacks2@llnl.gov

The high foot experiments on the National Ignition Facility have increased hot spot symmetry, neutron yield, and hot spot temperature while decreasing the amount of mix present in the central hot spot [1]. In addition, the CD Mix campaign has given a detailed physical representation of the mix mechanics in the current ignition capsule designs by investigating the relationship between material mixing, shell-fuel interfaces, and the change in thermonuclear yield given a deuterated layer in the capsule [2]. Alternative ignition scenarios include the use of double shell designs that incorporate high-Z material in the capsule [3, 4]. Simulations are conducted on a proposed capsule platform and compared using the CALE code [5], with the K-L mix model [6], and the ARES code [7], using an LES model, on scaled capsule designs using a partially reduced glass capsule design. This allows for the inclusion of hydrogen and deuterium on the inner surface of the pusher layer similar to the CD mix experiments. The presence of silicon dioxide allows for the investigation of the influence of higher Z material on the mixing characteristics. Alternative designs are possible with titanium dioxide and germanium dioxide and will require further investigation. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA27344, Lawrence Livermore National Security, LLC. Information Management release number LLNL-ABS-669668.

[1] O.A. Hurricane, D.A. Callahan *et al.*, Phys. Plasmas **21**, 056314 (2014).
[2] D.T. Casey, V.A. Smalyuk *et al*., Phys. Plasmas **21**, 092705 (2014).
[3] P.A. Amendt, H.F. Robey *et al.*, Phys. Rev. Lett. **94**, 065004 (2005).
[4] H.F. Robey, P.A. Amendt *et al.*, Phys. Rev. Lett. **103**, 145003 (2009).
[5] R.E. Tipton, *CALE users manual. CALE Documentation, Lawrence Livermore National Laboratory* (1991)
[6] G. Dimonte and R.E. Tipton, Phys. Fluids **18**, 085101 (2006)
[7] R.M. Darlington, *Large Eddy Simulation of Rayleigh-Taylor Instability using the Arbitrary Lagrangian-Eulerian Method*, Ph.D. Thesis U.C. Davis, UCRL-LR-136160