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Wetted Foam Liquid Fuel ICF Target Experiments R. OLSON, R. LEEPER, A. YI, A. ZYLSTRA, J. KLINE, R. PETERSON, LANL, T. BRAUN, J. BIENER, M. BIENER, B. KOZIOZIEMSKI, J. SATER, A. HAMZA, A. NIKROO, L. BERZAK HOPKINS, S. LEPAPE, A. MACKINNON, N. MEEZAN, LLNL —
We are developing a new NIF experimental platform that employs wetted foam liquid fuel layer ICF capsules. We plan to use the liquid fuel layer capsules in a NIF experimental campaign to explore the relationship between hot spot convergence ratio (CR) and the robustness of hot spot formation. DT or D2 Liquid Layer ICF capsules allow for flexibility in hot spot convergence ratio via the adjustment of the initial cryogenic capsule temperature and, hence, DT vapor density.[1] Our hypothesis is that the predictive capability of hot spot formation is robust and 1D-like for a relatively low CR hot spot (CR=15), but will become less reliable as hot spot CR is increased to CR>20. Simulations indicate that backing off on hot spot CR is an excellent way to reduce capsule instability growth and to improve robustness to low-mode x-ray flux asymmetries. In these initial experiments, we are testing our hypothesis by measuring hot spot size, neutron yield, ion temperature, and burn width to infer hot spot pressure and compare to predictions for implosions with hot spot CR's in the range of 12 to 25. Larger scale experiments are also being designed, with the longer-term objective of developing a liquid fuel layer ICF capsule platform with robust thermonuclear burn, modest CR, and significant α-heating with burn propagation.

[1]R.E. Olson and R.J. Leeper, Phys. Plasmas 20, 092705 (2013).

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