PROGRESS IN DETAILED MODELING OF LOW FOOT AND HIGH FOOT DT IMPLOSION EXPERIMENTS ON THE NATIONAL IGNITION FACILITY

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Several dozen high convergence inertial confinement fusion ignition experiments have now been completed on the National Ignition Facility (NIF). These include both "low foot" experiments from the National Ignition Campaign (NIC) [1] and more recent "high foot" experiments [2]. At the time of the NIC, there were large discrepancies between simulated implosion performance and experimental data [3,4]. In particular, simulations over predicted neutron yields by up to an order of magnitude, and some experiments showed clear evidence of mixing of ablator material deep into the hot spot that could not be explained at the time [5,6]. While the agreement between data and simulation improved for high foot implosion experiments, discrepancies nevertheless remain. This talk describes the state of detailed modeling of both low foot and high foot implosions using 1-D, 2-D, and 3-D radiation hydrodynamics simulations with HYDRA [7]. The simulations include a range of effects, in particular, the impact of the plastic membrane used to support the capsule in the hohlraum, as well as low-mode radiation asymmetries tuned to match radiography measurements. The same simulation methodology is applied to low foot NIC implosion experiments and high foot implosions, and shows a qualitatively similar level of agreement for both types of implosions. While comparison with the experimental data remains imperfect, a reasonable level of agreement is emerging and shows a growing understanding of the high-convergence implosions being performed on NIF.

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