DETAILED 3D SIMULATIONS OF OMEGA ICF EXPERIMENTS WITH SEPARATED REACTANTS

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We present detailed 3D simulations of two sets of OMEGA direct drive ICF experiments with separated reactants. The simulations model all known experimental asymmetries, including the target mount, laser speckle, beam imbalances, and surface defects, using the most accurate available data. Simulations are performed with LANL's RAGE radiation-hydrodynamics code and employ the highest fidelity physics models currently available. Simulations show good agreement with existing experimental data.

We consider two types of capsules. First, we present results for a set of capsules with 1 micron deuterated shell layers filled with tritium gas. Levels of mixing are varied in experiment by changing the burial depth of the deuterated shell layer. In the simulations, mix is generated near the fuel/shell interface through instabilities seeded by surface defects and laser speckle. The mixed material is transported into the center of the hot spot through jetting from the target mount and other large-scale flows generated by beam imbalances. Favorable comparisons with experimental results give us confidence in our ability to model Marble ICF capsules, presented next. These capsules contain deuterated foam with tritium gas in the pores. These capsules are designed to show sensitivity to mix morphology (distribution of mix) rather than just the total amount of mix. Simulations suggest that as pore sizes are decreased, mix becomes more atomic, as quantified by material concentration distributions. Preliminary experimental results are consistent with trends observed in simulation, including a sharp decrease in capsule yield at higher foam densities.