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Hydrodynamic instability and mix experiments at National Ignition Facility

VLADIMIR SMALYUK, Lawrence Livermore National Laboratory

Hydrodynamic growth and its effects on implosion performance and mix are being studied in hohlraum-driven implosions using gas-filled plastic shells at the National Ignition Facility (NIF). These experiments are motivated by observed elevated amounts of plastic mixed into the hot spot, degrading the performance of high-compression cryogenic DT layered implosions on NIF. Spherical shells with pre-imposed 2D modulations are being developed to measure Rayleigh-Taylor (RT) instability growth in the acceleration phase of implosions using in-flight x-ray radiography. Ablation-front RT growth measurements will be carried out for mode numbers ranging from 30 to 80 at drive conditions relevant to high-compression cryogenic implosions. In addition, implosion performance and mix are being studied at peak compression using plastic "Symcap" shells filled with tritium gas and imbedding localized CD diagnostic layer in various locations in the ablator. Neutron yield and ion temperature of the DT fusion reactions are used as a measure of shell-gas mix, while neutron yield of the TT fusion reaction is used as a measure of implosion performance. Experimental results and comparisons with 1D and 2D simulations, including mix models, will be presented.

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