FY19 Naval Research Laboratory Report on Omega Laser Facility Experiments

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Naval Research Laboratory (NRL) researchers in collaboration with LLE conducted tests of the high-*Z* coating hybrid drive with spherical shells on OMEGA. Building on data and insight from NIKE and OMEGA EP experiments, the shot day experiments (see Fig. 1) focused on coating pre-expansion needed for effective imprint suppression with the coating and on shell radiography for measuring the areal mass perturbations at the early stages of implosions. Two methods of coating pre-expansion were tested: direct low-power laser beam prepulse and indirect soft x-ray–driven pre-expansion. The low-power laser prepulse required a nonstandard beamline operation with amplification stages turned off (developed by the LLE laser operators for these shots).

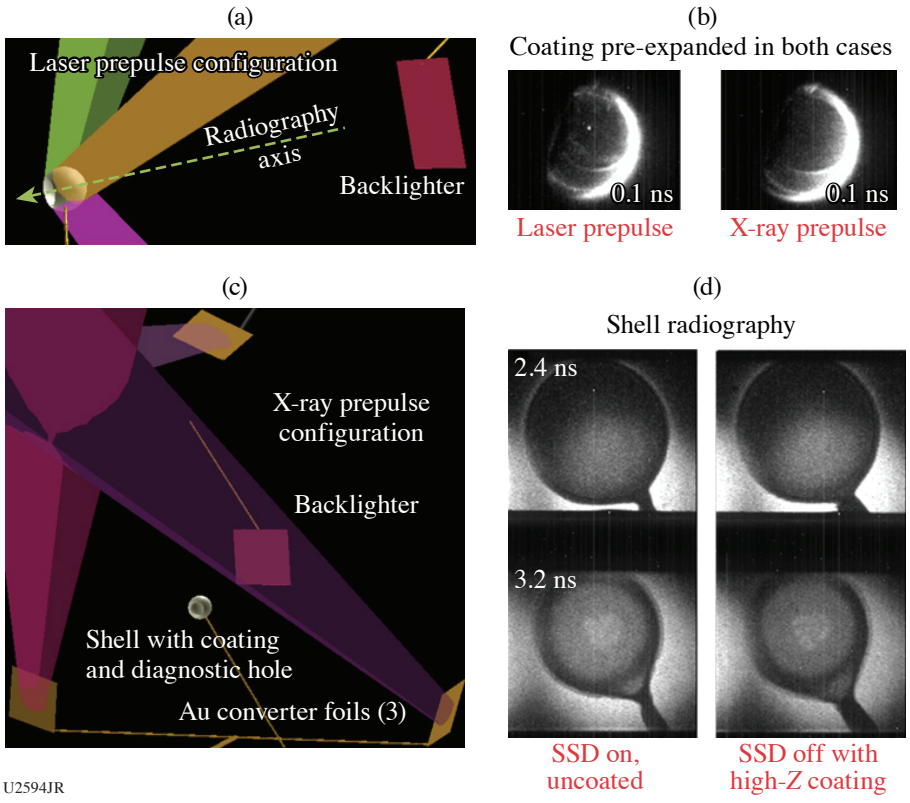

Figure 1

[(a),(b)] Two experimental configurations for high-*Z* coating pre-expansion: (a) direct laser prepulse and (b) x-ray prepulse (bottom left). (c) Self-emission shows coating was expanded in both laser prepulse and x-ray prepulse configurations. (d) Example shell radiography for two shots: an uncoated shell with maximally smoothed SSD drive and a shell with high-*Z* coating pre-expanded by the x-ray prepulse with no SSD smoothing.

The x-ray prepulse utilized a converter foil design developed on our OMEGA EP experiments. Self-emission images of coating dynamics show that successful coating pre-expansion was achieved with both methods. Data were obtained on hydrodynamic growth of pre-imposed target perturbations. Radiography images show similar results for the case of maximum smoothing using the smoothing by spectral dispersion (SSD) drive on an uncoated shell and for the case of no SSD on a high-*Z*–coated shell. Detailed analysis is underway.