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**Measurements of the Effects of Isolated Surface Defects on Laser Accelerated Targets**[1]

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Initial imperfections in ICF targets, amplified by hydrodynamic instabilities can lead to asymmetric target compression and mixing of the ablator material into the fuel. Previous efforts to understand perturbation growth have largely focused on studies of uniformly imposed patterns such as sinusoidal modulations or surface roughness of targets. However, implosions on the NIF and OMEGA have raised questions about the effect on target performance of localized large amplitude, or isolated, perturbations such as fill tubes, target mount structures, pits, and other localized target defects. A better understanding of the evolution of such non-linear seeds is necessary to mitigate their effects. To this end, hydrodynamic growth of isolated defects, with characteristic widths of 1 to 30$\mu$m and depths of 100 nm to 25 $\mu$m, was studied using planar plastic targets ablatively accelerated by the Nike KrF laser. The target defects were machined in CH foils using femtosecond laser ablation. The high drive uniformity of ISI-smoothed Nike beams allows hydrodynamics to be dominated by the imposed target features with negligible laser imprint. X-ray backlighting using monochromatic curved crystal imaging was used to obtain high resolution, large-field-of-view measurements of areal mass evolution while x-ray sidelighting provided images of axial structures such as jets. The growth rate of the perturbations, which can be followed by late time hole closure of the areal density perturbation, was observed to vary with the shock strength and initial feature sizes. Side-on images showed rear-surface jet formation and enhanced self-emission on the front surface, originating at the isolated defects and propagating back toward the laser, indicating that the coronal plasma was being perturbed. The experimental results are compared to simulations using the FASTRAD3D rad-hydro code.

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