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13.1 Using 2D velocimetry to probe the hydrodynamic instabilities from nonuniformities in ablator materials

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Extensive work has been done to characterize and improve the smoothness of ablator materials used in inertial confinement fusion, however, features indicative of instabilities seeded from heterogeneity in these materials are still observed. A two-dimensional imaging velocimetry technique has been used on Omega (OHRV 2D-VISAR system) to measure the nonuniformity in the velocity of shock fronts launched by indirect drive in the three ablator materials of current interest, glow-discharge polymer (GDP), beryllium, and high-density carbon (HDC). We have used this experimental platform, combined with extensive pre-shot target metrology, to study the presence of shock-front perturbations. Observed features are small variations from one-dimensional evolution, but are important for fully understanding the effects of surface topography, dynamic material response, and internal heterogeneities on the stability of ICF capsules. For all three ablators we have quantified perturbations that can dominate conventional surface roughness seeds to hydrodynamic instability. This work performed was under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344 and by General Atomics under Contract DE-NA0001808.

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