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Predictive modeling of Omega Laser Plasma Interaction Experiment[1]

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We have developed a new target platform to study Laser Plasma Interaction in ignition-relevant condition at the Omega laser facility (LLE/Rochester)[1]. By shooting an interaction beam along the axis of a gas-filled hohlraum heated by 15 kJ of heater beam energy, we were able to create a millimeter-scale underdense uniform plasma at electron temperatures above 3 keV. Extensive Thomson scattering measurements allowed to benchmark our hydrodynamic simulations performed with HYDRA [1]. As a result of this effort, we can use with much confidence these simulations as input parameters for our LPI simulation code pF3d [2]. The variety of LPI measurements performed (Stimulated Brillouin and Raman backscattering both in the lens (FABS) and outside (NBI), transmitted light image and energy) allows for a constraining test of our LPI predictive capabilities. We will show that by using accurate hydrodynamic profiles and full three dimensional simulations (see Fig. 1) including a realistic modeling of the laser intensity pattern generated by various smoothing options, linear LPI theory reproduces a variety of measured quantities, including SBS thresholds and absolute reflectivity values, beam spray and the absence of measurable SRS. We will also discuss the effect of beam smoothing techniques (Polarization smoothing, spectral dispersion) on SBS in these targets and compare to experimental data. This good agreement was made possible by the recent increase in computing power routinely available for such simulations, coupled to a detailed description of both plasma and laser parameters.

[1] Phys. Plasmas **14**, 056304 (2007); Phys. Plasmas **14**, 055705 (2007)
[2] Phys. Plasmas 5, 4337 (1998)

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