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Exploring Pathways to Hydro-Equivalent Ignition on the OMEGA Laser RICCARDO BETTI, VARCHAS GOPALASWAMY, AARNE LEES, DHRUMIR PATEL, JAMES KNAUER, University of Rochester — Recent progress in direct-drive inertial confinement fusion has considerably improved the prospects for achieving thermonuclear ignition with megajoule-class lasers. When hydrodynamically scaled to laser energies on the National Ignition Facility (NIF) and symmetric illumination, recent implosions on OMEGA are expected to produce about 500 kJ of fusion yield and 75% of the Lawson triple product required for ignition. Those implosions have benefited from an increase in implosion velocity obtained through larger-diameter targets and thinner ice layers. A statistical approach [V. Gopalaswamy *et al.*, Nature **565**, 581 (2019)] used in designing OMEGA targets has demonstrated a considerable predictive capability, thereby enabling the design of targets with improved performance, leading to tripling the fusion yield and increasing the areal density by over 60%. Systematic experiments such as scans of laser smoothing, laser beam radii, and DT fill age are used to identify the mechanisms of performance degradation and implosion optimization. Ongoing improvements in laser performance and target quality are expected to further augment implosion performance toward the goal of demonstrating core conditions that scale to ignition at NIF energies. Based on these results, a path to demonstrating hydro-equivalent ignition on OMEGA is presented This work was supported by the DOE-NNSA under Award Number DE-NA0003856

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