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Progress in Polar-Direct-Drive Simulations and Experiments

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Polar direct drive (PDD)[1] will allow ignition experiments on the National Ignition Facility (NIF) while it is configured for x-ray drive. Optimal drive uniformity is obtained via a combination of beam repointing, pulse shapes, spot shapes, and/or target design. This talk describes progress in developing PDD designs including the "Saturn" target[2] concept that improves drive uniformity by adding a low-Z ring around the target to refract light toward the target equator. These concepts are being evaluated on the OMEGA Laser System and with two-dimensional hydrodynamic simulations.[3] Forty OMEGA beams, arranged in six rings to emulate the NIF x-ray drive configuration, implode 20-μm-thick, 865-μm-diam CH shells, filled with 15 atm of D_2. Diagnostics include framed x-ray backlighting and time-integrated x-ray imaging. Saturn target experiments have resulted in ~75% of the yield from energy-equivalent symmetrically irradiated implosions. Two-dimensional PDD simulations are performed using both the *SAGE* (Eulerian) and *DRACO* (ALE) codes. The simulations are in good agreement with the experiments. PDD simulations for the NIF show modest gains and high areal densities. This work was supported by the U.S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreement No. DE-FC52-92SF19460. Contributors: F. J. Marshall, R. S. Craxton, I. V. Igumenshchev, P. B. Radha, S. Skupsky, P. W. McKenty, T. J. B. Collins, R. Epstein, M. J. Bonino, D. Jacobs-Perkins, D. D. Meyerhofer, T. C. Sangster, J. P. Knauer, V. A. Smalyuk, V. Yu. Glebov, S. G. Noyes, W. Seka, and R. L. McCrory.

[1]S. Skupsky *et al.*, Phys. Plasmas **11**, 2763 (2004).
[2]R. S. Craxton and D. W. Jacobs-Perkins, Phys. Rev. Lett. **94**, 095002 (2005).
[3]R. S. Craxton *et al.*, Phys. Plasmas **12**, 056304 (2005).