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Cryogenic Target Performance on OMEGA

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Ignition-relevant target physics is studied using direct-drive cryogenic D_2 and DT implosions on the OMEGA Laser System. These experiments are designed to validate the performance of polar-drive ignition designs for the NIF using energy-scaled symmetric-drive designs on OMEGA. The focus of current experiments is on shell stability and preheat at ignition adiabats. Recent work with cryogenic cone-in-shell targets demonstrated the sensitivity of the baseline design to shock (mis)-timing and subsequent shock-induced preheating. Hot-electron preheat was shown to be mitigated by including high-Z dopants in the ablator that raise the temperature of the corona and increase the threshold for the two-plasmon decay. Nonlocal heat transport was found to be important in modeling laser absorption during the leading picket, and hydrodynamic growth of target modulations was experimentally shown to be stabilized at peak drive intensities by these nonlocal effects. Finally, much work has been done to prepare the cryogenic target systems for backlighting using the new high-energy, short-pulse beams provided by the recently completed OMEGA EP Facility. This work includes proof-of-principle demonstrations using OMEGA beams to backlight a cryogenic core. The status of short-pulse backlighting will be presented along with the latest fuel compression and target-performance results. This work was supported by the U.S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreement No. DE-FC52-08NA28302. Contributors: R. Betti, R.S. Craxton, J.A. Delettrez, D.H. Edgell, V.Yu. Glebov, V.N. Goncharov, D.R. Harding, S.X. Hu, J.P. Knauer, F.J. Marshall, R.L. McCrory, P.W. McKenty, D.D. Meyerhofer, P.B. Radha, S.P. Regan, T.C. Sangster, W. Seka, R.W. Short, S. Skupsky, J.M. Soures, C. Stoeckl, B. Yaakobi, UR/LLE; J.A. Frenje, C.K. Li, R.D. Petrasso, F.H. Séguin, PSFC MIT.