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**Performance of Direct-Drive Cryogenic Targets on OMEGA**

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Cryogenic $D_2$ and DT targets are routinely imploded on the OMEGA Laser System to study ignition-relevant, high-convergence-ratio, direct-drive physics. High-performance target designs depend crucially on the accuracy of the physics models used to simulate the implosions. To validate the predictive capabilities of the physics models, computer simulations have been benchmarked against a variety of precision measurements, including laser-energy absorption, x-ray emission spectra, neutron and charged-particle yields and spectra, core emission spectra, and time-resolved hard-x-ray spectra (>20 keV). The target designs are characterized by the shell adiabat $\alpha$ (ratio of the fuel pressure to the Fermi-degenerate pressure) and the peak drive intensity. Targets for the OMEGA experiments included both "ice–CD" designs, consisting of a 65- to 100-$\mu$m ice layer with a 3- to 13-$\mu$m CD overcoat, and 40- to 70-$\mu$m wetted-foam designs with a 2- to 5-$\mu$m CH overcoat. The cryogenic shells were driven using high-contrast-ratio (up to 100) pulse shapes, including picket pulses to shape the adiabat inside the shell to improve stability. This talk will review the results of OMEGA cryogenic implosions with shell adiabats in the range $1 < \alpha < 10$ and peak intensities varying from $2 \times 10^{14}$ to $1.5 \times 10^{15}$ W/cm$^2$. High-areal-density, cryogenic fuel assembly ($\rho R > 0.2$ g/cm$^2$,$\rho_{D2} \sim 100$ g/cm$^3$, 500 $\times$ LD) is achieved when the excessive hot-electron and radiation preheat is mitigated. The experimental database of cryogenic targets imploded on the OMEGA laser will be used to design direct-drive-ignition targets for the National Ignition Facility. This work was supported by the U.S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreement DE-FC52-92SF19460.

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