Effects of Preheating on Compression and Rayleigh–Taylor Growth in Planar Plastic Targets on OMEGA


— Direct-drive inertial confinement fusion ignition target performance is sensitive to the details of thermal coupling, transport, and preheat that directly affect the fuel adiabat. The results of plastic, planar thin-foil acceleration and thick-foil compression experiments on OMEGA at laser intensities from $\sim 2 \times 10^{14}$ W/cm$^2$ agree well with 2-D simulations using a constant flux limiter (0.06). However, at intensities of $\sim 1 \times 10^{15}$ W/cm$^2$, a nonlocal thermal-transport model or time-dependent flux limiter is necessary to explain the experimental results. In addition, a deposited preheating of $\sim 30$ J must be included into simulations at high drive intensities to match the experimental results. The reduction of the Rayleigh–Taylor growth of preimposed modulations at higher intensities correlates with measured hot-electron preheat. This work was supported by the U.S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreement DE-FC52-92SF19460.