DPP07-2007-000654

Abstract for an Invited Paper
for the DPP07 Meeting of
the American Physical Society

Time-Resolved Absorption in Cryogenic and Room-Temperature, Direct-Drive Imploding Targets

W. SEKA, Laboratory for Laser Energetics, U. of Rochester

Time-resolved absorption has been measured in direct-drive-implosion experiments for various targets and pulse shapes using OMEGA's UV Laser System. These experiments reveal a number of interaction processes beyond inverse bremsstrahlung absorption. During the first 100 to 200 ps, evidence of enhanced absorption points toward resonance absorption. Depending on target material and pulse shapes, the absorption at times $t > 0.7$ ns is reduced compared to predictions by hydrodynamic simulations with flux-limited electron heat transport. This discrepancy may be partly due to uncertainties in the heat transport model. Scattered light spectra further indicate that beam-to-beam energy transfer with gain provided by stimulated Brillouin scattering (SBS) may also contribute. Evidence for two-plasmon-decay (TPD) instability is seen in almost all direct-drive-implosion experiments as evidenced by hard-x-ray and $3\omega/2$ emission. The TPD instability is driven particularly hard when the laser burns through the CD shell during the laser pulse in a cryogenic target implosion with the concomitant possibility of fast-electron preheat. This wealth of interaction processes will be discussed along with implications for future larger-scale experiments. This work was supported by the U.S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreement DE-FC52-92SF19460. Contributors: D.H. Edgell, V.N. Goncharov, I.V. Igumenshchev, J.A. Delettrez, J. Myatt, A.V. Maximov, R.W. Short, C. Stoeckl, and T.C. Sangster.