DPP17-2017-000558

Abstract for an Invited Paper
for the DPP17 Meeting of
the American Physical Society

Wavelength Detuning Cross-Beam Energy Transfer Mitigation Scheme for Direct-Drive: Modeling and Evidence from National Ignition Facility Implosions

J.A. MAROZAS, Laboratory for Laser Energetics, U. of Rochester

Cross-beam energy transfer (CBET) has been shown to significantly reduce the laser absorption and implosion speed in direct-drive implosion experiments on OMEGA and the National Ignition Facility (NIF). Mitigating CBET assists in achieving ignition-relevant hot-spot pressures in deuterium–tritium cryogenic OMEGA implosions. In addition, reducing CBET permits lower, more hydrodynamically stable, in-flight aspect ratio ignition designs with smaller nonuniformity growth during the acceleration phase. Detuning the wavelengths of the crossing beams is one of several techniques under investigation at the University of Rochester to mitigate CBET. This talk will describe these techniques with an emphasis on wavelength detuning. Recent experiments designed and predicted using multidimensional hydrodynamic simulations including CBET on the NIF have exploited the wavelength arrangement of the NIF beam geometry to demonstrate CBET mitigation through wavelength detuning in polar-direct-drive (PDD) implosions.[1] Shapes and trajectories inferred from time-resolved x-ray radiography of the imploding shell, scattered-light spectra, and hard x-ray spectra generated by suprathermal electrons all indicate a reduction in CBET. These results and their implications for direct-drive ignition will be presented and discussed. In addition, hydrodynamically scaled ignition-relevant designs for OMEGA implosions exploiting wavelength detuning will be presented. Changes required to the OMEGA laser to permit wavelength detuning will be discussed. Future plans for PDD on the NIF including more-uniform implosions with CBET mitigation will be explored. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0001944.

[1]J. A. Marozas *et al.*, "First Observation of Cross-Beam Energy Transfer Mitigation for Direct-Drive Inertial Confinement Fusion Implosions Using Wavelength Detuning at the National Ignition Facility," submitted to Physical Review Letters.