

Contribution ID: 691

Type: Poster

IFE/1-2: Progress toward Polar-Drive Ignition for the NIF

Thursday, 11 October 2012 14:00 (4h 45m)

The Omega Laser Facility at the Laboratory for Laser Energetics (LLE) is used to study direct-drive inertial confinement fusion (ICF) ignition concepts. The baseline ignition target design for this research, using symmetric irradiation, consists of a 1.5-MJ multiple-picket laser pulse that generates four shock waves [similar to the National Ignition Facility (NIF) baseline indirect-drive design] and produces a 1-D gain of 48. Re optimized for polar-drive (PD) illumination (with beams in the x-ray drive configuration), the predicted 2-D gain for this design is $^{3}2$, including all known sources of nonuniformities. Verification of the physics base of these simulations is a major thrust of implosion experiments on both OMEGA and the NIF. Many physics issues can be examined with symmetric beam irradiation. OMEGA cryogenic-DT target experiments with symmetric irradiation have produced areal densities of $^{0.3}$ g/cm 2 . Physics issues unique to PD are being examined on OMEGA by turning off the equatorial beams and closely approximating the polar-illumination geometry on the NIF. Initial PD "exploding-pusher" experiments on the NIF, designed and tested on OMEGA, have produced neutron yields up to 6 x 10¹4 and are a critical facet in the testing of diagnostics required for the ignition campaign on the NIF.

This talk describes progress in direct-drive central hot-spot ICF in both symmetric and PD configurations. The current research program is comprised of three segments: (1) validation of direct-drive, symmetric, cryogenic target performance on the OMEGA Laser System; (2) demonstration of a viable polar-drive–ignition platform using experiments on the OMEGA Laser System; and (3) definition and execution of a polar-drive–ignition campaign on the NIF. Each of these segments has seen significant progress since the 2010 IAEA FEC, enhancing our confidence in achieving polar-drive ignition on the NIF.

This work was supported by the U.S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreement No DE-FC52-08NA28302, the University of Rochester, and the New York State Energy Research and Development Authority. The support of DOE does not constitute an endorsement by DOE of the views expressed in this article.

Country or International Organization of Primary Author

USA

Primary author: Mr MCCRORY, Robert L. (USA)Presenter: Mr MCCRORY, Robert L. (USA)Session Classification: Poster: P6