DPP12-2012-001827

Abstract for an Invited Paper
for the DPP12 Meeting of
the American Physical Society

Progress Towards Ignition on the National Ignition Facility

JOHN EDWARDS, Lawrence Livermore National Laboratory

Since completion of the National Ignition Facility (NIF) construction project in March 2009, a wide variety of diagnostics, facility infrastructure, and experimental platforms have been commissioned in pursuit of generating the conditions necessary to reach thermonuclear ignition in the laboratory via the inertial confinement approach. NIF's capabilities and infrastructure include over 50 X-ray, optical, and nuclear diagnostics systems and the ability to shoot cryogenic DT layered capsules. There are two main approaches to ICF: direct drive in which laser light impinges directly on a capsule containing a solid layer of DT fuel, and indirect drive in which the laser light is first converted to thermal X-rays. To date NIF has been conducting experiments using the indirect drive approach, injecting up to 1.8MJ of ultraviolet light (0.35 micron) into 1 cm scale cylindrical gold or gold-coated uranium, gas-filled hohlraums, to implode 1mm radius plastic capsules containing solid DT fuel layers. In order to achieve ignition conditions the implosion must be precisely controlled. The National Ignition Campaign (NIC), an international effort with the goal of demonstrating thermonuclear burn in the laboratory, is making steady progress toward this. Utilizing precision pulse-shaping experiments in early 2012 the NIC achieve fuel rhoR of approximately 1.2 gm/cm^2 with densities of around 600-800 g/cm^3 along with neutron yields within about a factor of 5 necessary to enter a regime in which alpha particle heating will become important. To achieve these results, experimental platforms were developed to carefully control key attributes of the implosion. This talk will review NIF's capabilities and the progress toward ignition, as well as the physics of ignition targets on NIF and on other facilities. Acknowledgement: this work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.