DPP05-2005-020028

Abstract for an Invited Paper
for the DPP05 Meeting of
the American Physical Society

The Path to Ignition on NIF

JOHN LINDL, Lawrence Livermore National Laboratory

Advances in ignition target designs, including both indirect and direct drive schemes, have opened up a significantly larger and more robust operating space for ignition on NIF. The point design for our 2010 ignition experiments relies on indirect drive, and uses beryllium capsules with copper doped in a radially varying concentration. In simulations, these targets tolerate surface roughness several times the best previous target designs. The target will utilize a small fill-tube to introduce DT into the Be capsule. Be capsules absorb about 30% more energy in a given hohlraum than a CH capsule. The hohlraums for the 2010 experiments include several design modifications to increase efficiency. Mixtures of high-z materials (cocktails) can "fill holes" in the x-ray opacity and result in reduced losses into the hohlraum wall. Laser entrance hole (LEH)shields, which block the view of the LEH as seen by the capsule, increase the energy absorbed by the capsule. These advances increase the ignition margin on NIF by almost a factor of two. With significant advances in target fabrication technology, most requirements for the ignition targets have now been demonstrated. When all 192 beams of NIF are available for precision experiments in 2010, we will conduct an ignition campaign to obtain the required hohlraum drive, to tune symmetry, to optimize ablator performance for ablation depth and stability, and to adjust shock timing prior to the first ignition attempts. Polar Direct Drive is also being developed for ignition on NIF. In this scheme, the arrangement of the NIF beams developed for Indirect Drive is utilized for Direct Drive by employing a combination of re-pointing, phase-plate design, and target geometry. Recent experiments on the Omega laser at LLE have demonstrated an ability to control symmetry using these techniques. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract No. W-7405-Eng-48, and by Los Alamos National Laboratory under Contract No. W-7405-Eng-36.