THE STRUCTURE OF THE LASER ENTRANCE HOLE IN NIF GAS-FILLED IGNITION HOHLRAUMS

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At the National Ignition Facility (NIF), laser beams enter an axi-symmetric hohlraum via laser entrance holes (LEHs) at each end. The x-ray drive on the capsule is deduced by measuring the time evolution and spectra of the x-radiation coming out the LEH and correcting for geometry and for the radius of the LEH[1]. The LEH radius decreases as heated plasma from the LEH material blows radially inward but this is largely balanced by hot plasma from the high-intensity region in the center of the LEH pushing radially outward. The ViewFactor platform[2], which uses a truncated hohlraum, allows time-resolved measurements of the LEH radius at thermal x-ray energies from two views, from outside the hohlraum and from inside the hohlraum. These measurements show that the LEH radius at peak power is larger than models predict by about 15-20% and the radius does not change very much with time. In addition, time-resolved images in a > 4 keV (non-thermal) x-ray band show a ring of optically thin gold plasma just inside the optically thick LEH plasma. The structure of this plasma varies with time and with Cross Beam Energy Transfer (CBET). The standard models do not predict the same LEH structure as measured, perhaps because the standard models underestimate the laser power at the LEH. These models remove the backscatter and redistribute the laser power according to the CBET scrip and then use this modified laser power in the simulation. Data on the LEH radius and structure as a function of laser pulse shape, gas fill, and energy transfer will be presented.

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[1] N. B. Meezan, A. J. MacKinnon, D. G. Hicks et al., *Phys. Plasmas* **20**, 056311 (2013).
[2] S. A. Maclaren, M. B. Schneider, K. Widmann et al., *Phys. Rev Lett.,* **112**, 105003 (2014).