# MEASUREMENTS OF LASER-DRIVEN MAGNETIC FIELDS IN QUASI-HOHLRAUM GEOMETRIES

B.B. Pollock[1], D.Turnbull[1], C. Goyon[1], J.S. Ross[1], W.A. Farmer[1], A. Hazi[1], E.R. Tubman[2], J.D. Moody[1]
[1]Lawrence Livermore National Laboratory, Livermore, CA, USA
[2]University of York, York, North Yorkshire, UK
pollock6@llnl.gov

The inclusion of background axial magnetic fields in indirect drive inertial confinement fusion hohlraums has been previously calculated to increase ion temperature and fusion yield under certain conditions[1,2]. This yield increase is most pronounced for initial field strengths of 20-40 T. The implosion compresses the B-field with the capsule and amplifies it to several hundred times its initial value. This amplified field acts to confine alpha particles and increase alpha heating of the fuel. This effect has been experimentally demonstrated in direct drive fusion experiments using a pulsed-power-driven solenoid to supply an initial 8 T solenoidal field around a capsule[3].

Alternatively, magnetic fields of 10-100 T have been produced using a laser-driven scheme[4] which eliminates the need for pulsed-power systems. Using a parallel-plate target geometry, a laser is directed through a hole in the front plate and irradiates the rear plate behind it. Hot electrons are generated from the rear plate and collect on the front plate, creating a voltage difference (~10-100 keV) between them. When the plates are connected via a conductor, this voltage sources current in the range of ~0.1-1 MA. A quasi-loop conductor can be used to produce a magnetic field along the axis of the loop. The field is generated on fast (~ns) timescales, and can be scaled by changing the drive laser parameters.

All previous work has reported measurements of the fringing magnetic fields outside of the loop region[5-7]. However, recent experiments using the Omega EP laser system have allowed direct Faraday rotation (in fused $SiO_2$) measurements of the field strength inside the current loop producing the field by employing the 4w polarimetry capability of EP. The maximum field recorded along the axis of the quasi-loop is ~5 T at moderate (100 J) laser drive, and measurements of fringing fields outside the loop at 1 kJ indicate that the field increases to ~40 T.

In addition to the Faraday rotation, which provides a line-integrated field measurement, we have also measured the extent and structure of the field with proton deflectometry. Using both short pulse beams as proton backlighters, two orthogonal views of the field are recorded on radio-chromic film packs. These results are compared with modeling to determine the current driven in the target, and infer information about the plasma conditions which sourced the current.

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