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Characterizing the Degree of Fuel Magnetization for MagLIF Using Neutron Diagnostics

K.D. Hahn, G.A. Chandler, P.F. Schmit, P.F. Knapp, S.B. Hansen, E. Harding, C.L. Ruiz, B. Jones, M.R. Gomez, D.J. Ampleford, J.A. Torres, and P.J. Alberto, Sandia National Laboratories

G.W. Cooper and J.D. Styron, Univ. New Mexico

We are studying Magnetized Liner Inertial Fusion (MagLIF) sources which utilize deuterium fuel and produce up to 4e12 primary DD and 5e10 secondary DT neutrons. For this concept, magnetizing the fuel can relax the stagnation pressures and densities required for ignition by insulating the hot fuel and confining the charged fusion products. The degree of magnetization of the fuel at stagnation is quantified using secondary DT neutron spectral measurements in the axial and radial directions and is also related to the ratio of the secondary DT yield to the primary DD yield. Measurements have confirmed that charged fusion products are strongly magnetized, as indicated by the product of the magnetic field and the fuel radius, up to 0.4 MG-cm. For DT fuel experiments, this suggests that alpha particles will be confined and lead to significant fuel self-heating. We present new results that compare the degree of fuel magnetization inferred from spectral and yield measurements.

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