Design of MagLIF experiments using the Z facility\textsuperscript{1}

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The MagLIF (Magnetized Liner Inertial Fusion) concept has been presented as a path toward obtaining substantial fusion yields using the Z facility [S.A. Slutz, et. al., Phys. Plasmas 17, 056303 (2010)], and related experiments have begun in earnest at Sandia National Laboratories. We present fully integrated numerical magnetohydrodynamic simulations of the MagLIF concept, which include laser preheating of the fuel, the presence of electrodes, and end loss effects. These simulations have been used to design neutron-producing integrated MagLIF experiments on the Z facility for the capabilities that presently exist, namely, D\textsubscript{2} fuel, peak currents of I\textsubscript{max} =15-18 MA, pre-seeded axial magnetic fields of B\textsubscript{z0} =7-10 T, and laser preheat energies of E\textsubscript{laser} =2-3 kJ delivered in 2 ns. The first fully integrated experiments, based on these simulations, are planned to occur in 2013. Neutron yields in excess of 10\textsuperscript{11} are predicted with the available laser preheat energy and accelerator drive energy. In several years, we plan to upgrade the laser to increase E\textsubscript{laser} by several more kJ, provide B\textsubscript{z0} up to 30 T, deliver I\textsubscript{max} =22 MA or more to the load, and develop the capability to use DT fuel.

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