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Laser-driven preheat simulations of magnetized fusion fuel for magnetically-driven liner implosions on pulsed power accelerators A.B. SEFKOW, M.C. HERRMANN, S.A. SLUTZ, R.A. VESEY, Sandia National Laboratories — Magnetically-driven implosions of cylindrical metal liners containing magnetized and preheated fuel are being studied to determine whether significant inertial confinement fusion yields can be economically obtained on pulsed power accelerators. Preliminary radiation-MHD simulations of dense (1-5 mg/cc), axially-magnetized (3-30 T), and preheated (200-500 eV) deuterium-tritium (DT) fuel driven by a pulsed power accelerator similar to Z (25-60 MA) indicate fast implosions (100-300 ns) and high yields (100s kJ - 10s MJ) may be feasible. Efficient alpha particle trapping for self-heating and reduced heat conduction losses in the radial direction can be provided by compression of the axial magnetic field (to $\sim$ 10 kT), which substantially reduces the traditional threshold value of the fuel ρR at ignition. Preheating the fuel before compressing it is advantageous because ignition temperatures can thereby be accessed without requiring extraordinarily large convergence ratios or implosion velocities. A few kJ of 2ω laser light delivered over a few ns by Z Beamlet (ZBL) may sufficiently preheat the fuel, and Z and ZBL experiments are planned to test the various components of this concept.

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