Abstract Submitted
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Experimental Study of Magnetic Field Production and Dielectric Breakdown of Auto-Magnetizing Liners[1] GABRIEL SHIPLEY, THOMAS AWE, Sandia National Laboratories, TREVOR HUTCHINSON, University of Nevada, Reno, BRIAN HUTSEL, STEPHEN SLUTZ, DEREK LAMPPA, Sandia National Laboratories — AutoMag liners premagnetize the fuel in MagLIF targets and provide enhanced x-ray diagnostic access and increased current delivery without requiring external field coils [Slutz et al., Phys. Plasmas 24, 012704 (2017)]. AutoMag liners are composite liners made with discrete metallic helical conduction paths separated by insulating material. First, a low dI/dt foot current pulse (1 MA in 100 ns) premagnetizes the fuel. Next, a higher dI/dt pulse with larger induced electric field initiates breakdown on the composite liners surface, switching the current from helical to axial to implode the liner. Experiments on MYKONOS have tested the premagnetization and breakdown phases of AutoMag and demonstrate axial magnetic fields above 90 Tesla for a 550 kA peak current pulse. Electric fields of 17 MV/m have been generated before breakdown. AutoMag may enhance MagLIF performance by increasing the premagnetization strength significantly above 30 T, thus reducing thermal-conduction losses and mitigating anomalous diffusion of magnetic field out of hotter fuel regions, by, for example, the Nernst thermoelectric effect.

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