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Stabilizing Liner Implosions with a Dynamic Screw Pinch[1]
PAUL C. CAMPBELL, T.M. JONES, J.M. WOOLSTRUM, N.M. JORDAN, R.D. MCBRIDE, University of Michigan, J.B. GREENLY, W.M. POTTER, E.S. LAVINE, B.R. KUSSE, D.A. HAMMER, Cornell University — Pulsed power driven liner implosions are susceptible to instabilities like the magneto Rayleigh-Taylor (MRT) instability. One proposed method for mitigating MRT uses the rotating magnetic field of a dynamic screw pinch, which can be generated using a twisted return current structure. This method has been examined in computer simulations [1] and now in experiments as well. Using the COBRA pulsed power driver, both straight and twisted return current paths were tested on imploding thin-foil liners, made from 650 nm thick aluminum foil. Each implosion was driven by a current pulse that rose from 0 to 1 MA in 100 ns. Three different twisted return current structures were tested with peak axial magnetic fields ranging from 2 T to 20 T. These experiments revealed remarkable differences in the instability structures between the cases. Helical modes were observed for the twisted return can cases and were absent from the normal z-pinch case. The amplitudes of the MRT spikes were also reduced, by up to a factor of two, at the time of liner stagnation on a central support rod, at a convergence ratio of about two. [1] P.F. Schmit et al., PRL 117, 205001 (2016).

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