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Simulations for a Staged Z-pinch and MagLIF at 26 MA, 130 ns, and 22 MJ[1] HAFIZ RAHMAN, FRANK WESSEL, PAUL NEY, Magneto-Inertial Fusion Technologies, Inc., JEFF NARKIS, JULIO VALENZUELA, FARHAT BEG, University of California, San Diego, RADU PRESURA, Voss Scientific, LLC — Simulations for a Staged Z-pinch (SZP),[2] using a 6-mm diameter, 100-μm thick Silver plasma shell, imploding onto a uniform (target) plasma fill of Deuterium, are compared to MagLIF, configured similarly, except with a 500 μm Beryllium solid liner. Both pinches are pre-magnetized with: $B_z = 0$, 3, 7, and 10 T and the driver parameters are: $\tau_{1/4} = 130$ ns, $I_{peak} = 26$ MA, $E_{stored} = 22$ MJ; the simulation code is MACH2, a 2-1/2 D, radiation-MHD code. Solid-liner simulations reproduce well, experimental results.[3] Plasma-liner simulations exhibit magnetosonic shocks in the liner and ordinary sonic shocks in the target, preheating the plasma. A conduction-channel, shock-front at the interface remains stable throughout compression, even as the liner's outer surface becomes RT unstable. At peak compression the target decelerates and interface instability appears, triggering ignition and a fusion yield of, $Y > 200$ MJ; that is, 10$\times$ greater than E_{stored}. The yield from the solid liner implosion is 4 orders-of-magnitude less, even though it is more stable than the SZP.

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[2]H. U. Rahman, F. J. Wessel, and N. Rostoker. Staged Z-pinch. PRL, 74:714, 1995
[3]M. Gomez, et.al., Phys.Plasmas (22)056306:1-10, 2015

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