Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Staged Z-pinch for Fusion[1] FRANK WESSEL, HAFIZ RAHMAN, PAUL NEY, Magneto-Inertial Fusion Technologies, Inc., TIM DARLING, ERIK MCKEE, AARON COVINGTON, University of Nevada, Reno, FARHAT BEG, JULIO VALENZUELA, JEFF NARKIS, University of California, San Diego, RADU PRESURA, Voss Scientific, LLC — The Staged Z-pinch (SZP)[2] is configured as a plasma shell imploding onto an uniform, plasma fill (50:50 Deuterium:Tritium); the pinch is pre-magnetized, with an axial B_z field. Gas-puff experiments, at the University of California, Irvine,[3] 1.25 MA, 1.25 μs, and 50 kJ, demonstrated that the implosion was stable, as primary (DD) and secondary (DT) neutrons were produced at peak compression. Subsequent analysis accounts for the stability and neutron yield, indicating that the SZP implosion is magneto-inertial, shock-driven, with magneto-sonic shocks in the liner and ordinary (sonic) shocks in the target. The shock waves preheat the target, as a stable, current-carrying, shock front forms at the interface. Near-term, the SZP team will test pinch loads on the 1 MA, 130 ns, 100 kJ University of Nevada, Reno, Nevada Terawatt, Zebra Facility. This paper details the context and our specific plans for the upcoming experiments, as well as our recent simulations predicting breakeven fusion on existing devices.

[1]Funded by the US Department of Energy, ARPA-E, Control Number 1184-1527
[2]H. U. Rahman, F. J. Wessel, and N. Rostoker. Staged Z-pinch. PRL, 74:714, 1995
[3]F. J. Wessel, Staged Z-pinch, Final Report, DoE FG03-93ER544220, March 2000

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Date submitted: 24 Jul 2015 Electronic form version 1.4