Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

The Role of Magnetosonic Shocks in the Dynamics and Stability of the Staged Z-pinch[1] HAFIZ U. RAHMAN, F. J. WESSEL, E. RUSKOV, P. NEY, Magneto-Inertial Fusion Technologies, Inc., J. NARKIS, J. VALENZUELA, F. CONTI, F. BEG, University of California, San Diego — A Staged Z-pinch[2], [3] is comprised of a magnetized, high-Z liner compressing a low-Z target and is predicted to achieve high, final-energy-density through enhanced stability, shock heating, and flux compression. Magnetosonic waves propagate radially in the system producing a stable, current carrying shock front that heats the target plasma during run-in, prior to inertial-adiabatic compression by the liner. The propagation of nonlinear-magnetosonic waves is described analytically by the KdV-Burger's Equation, providing stable-stationary solutions. We include a finite resistivity in the energy equation and generalized Ohm's law. A radiation-hydrodynamic code is used to evaluate the dynamic shock behavior, energy coupling, and the stability of the pinch. During implosion the axial-magnetic field provides enhanced stability and thermal insulation between the liner and the target plasmas. At peak compression the large amplitude B_z traps the fusion products leading to ignition in a deuterium-tritium target mixture.

[1]Advanced Research Projects Agency - Energy, DE-AR0000569
[2]H. U. Rahman, et. al., Phys.Rev.Lett.**74**, 714 (1995)
[3]F. J. Wessel, et. al. AIP Conf. Proc. 1721, 060002 (2016)

Frank Wessel
Univ of California - Irvine

Date submitted: 15 Jul 2016 Electronic form version 1.4