

Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Long-length, long-lived flow-shear stabilized Z-pinches: Background and Experimental plans for scaling studies B.A. NELSON, U. SHUMLAK, R.P. GOLINGO, E.L. CLAVEAU, University of Washington, H.S. MCLEAN, A.E. SCHMIDT, LLNL — The ZaP experiment produces long-lived sheared-flow-stabilized Z-pinch plasmas up to 126 cm in length for several flow-through times, and up to thousands of Alfvén times. Experimental measurements of the magnetic structure along the full length of the plasma column show an axially uniform Z-pinch plasma during the observed quiescent period. Interferometry, fast-framing images, and Rogowskii coils corroborate the existence of a pinched plasma during this quiescent period of time. Detailed two-dimensional non-linear magnetohydrodynamic (MHD) calculations have been performed showing the formation and assembly of long-length, long-lived Z-pinches. Experimentally-observed plasma lifetimes and velocity-shear profiles are shown to be consistent with calculations of viscous-damping timescales based on the measured plasma parameters. A newly-funded ARPA-E ALPHA project, the Fusion Z-pinch Experiment “FuZE” is being constructed at the University of Washington, in collaboration with the Lawrence Livermore National Laboratory. FuZE will study scaling and stability of the successful ZaP experiment to higher pinch currents. The FuZE experimental design, goals, and plans, based on ZaP experimental results, will be presented.

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Date submitted: 24 Jul 2015

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