Abstract Submitted
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Scaling of the Sheared-Flow Stabilized Z-Pinch: The Fusion Z-Pinch Experiment "FuZE"[1] B.A. NELSON, U. SHUMLAK, E.L. CLAVEAU, R.P. GOLINGO, T.R. WEBER, University of Washington (UW), H.S. MCLEAN, K.K. TUMMEL, D.P. HIGGINSON, A.E. SCHMIDT, Lawrence Livermore National Laboratory (LLNL), UW/LLNL COLLABORATION — The sheared flow stabilized (SFS) Z-pinch ZaP experiment was constructed based on calculations [1] showing stabilization of kink and sausage instabilities. ZaP experimentally demonstrated production and sustainment of an SFS Z-pinch for a wide range of plasma parameters, with densities up to $n = 10^{23}$ m^{-3} and a pinch radius of a=1 cm. [2-4] The SFS Z-pinch is resistant to the instabilities of conventional Z-pinches, yet maintains the same favorable radial scaling, making it an energy-efficient way to achieve fusion-relevant conditions. The ZaP-HD (high density) experiment has demonstrated scaling of the SFS Z-pinch to 2-3× smaller a and 10× higher n. [5] Supported by ZaP and ZaP-HD, the Fusion Z-pinch Experiment (FuZE) project investigates scaling plasma parameters toward fusion conditions by decreasing a 2-3× to 1 mm, and increasing n 10× to 10^{25} m^{-3}. The approach combines improved gas injection and flexible power supplies with the successful ZaP SFS Z-pinch formation. Detailed fluid and kinetic simulations complement the experimental studies to gain scientific insight into the plasma behavior and predict scaling to higher performance.

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