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ZaP-HD: High Energy Density Z-Pinch Plasmas using Sheared Flow Stabilization[1] U. SHUMLAK, B.A. NELSON, R.P. GOLINGO, C.A. BOWERS, S.A. DOTY, E.G. FORBES, D. GOLDSTONE, M.C. HUGHES, B. KIM, S.D. KNECHT, K.K. LAMBERT, W. LOWRIE, M.P. ROSS, J.R. WEED, Aerospace & Energetics Research Program, University of Washington — The ZaP-HD flow Z-pinch project investigates scaling the sheared flow Z-pinch to HEDP conditions by using sheared flow stabilization. Z-pinch plasmas have been produced that are 100 cm long with a 1 cm radius and are quiescent for many radial Alfven times and axial flow times. Quiescent periods are characterized by low magnetic mode activity measured at several locations along the plasma column and by stationary visible plasma emission. Plasma evolution is modeled with high-resolution simulation codes: Mach2, WARPX, and NIMROD. A sheared flow profile is observed to be coincident with the quiescent period and is consistent with classical plasma viscosity. Equilibrium is determined by diagnostic measurements of density, flow, electron & ion temperature, and magnetic field. Wall stabilization is investigated computationally and experimentally by removing 70% of the surrounding conducting wall. The flow Z-pinch concept provides an approach to achieve HED plasmas, which are large and persist for extended durations. The new experiment, ZaP-HD, has been built to investigate this approach. Experimental results and scaling analyses are presented.

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