Abstract Submitted
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Polytropic scaling of a flow Z-pinch[1] M.C. HUGHES, U. SHUMLAK, B.A. NELSON, R.P. GOLINGO, E.L. CLAVEAU, S.A. DOTY, E.G. FORBES, B. KIM, M.P. ROSS, J.R. WEED, University of Washington — The ZaP Flow Z-Pinch project investigates the use of velocity shear to mitigate MHD instabilities. The ZaP-HD experiment produces 50 cm long pinches of varying radii. The power to the experiment is split between the plasma formation and acceleration process and the pinch assembly and compression process. Once the pinch is formed, low magnetic fluctuations indicate a quiescent, long-lived pinch. The split power supply allows more control of the pinch current than previous machine iterations, with a designed range from 50 to 150 kA. Radial force balance leads to the Bennett relation which indicates that as the pinch compresses due to increasing currents, the plasma pressure and/or linear density must change. Through ion spectroscopy and digital holographic interferometry coupled with magnetic measurements of the pinch current, the components of the Bennett relation can be fully measured. A scaling relation is then assumed to follow a polytrope as the pinch pressure, initially approximately 250 kPa, increases from an initially formed state to much higher values, approaching 100 MPa. A preliminary analysis of pinch scaling is shown corroborating with other diagnostics on the machine along with extrapolations to required currents for an HEDLP machine.

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