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ZaP Flow Z-pinch extended source results and machine upgrade to ZaP-HD MICHAL HUGHES, URI SHUMLAK, BRIAN NELSON, RAYMOND GOLINGO, CHRIS BOWERS, SHAWN DOTY, SEAN KNECHT, MICHAEL ROSS, HARRISON STANKEY, SYDNEY SWOFFORD, University of Washington — The ZaP Flow Z-Pinch project investigates the use of velocity shear to mitigate MHD instabilities. The existing experiment produces Z-pinch plasmas that are approximately 1 cm in radius and 100 cm long. Low magnetic fluctuations demonstrate a long-lived stable pinch lasting several flow-through times. The experiment presently has two regions of differing physics: an acceleration region that ionizes neutral gas and accelerates the plasma axially providing a plasma source with axial momentum and an assembly region forming the Z-pinch configuration and compressing the plasma to high density and temperature. Past run campaigns have modified the plasma source to investigate the resulting behavior of the pinch plasma. Previous results show that the lifetime of the plasma is limited by the current from the power supply and depletion of the plasma source. The supplied power has previously been increased to extend the current waveform. The source has an increased plenum to extend the supply from the accelerator, the stability period of the Z-pinch, and thus the plasma lifetime. Results are discussed focusing on the physics of the source and pinch stability. The results have guided the design of a new ZaP-HD experiment which is presented.

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