Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Z-pinch equilibrium and instability analysis with digital holographic interferometry[1] M.P. ROSS, U. SHUMLAK, B.A. NELSON, R.P. GOLINGO, M.C. HUGHES, E.L. CLAVEAU, E.G. FORBES, S. DOTY, B. KIM, University of Washington — The ZaP-HD Flow Z-Pinch project provides a platform to explore how shear flow stabilized Z-pinches could scale to high-energy-density plasma and fusion reactor conditions. ZaP-HD generates shear stabilized, axisymmetric Z-pinches with stable lifetimes approaching 60 μs. The goal of the project is to increase the plasma density and temperature compared to the previous ZaP project by compressing the plasma to smaller radii ($\approx$ 1 mm). Radial and axial plasma electron density structures are measured using digital holographic interferometry (DHI), which provides the necessary fine spatial resolution. ZaP-HD's DHI system uses a 2 ns Nd:YAG laser pulse with a second harmonic generator ($\lambda = 532$ nm) to produce holograms recorded by a Nikon D3200 digital camera. The holograms are numerically reconstructed with the Fresnel transform reconstruction method to obtain the phase shift caused by the interaction of the laser beam with the plasma. This provides a two-dimensional map of line-integrated electron density, which can be Abel inverted to determine the local number density. The DHI resolves line-integrated densities down to 3×10^{20} m^{-2} with spatial resolution near 10 μm.

[1]This work is supported by grants from the US DoE and NNSA.

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Date submitted: 15 Jul 2016 Electronic form version 1.4