

Four-chord Interferometer Measurements of the ZaP Flow Z-Pinch

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Abstract: The ZaP Flow Z-pinch Experiment studies sheared flow stabilization on an otherwise unstable plasma confinement configuration. The plasma density is measured by a four-chord, Mach-Zehnder, heterodyne quadrature interferometer driven by a HeNe laser with a wavelength of 632.8 nm and a Bragg cell at 40 MHz. Interferometer signals are digitized throughout each plasma pulse, then processed by an IDL (Interactive Data Language) procedure to obtain line-integrated electron number density. Time-dependent spatial density measurements give insight to the evolution of the plasma formation and instabilities inherent to Z-pinches. A new inner electrode with a larger diameter is installed and expected to increase plasma temperature and achieve longer quiescent periods. Interferometer measurements show a highly pinched plasma with line-integrated electron number density around 10^{21} m^{-2} at the beginning of the quiescent period of plasma pulses with 9-10 kV capacitor bank voltage. Results suggest a higher bank voltage produces longer quiescent periods and denser pinches.