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Magnetic Field Measurements in Wire-Array Z-Pinches using Magneto-Optically Active Waveguides WASIF SYED, DAVID HAMMER, MICHAL LIPSON, Cornell University, Ithaca, NY — Understanding the magnetic field topology in wire-array Z-pinches as a function of time is of great significance to understanding these high-energy density plasmas. We are developing techniques to measure magnetic fields as a function of space and time using Faraday rotation of a single longitudinal mode (SLM) laser through a magneto-optically active bulk waveguide (terbium borate glass) placed adjacent to, or within, the wire array in experiments on the COBRA pulsed power generator [1]. We have measured fields >10 T with 100 ns rise times outside of a wire-array for the entire duration of the current pulse and as much as ∼2 T inside a wire-array for ∼40 ns from the start of current. This is the first time that such rapidly varying and large fields have been measured using these materials. We will also present our progress on field measurements using an optical fiber sensor and a very small "thin film waveguide" coupled to a fiber optic system. In a dense Z-pinch, these sensing devices may not survive for long but may provide the magnetic field at the position of the sensor for a greater fraction of the current pulse than magnetic probes, with which we compare our results. This research was sponsored by NNSA under SSAA program via DOE Coop Agreement DE-F03-02NA00057.
[1] W. Syed, D. A. Hammer, & M. Lipson, 34^{th} ICOPS & 16^{th} PPPS, Albuquerque, NM, June 2007.

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