Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Construction of an All-Optical B-Dot Probe WILLIAM PRZYBYSZ, J. ELLIS, A. HANSEN, R.A. HARDIN, E.E. SCIME, West Virginia University — For decades the standard method of performing spatially resolved magnetic fluctuation measurements in plasma has been through the use of inductive coils, "B-dot probes." However, these probes are plagued by both a limited bandwidth and a susceptibility to capacitive pickup, especially in RF generated plasmas. All-optical methods for measuring equilibrium and fluctuating magnetic fields in plasmas have been developed, but are typically limited to line-integrated measurements. The transient internal probe developed at the University of Washington – Seattle is an all-optical, spatially resolved, magnetic field diagnostic [*Kim et al.*, Rev. Sci. Instrum. **76**, 53504 (2005)], but is limited to a low measurement cadence and by complex infrastructure needs. Here we present proof-of-principle tests of an all-optical, magnetic fluctuation probe constructed from a large Verdet constant, magnetically active crystal and a simple optical detection scheme. The bandwidth of the system exceeds 1 MHz with a sensitivity of less than 0.1 Gauss. The spatial resolution of this system is 25mm. With a higher Verdet constant sensor, this could easily be reduced to 1mm.

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Date submitted: 07 Jul 2008 Electronic form version 1.4