Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Commissioning of the Millimeter-Wave Polarimeter on the HIT-SI Spheromak N.K. HICKS, R.J. SMITH, D.A. ENNIS, C.J. HANSEN, T.R. JARBOE, B.S. VICTOR, University of Washington, J. HOWARD, Plasma Research Laboratory, Australian National University, HIT-SI TEAM — The Helicity Injected Torus-Steady Inductive (HIT-SI) experiment investigates helicity injection current drive for magnetic confinement of fusion plasmas. A non- perturbative diagnostic of the internal magnetic field in HIT-SI discharges is needed to measure current-, q- and λ-profiles, and plasma polarimetry is the chosen diagnostic approach. The polarimeter diagnostic introduces a probe beam at millimeter wavelengths, and the beam's polarization is modified by the spheromak plasma as it propagates; measurement of this effect yields the density-weighted, line-integrated magnetic field strength parallel to the propagation. The diagnostic will also make an interferometric measurement of the electron density. A novel instrument design achieves relatively low cost and robustness to refraction by using a single radiation source (backward wave oscillator, swept-frequency centered on 300 GHz) and a single detector. The details of the design and implementation on HIT-SI are presented, as well as results from the commissioning of the instrument and initial magnetic field measurements. This research is supported in part by an appointment to the U.S. DOE Fusion Energy Postdoctoral Research Program administered by the Oak Ridge Institute for Science and Education.

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Date submitted: 26 Jul 2011 Electronic form version 1.4