

**Abstract Submitted for the 52nd Annual Meeting
Division of Plasma Physics
November 8–12, 2010, Chicago, Illinois**

Category Number and Subject:

Theory Experiment

2D Soft X-ray System for Imaging Magnetic Topology in the Pedestal Region on DIII-D,* M.W. Shafer, D.J. Battaglia, E.A. Unterberg, J. Canik, D.L. Hillis, R. Maingi, *ORNL*; T.E. Evans, *GA* — A new tangential 2D Soft X-ray Imaging System (SXRIS) is designed to examine the edge magnetic island structure in the lower X-point region of DIII-D. Plasma shielding and/or amplification of applied resonant magnetic perturbations (RMPs) may play a role in the suppression of edge localized modes. The SXRIS will aid in determining the 3D magnetic structure due to applied RMPs. A synthetic diagnostic calculation based on 3D SXRIS emissivity estimates calibrated against NSTX data, shows a signal-to-noise ratio of 10 with 1 cm resolution for a 25 ms integration time. Impurity puffing is expected to increase the SNR further. Image inversion is required but is an ill-posed problem, requiring symmetry assumptions such as constant emission along field lines. Advanced inversion methods are examined in the context of noise, spatial sensitivity, and symmetry assumptions. Forward modeling is used to compare 3D equilibria, e.g. from SIESTA, and simulated images to examine the non-ideal plasma response.

*Supported by the US Department of Energy under DE-AC05-00OR22725 and DE-FC02-04ER54698.