Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Design study for a spatial heterodyne Doppler coherence imaging system for flow measurements on NSTX-U[1] JACOB SCHWARTZ, M.A. JAWORSKI, A. DIALLO, R. KAITA, J.H. NICHOLS, Princeton Plasma Physics Laboratory — Measuring the flow of impurities in the SOL of NSTX-U can lead to understanding of main ion flow and heat transport. Spatial heterodyne Doppler coherence imaging is a technique that allows a single camera frame to record both the brightness and Doppler shift of an emitted spectral line over the entire field of view. With a tangential view on NSTX-U it is possible to tomographically reconstruct 2d (r-z) profiles of emissivity and flow velocity for an imaged impurity ion by assuming axisymmetry and field-aligned flow. One can derive the main ion parallel flow velocity by making four measurements and using additional assumptions. Imaging of two spectral lines each from two ion species allows solving for n_e, T_e, and the density of the two ion species by using ADAS emissivity tables. Since measurements of the velocity of two impurities are planned, it is possible to derive a main ion parallel velocity by using a reconstructed n_i and T_i (from other diagnostics), a 1d conduction-limited SOL model, and a 1d model of forces on impurities. With fewer than four measurements, it is possible to derive the main ion velocity if the impurities are entrained in the flow. A design study for such a spatial heterodyne Doppler coherence imaging system on NSTX-U will be presented.

[1]Supported by U.S. DOE Contract No. DE-AC02-09CH11466.

Jacob Schwartz
Princeton Plasma Physics Laboratory

Date submitted: 24 Jul 2015 Electronic form version 1.4