Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Hollow profile of effective ionic charge in the MST RFP[1] S.T.A. KUMAR, D.J. DEN HARTOG, B.E. CHAPMAN, S. EILERMAN, G. FIKSEL[2], M. NORNBERG, E. PARKE, J. REUSCH, University of Wisconsin-Madison, WI, USA, D. CRAIG, Wheaton College, Wheaton, IL, USA, L. LIN, UCLA, USA — Densities of various impurity ions (B^{+5}, C^{+6}, O^{+8}, Al^{+11}, Al^{+13}) are measured in the MST reversed field pinch using a fast, active charge-exchange recombination spectroscopy diagnostic with high spatial and temporal resolution. Measurements are made in improved-confinement deuterium plasmas with I_p ∼550 kA, core $n_e \sim 1.2{\times}10^{19}$ m^{-3}, core T_e ∼1.5-2 keV and core $T_i \sim 1.2$ keV. It is found that radial profiles are hollow for these impurity ions. These impurity ion densities are used in combination with a collisional radiative model (with measured radial profiles of electron temperature, electron density and neutral deuterium density) to calculate densities of all other charge states of these impurities in the plasma. The effective ionic charge, $Z_{\rm eff}$, estimated from the impurity densities is ∼2 near the magnetic axis and up to ∼ 5 at mid radius. Analysis using collisional transport theory shows that the hollow profile could be explained by temperature screening of impurities due to the ion temperature gradient.

[1]Work supported by U.S. DOE and NSF.
[2]Currently at University of Rochester, NY, USA

S. T. A. Kumar
University of Wisconsin-Madison

Date submitted: 13 Jul 2011 Electronic form version 1.4