Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Measurements of Ion Flow and Neutral Depletion in an Argon Helicon Plasma with Magnetic Nozzle CHRISTOPHER DENNING, MATT WIEBOLD, JOHN SCHARER, University of Wisconsin-Madison — Argon helicon plasmas are generated using 13.56 MHz RF power of up to 3 kW in a 10-cm-diameter Pyrex vacuum chamber attached to a 45-cm-diameter stainless steel chamber. Magnetic field strengths range up to 1 kG in the helicon source region and 1.5 kG at the peak of a downstream magnetic nozzle. 105 GHz microwave interferometry and a Langmuir probe are used to measure plasma densities in the range of 10^{12} - $4x10^{13}$ cm^{-3} with electron temperatures in the range of 4 - 8 eV. A maximum density is observed for any given neutral gas pressure in the range of 0.1 - 5 mTorr (at RF powers typically between 1 and 1.5 kW), decreasing for greater powers, suggesting neutral depletion. Tunable diode laser-induced fluorescence is used to examine ion dynamics in the presence and absence of a magnetic nozzle. Near-sonic (M = 0.7) ion flows of up to 2.7 km/s have been observed in initial experiments. The axial plasma potential variation is measured using probe diagnostics.

Christopher Denning
University of Wisconsin-Madison

Date submitted: 27 Jul 2007 Electronic form version 1.4