

Abstract Submitted
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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} - 4×10^{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

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