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High Power Helicon Plasma Source Characteristics as a Function of Input Neutral Density Distributions TIMOTHY ZIEMBA, RACE ROBERSON, ROBERT WINGLEE, University of Washington, JOHN CARSCADDEN, University of Washington, JIM PRAGER, University of Washington — A high power helicon source has been developed at the University of Washington, which is capable of tens of kilowatts power transfer into the plasma. Measured source electron densities in Argon are near $2x10^{20}$ m^{-3} with electron temperatures of 5-7 eV. The system is capable of operation with different types of neutral input gases with argon, xenon, nitrogen and hydrogen having been investigated. Unlike typical helicon coil experiments, which usually use a low-pressure backfill to start and maintain the discharge, neutral gas is injected into the center of the helicon coil region just prior to the creation of the discharge. Several neutral gas injectors have been designed and tested allowing for an investigation of source performance with different neutral pressure distributions and flow rates. Results show that differing profiles for the neutral gas density distribution and flow rates can have a significant impact on the downstream plasma characteristics as measured with both an ion energy analyzer and Langmuir probe. Detailed results of the helicon source and downstream election densities and ion energies, as a function of neutral gas injection parameters will be presented.

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