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Magnetic Nozzle Effects for High Power Helicon Plasma Propulsion Systems ROBERT WINGLEE, TIMOTHY ZIEMBA, JAMES PRAGER, NATHAN STOBIE, RACE ROBERSON, JOHN CARSCADDEN, University of Washington — The high power helicon (HPH) is an electrode propulsion system that utilizes non-linear helicon/whistler waves to accelerate the plasma at very high densities. Because the plasma is generated in a magnetized environment at high beta, HPH has an inherent feature that the magnetic nozzles can be used to focus the plasma and increase its efficiency. Laboratory results and computer simulations are used to quantify this focusing and the changes the plasma characteristics as a function of the position and field strength on the magnetic nozzle. It is shown that the Isp of the system can be increase by 20-30% by the addition of the nozzle due to the conversion of thermal energy into directed energy. As the plasma leaves the nozzle, the plasma is supersonic (mach $\sim$5) and super-Alfvénic. This parameter region means that there are no problems associated with attachment of the plasma to the magnetic field lines and leads to a highly collimated beam well downstream from the magnetic nozzle. This collimation opens up additional applications for the high power helicon.

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