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**Enhanced Output from the High Power Helicon in Association with Macroscopic Currents and Magnetic Field Annihilation** RACE ROBERSON, TIM ZIEMBA, ROBERT WINGLEE, JAMES PRAGER, University of Washington — The high power helicon plasma source developed at the University of Washington is capable of transferring tens of kilowatts of power into the plasma with source plasma densities near $2x10^{20}$ $m^{-3}$. Optical emissions from the plasma show an intense axially peaked central plasma core, typical of a helicon discharge. The intense plasma extends tens of centimeters downstream of the helicon antenna. The helicon operates with a $B_0$ magnetic field of .2 to .6 kG on axis that diverges with axial distance from the source. As the plasma moves out from the source, the plasma beta changes from less than unity to greater than unity within two antenna lengths. Beyond this point, the azimuthal currents driven by the helicon wave are sufficient to lead to the cancellation of the base magnetic field, and the external magnetic field leads to a highly collimated beam. The plasma induced delta B is found to be correlated with the measured wave fields from the helicon antenna and are thought to contribute to the pressure driven diamagnetic plasma currents which annihilate the $B_0$ field, and definitive dissipation/reflection of the wave energy is observed. The output ion energies are shown to be enhanced under these conditions.

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