

Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Observation of Neutral Depletion in High Power Helium-Helicon Plasmas SAEID HOUSHMANDYAR, SAIKAT CHAKRABORTY THAKUR, STEPHANIE SEARS, JERRY CARR, EARL SCIME, West Virginia University — Helicon plasmas are known for their high plasma density. However, the effects of neutral atoms on wave dispersion cannot be neglected, even in the high density core, *e.g.* Alfvén wave propagation in helicon plasmas. Laser Induced Fluorescence (LIF), a noninvasive diagnostic tool, was used to measure the neutral density profile of helium atoms in high-density, helium helicon plasmas. At 578.725 nm (vacuum), the LIF signal of neutral helium atoms resulting from injection of the laser along the magnetic field, exhibits a dip, at the Doppler shifted central wavelength, that results from the finite optical depth of the plasma at that wavelength [51st APS-DPP, GP8.00133]. In a series of experiments performed in WVU HELIX (Hot hELIXon eXperiment), the neutral density profile and optical depth are measured for different ambient magnetic fields, radial positions and driving frequencies of the helicon source. As a result, the optimum plasma performance (*i.e.*, largest neutral depletion cases) for helium-helicon plasmas was determined.

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Date submitted: 14 Sep 2009

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