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Two photon absorption laser induced fluorescence measurements of neutral density profiles in a hydrogen helicon plasma[1] MATTHEW GALANTE, RICHARD MAGEE, EARL SCIME, West Virginia Univeristy — Neutral particles play a critical role in all plasma experiments. We report direct ground state neutral density measurements in hydrogenic helicon plasmas using a two-photon absorption laser induced fluorescence (TALIF) system. Specifically, we report the dependence of the neutral density on rf power, source magnetic field, driving frequency and equilibrium fill pressure. Neutral density was found to increase strongly with increasing rf power and fill pressure due to increased dissociation, and decrease weakly with magnetic field strength due to increased ionization. No significant dependence was found with varying driving frequency. Careful examination of the neutral production was made near to and far from the lower hybrid resonance by scanning the resonance from $0.15f_{rf}$ to $60f_{rf}$. No significant change in plasma or neutral production was found on or off resonance, counter to previous results in heavy ion helicon sources. Neutral density profiles were measured in the various parameter configurations. In some cases the profile was hollow, indicating possible neutral pumping. Profiles varied significantly from discharge to discharge indicating a sensitivity to wall conditions. We present a controlled study of the effect of wall conditioning on neutral density.

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