

Abstract Submitted
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Absolute neutral helium density measurements in helicon source plasmas SAEID HOUSHMANDYAR, None, EARL SCIME, West Virginia University — Laser induced fluorescence (LIF) measurements of the plasma opacity are used as a novel diagnostic to determine the absolute density of a metastable state of neutral helium atoms in a helicon plasma. The absorption scale length at a wavelength of 587.725 nm (vacuum) is determined from measurements of fluorescence intensity as a function of distance along the laser path. With a collisional-radiative model of the state populations, the absolute ground state neutral helium density is estimated from the metastable state density measurement. This work expands upon previous work through measurements of neutral density, temperature, and flow at different radial positions. The measured neutral density decreases by two orders of magnitude from the edge of the plasma to the axis of the plasma source. Furthermore, the measurements are extended to a case that the helicon source was operated in a static mode in which the helium gas was not continuously fed into the chamber. As a result, the on-axis measurements show 42% increase for the plasma density and 69% decrease for the neutral density, when compared to the traditionally active gas feeding of the helicon sources; yielding an ionization fraction of approximately 90%.

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