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Measurement of Neutral Hydrogen Density in a Helicon Plasma,* M.E. Galante, R.M. Magee, D.W. McCarren, E.E. Scime, *WVU*; N.H. Brooks, R.L. Boivin, *General Atomics* — A new diagnostic system based on two-photon absorption laser-induced fluorescence (TALIF) has been developed to measure neutral hydrogen density in the edge of fusion plasmas. 205 nm photons from a frequency tripled dye laser are injected co-propagating into the plasma chamber where they excite the 1s-3D transition in neutral hydrogen. The 3D state then decays emitting light at 656 nm. The emission intensity is directly proportional to the ground state hydrogen density. With the tabulated atomic absorption rates for hydrogen and krypton, TALIF measurements of krypton gas provide an absolute calibration. Here we present the technical details and measured performance of the TALIF system (laser line width, pulse length, pulse energy, RMS stability) and TALIF measurements of room temperature krypton gas. The krypton measurements are compared to expectations and the measured line widths are analyzed in terms of Doppler and saturation broadening. We also present TALIF measurements of the radial profiles of the absolute neutral hydrogen and neutral temperature in a helicon plasma source as a function of source parameters.

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