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Two-photon Laser Induced Fluorescence on Xenon for Neutral Density and Temperature Measurements DREW ELLIOTT, MATTHEW GALANTE[1], EARL SCIME, MARK SODERHOLM, ROBERT VANDERVORT, West Virginia University — Many noble gasses are ideal species for plasma generation because of their relatively low ionization energies, very low electron affinities, and because the neutral and ion electronic configurations are easily probed spectroscopically. Laser induced fluorescence of a ground state neutral atom is particularly useful because it enables absolute signal calibration. We have identified a new two-photon-absorption laser-induced-fluorescence (TALIF) scheme for neutral xenon. The initial $5p^6$ ground state is pumped to the $5p^5$ 7f state ($\Delta J=2$) by two photons of wavelength approximately 209nm, which then decays to the $5p^5$ 6s state through single photon emission at 543nm. Since the excitation is from the ground state, measurements of the fill gas provide absolute calibration. The pulsed TALIF laser (approx. 1MWatt) with a very narrow line width (approx. $1cm^{-1}$) enables the Doppler broadened line shape (superimposed on the isotopic splitting) to be measured. These measurements are obtained with confocal optics necessitating only a single lens and a single view port. We present spatially and temporally resolved neutral density and neutral temperature profiles in a xenon helicon plasma.

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