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Determination of the Relative Two-photon Absorption Cross-section Between Xenon and Hydrogen DREW ELLIOTT, EARL SCIME, DUSTIN MCCARREN, ROBERT VANDERVORT, MARK SODERHOLM, West Virginia University — Two-photon Absorption Laser Induced Fluorescence (TALIF) is a non-perturbative method for measuring the density and temperature of neutral hydrogen in a fusion plasma. Calibration of a TALIF system, for absolute density measurements, requires a measurement of a known density of particles under controlled conditions. Since hydrogen is diatomic, hydrogen TALIF system calibration requires measurements of target cold monatomic gas with a two-photon transition from the ground state and fluorescence decay at accessible energies. Here we present single-sided TALIF (angular momentum change of 2) measurements of a new transition in xenon with absorption and emission wavelengths nearly identical to those of the hydrogen TALIF sequence (the n = 3 to n = 2 emission in hydrogen is at 656.27 nm whereas it is at 655.99 nm in xenon). The xenon calibration approach provides the first opportunity for absolute calibration of Doppler-free (angular momentum change of 0) hydrogen TALIF. We first measure the relative TALIF absorption cross section between xenon and krypton and then use the known cross section ratio between the krypton and hydrogen transitions to calculate the relative xenon-hydrogen cross section. Single isotope xenon samples are used to remove the confounding factors of isotopic and hyperfine splitting.

Drew Elliott
West Virginia University

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