A TALIF Diagnostic for the DIII-D Tokamak\textsuperscript{1}  R.M. MAGEE, M.E. GALANTE, D.W. MCCARREN, E.E. SCIME, WVU, R.L. BOIVIN, N.H. BROOKS, General Atomics — The density profile of hydrogenic neutrals in the edge of DIII-D plays an important role in the problems of momentum transport, pedestal formation, and plasma-wall interaction, but an accurate measurement has proven difficult. A two-photon absorption laser induced fluorescence (TALIF) diagnostic is under construction and is intended to provide temporally and spatially resolved neutral density measurements in the pedestal region. This three-level TALIF scheme offers the advantages of direct excitation of ground state atoms, emission in the visible portion of the spectrum, a high degree of spatial localization, and the potential for a Doppler-free measurement. The large background of D\textsubscript{\alpha} emission, the principal challenge of the measurement, can be overcome by the focusing of a high power (1 MW) UV laser. Calculations of the SNR show that densities of \(10^{15} \text{ m}^{-3}\) or lower can be measured with a spatial resolution of 0.3 mm. We present design details of the proposed laser system, calculations of the expected performance in DIII-D and in a helicon source plasma, and measurements of the HI profile in the helicon plasma.

\textsuperscript{1}Work supported in part by US DOE under DE-FC02-04ER54698.