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Two-photon Laser Induced Fluorescence Measurements of Neutral Density in the Prototype Material Plasma Exposure eXperiment[1]
T.E. STEINBERGER, West Virginia Univ, J.W. MCLAUGHLIN, University of Iowa, T.M. BIEWER, ORNL, Univeristy of Tennessee, C.J. BEERS, ORNL, University of Tennessee, J.B. CAUGHMAN, J.F. CANESES, ORNL, E.E. SCIME, West Virginia Univ, THE PROTO MPEX TEAM — The development of remotely situated diagnostics for fusion plasmas is necessary since the radiation and electromagnetic-interference (EMI) environment of such devices is becoming ever more intense. Two-photon absorption laser induced fluorescence (TALIF) measurements of neutral velocity distribution functions (NVDF) provide non-perturbative measurements of neutral deuterium temperature, absolute density, and bulk flow in fusion relevant plasmas. Recently, a TALIF system was installed at ORNL on the Prototype Material Plasma Exposure eXperiment (Proto-MPEX). A maximum of 4 mJ of 205 nm light in 8 ns pulses is transmitted over 20 m to measure deuterium NVDFs. Signal is collected confocally and is fiber-coupled back to the laser room. The confocal design requires only one point of optical access-making this design suitable for fusion devices. However, 205 nm light is difficult to transmit through common vacuum components and fiber optics. To explore more compatible options for transmission, a three-photon absorption laser induced fluorescence (3pLIF) scheme is attempted in krypton as a proof-of-principle measurement to increase the injected wavelength. We will present preliminary TALIF deuterium NVDFs and 3pLIF krypton NVDFs.

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