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Edge Ionization Rate and Neutral Density from Main Chamber Measurements of Lyman alpha on DIII-D[1] AARON ROSENTHAL, JERRY HUGHES, Plasma Science and Fusion Center - MIT, ALESSANDRO BORTOLON, FLORIAN LAGGNER, Princeton Plasma Physics Lab, THERESA WILKS, Plasma Science and Fusion Center - MIT — A new one-dimensional absolutely calibrated Lyman-alpha (Ly-α) camera has been implemented to study neutral hydrogenic species at the boundary of DIII-D. The Ly-α camera provides two radial profiles consisting of 20 lines of sight covering 22 cm about the separatrix below the midplane on the high field side (HFS) and low field side (LFS) of the tokamak. Each channel provides a line integrated measurement of the Ly-α (121 nm) brightness, which can be combined with electron temperature and density measurements to determine local time resolved neutral densities and ionization rates. Recent experiments commissioned the diagnostic and provided first results: measured Ly-α brightness profiles track rigid plasma shifts, peak Ly-α brightness scales with gas puff rates and shows similar dynamic behavior as midplane Balmer-alpha measurements. Initial measurements of neutral density found magnitudes of 10^{17} m^{-3} on the LFS consistent with modeling and measurements on other machines. The diagnostic has measured a robust in-out asymmetry in Ly-α brightness with an order of magnitude larger signals on the HFS. The diagnostic will continue regular operation providing quantitative studies of neutral transport of the plasma edge on DIII-D.

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