Development of the Motional Stark Effect with Laser-Induced Fluorescence (MSE-LIF) Diagnostic\(^1\) ELIZABETH L. FOLEY, FRED M. LEVINTON, Nova Photonics, Inc. — The motional Stark effect with laser-induced fluorescence (MSE-LIF) diagnostic is under development to extend the MSE magnetic pitch angle diagnostic to lower fields (\(< 0.5\) T) and enable measurement of magnetic field magnitude as well as direction. The technique involves injecting a low energy-spread neutral hydrogen beam (30 kV, 30 mA) into plasma, and using a collinear laser to excite transitions from the \(n=2\) to \(n=3\) atomic states in the beam atoms. The subsequent fluorescence from the same transition (Balmer-alpha, near 650 nm for the Doppler-shifted beam) is observed, and its splitting and polarization due to the \(E = v \times B\) electric field in the beam frame is used to determine the background magnetic field magnitude and direction. This poster will present recent results from MSE-LIF development, including magnetic field measurements at very low field (\(< 0.01\) T) in neutral gas based on an enhanced LIF phenomenon, a comprehensive collisional-radiative model which determines the population fractions in the \(n=1, 2\) and \(3\) states of the beam as the states mix in applied magnetic and electric fields, as well as upgrades to the experimental apparatus that will enable measurements in intermediate fields (0.01 - 0.2 T) in plasma.

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Elizabeth L. Foley
Nova Photonics, Inc.

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