Abstract Submitted
for the GEC19 Meeting of
The American Physical Society

Development of a Laser-Induced Fluorescence System to Measure the Electric Field Magnitude Induced by Energetic Electron Beams in a Gas CHRISTOPHER DUROT, JENNY SMITH, JOHN FOSTER, University of Michigan — A high energy electron beam in a gas induces an electric field by the time rate of change of the net current. This electric field can lead to an electrical breakdown of the gas and a return current that reduces the net current. Reliable measurement of the E-field magnitude is necessary to inform and validate models of the complicated dynamics of this interaction. In support of gas chemistry studies at the Naval Research Laboratory, the University of Michigan is developing a laser-induced fluorescence dip (LIF-dip) spectroscopy system. LIF-dip is a technique using two lasers to directly measure electric field magnitude. One laser populates the fluorescing state while the other depopulates it in a transition to Rydberg states. The electric field can be measured by analyzing the "dip" in the fluorescence signal as the second laser wavelength is scanned. The technique can sensitively detect electric field magnitude because Rydberg states are highly sensitive to the Stark effect. In this contribution, we describe the design and buildup of this laser spectroscopy system and present initial LIF measurements of argon metastables.

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Date submitted: 05 Jun 2019 Electronic form version 1.4