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**Development of a New Time-Resolved Laser-Induced Fluorescence Technique** CHRISTOPHER DUROT, ALEC GALLIMORE, Plasmadynamics and Electric Propulsion Laboratory, University of Michigan — We are developing a time-resolved laser-induced fluorescence (LIF) technique to interrogate the ion velocity distribution function (VDF) of EP thruster plumes down to the microsecond time scale. Better measurements of dynamic plasma processes will lead to improvements in simulation and prediction of thruster operation and erosion. We present the development of the new technique and results of initial tests. Signal-to-noise ratio (SNR) is often a challenge for LIF studies, and it is only more challenging for time-resolved measurements since a lock-in amplifier cannot be used with a long time constant. The new system uses laser modulation on the order of MHz, which enables the use of electronic filtering and phase-sensitive detection to improve SNR while preserving time-resolved information. Statistical averaging over many cycles to further improve SNR is done in the frequency domain. This technique can have significant advantages, including (1) larger spatial maps enabled by shorter data acquisition time and (2) the ability to average data without creating a phase reference by modifying the thruster operating condition with a periodic cutoff in discharge current, which can modify the ion velocity distribution.

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