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Time-Resolved Laser-Induced Fluorescence Measurements of the Ion Velocity Distribution in the H6 Hall Thruster Plume CHRISTOPHER DUROT, ALEC GALLIMORE, University of Michigan — We developed a technique to measure time-resolved laser-induced fluorescence signals in plasma sources that have a relatively constant spectrum of oscillations in steady-state operation but are not periodically pulsed, such as Hall thrusters. We present the first results using the new technique to capture oscillations in a Hall Thruster. The ion velocity distribution function in the plume of the H6 Hall thruster is interrogated during breathing mode oscillations. The breathing mode is characterized by an oscillating depletion and replenishment of neutrals at a frequency of about 10-25 kHz. We use laser modulation on the order of megahertz, well above the time scale of interest (about 0.1 ms). Band-pass filtering and phase-sensitive detection (with a time constant on the order of microseconds) raise the signal-to-noise ratio and demodulate the signal while preserving time-resolved information. Following phase-sensitive detection, we average over transfer functions to finish recovering the signal. This technique has advantages such as a shorter dwell time than other techniques and the lack of a need for triggering for averaging in the time domain.

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