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High time resolution LIF in pulsed argon plasma[1] IOANA BILOIU, EARL SCIME, West Virginia University — A high time resolution Laser Induced Fluorescence (LIF) method for obtaining the temporal evolution of the ion velocity distribution function in pulsed argon plasma is presented. A single mode tunable ring dye laser pumped by a 6 W argon-ion laser is used to excite a classic three-level Ar II LIF scheme $3d^{'2}G_{9/2} \rightarrow 4p^{'2}F_{7/2} \rightarrow 4s^{'2}D_{5/2}$. An LIF system used for steady-state plasma is slightly modified by addition of a digital oscilloscope and by replacing the mechanical chopper with a high frequency acousto-optic modulator. Ion velocity distribution measurements as a function of time during the rf pulse are obtained by taking temporal slices of the LIF intensity – wavelength plane. The parallel ivdf measurements indicate that in the region of high magnetic field gradient two ion groups coexist: a fast moving 'beam' and a slower moving background population. The formation of a weak double layer below a threshold pressure due to ion acceleration in the expansion region of plasma appears to be a characteristic of such low pressure helicon plasmas. We will present sub-ms time resolution measurements of the temporal evolution of the parallel and perpendicular ion velocity distribution functions (ivdf) in a pulsed, helicon-generated, expanding, argon plasma.

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