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Improved Measurements of Ion Beam Formation in Expanding Helicon Plasmas Using Upgraded Laser Induced Fluorescence Injection Optics[1] EARL SCIME, JOHN MCKEE, MARK SODERHOLM, ROBERT VANDERVORT, West Virginia University — A number of studies have demonstrated the spontaneous formation of ion beams in expanding plasmas. Ion beams are identified through measurements of the ion velocity distribution function. The two primary diagnostic techniques for the performing these measurements are laser induced fluorescence (LIF) and retarding field energy analyzers. Each measurement method has its strengths and weaknesses. One particular challenge for LIF is the difficulty in obtaining good signal to noise when the measurement location is far from the point of optical access to the plasma chamber and the light must be conveyed to the experiment through optical fibers. Here we present LIF measurements performed over 3 meters away from a 2.75" injection port. Laser light is coupled into a polarization preserving, single mode, optical fiber and focused to a beam radius of a few mm after the light emanating from the fiber is collimated with a concave mirror to eliminate chromatic distortion as the laser wavelength is scanned. Significant gains in signal-to-noise were obtained over unoptimized, injection optics; expanding the pressure and RF power range over which LIF measurements could be performed. LIF measurements of the argon ivdf in low and high pressure expanding helicon plasmas will be presented.

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