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Time Resolved Studies of Ion Beam Formation in Pulsed Helicon Argon Plasma[1] JERRY CARR JR., SAIKAT CHAKRABORTY THAKUR, ALEX HANSEN, SAEID HOUSHMANDYAR, STEPHANIE SEARS, EARL SCIME, West Virginia University, WEST VIRGINIA UNIVERSITY PLASMA TEAM — Previous laser induced fluorescence (LIF) measurements of the parallel ion velocity distribution function (ivdf) in expanding, steady-state, argon helicon plasma demonstrated the existence of an accelerated population of ions co-existing with a stationary ion background. Downstream of the expansion region, a clear ion beam (evidence of a double layer) is seen only for source frequencies greater than a critical frequency. To investigate the ion beam formation, the plasma is pulsed at 5 Hz with a 50% duty cycle. The parallel ivdf, obtained with high time resolution LIF, and electrostatic fluctuations are measured both upstream and downstream at several plasma frequencies. At lower frequencies, large electrostatic instabilities appear and the ion beam vanishes. Below the critical frequency, large electrostatic instabilities are observed after the ion beam begins to appear in the LIF measurements. The beam vanishes and the electrostatic fluctuations decay later in the discharge. Above the critical frequency, we observe a less energetic beam and no electrostatic fluctuations.

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