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Pressure Effects on Double Layer Accelerated Ion Beams in Multi-Species Helicon Plasmas EVAN AGUIRRE, West Virginia University, TIMOTHY GOOD, Gettysburg College, EARL SCIME, West Virginia University — Double layers are free-standing sheath like structures that are observed to form spontaneously in expanding, high-density plasmas, thereby accelerating ions to supersonic speeds. We use laser induced fluorescence to measure the parallel ion flow speeds of multi-species helicon plasmas immediately downstream of a current free double layer. Steady state, low pressure plasmas are created with three different gas mixtures; argon and xenon, argon and helium, xenon and helium. A helium ion LIF scheme does not exist, so we are confined to measuring the ion velocity distribution functions of argon and xenon. Contrary to observations in mixed gas sheath experiments, our measurements show that adding a lighter gas does not increase the ion beam speed, In fact, the heavy ion speed decreases. Thus, we find that different ion species fall through the double layer at their own Bohm speed rather than an average of their speeds, regardless of the relative densities of the ion species. Pressure effects are the dominant factor for ion beam speed; increasing pressure slows all ion beams.

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