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Stability of spontaneously appearing ion beams in expanding plasmas EARL SCIME, JERRY CARR JR., ROBERT VANDERVORT, West Virginia University, NJAL GULBRANDSEN, Univesity of Tromso — We present time resolved measurements of ion beam formation in the expansion region of a pulsed helicon plasma. The ion beams are identified in ion velocity distribution function measurements obtained through laser induced fluorescence and retarding field energy analyzer diagnostics. As the plasma discharge forms, an ion beam appears and then vanishes coincident with the appearance of large amplitude electrostatic fluctuations. For a strong mirror ratio, the correlation between fluctuations in the ion population and the electrostatic fluctuations are strong. For a weak mirror ratio, the beam is less correlated with the electrostatic fluctuations than the bulk ion population and the beam persists throughout the discharge. The fluctuation measurements are analyzed using a time-resolved spectral method that provides a measurement of the fluctuation spectrum throughout a single discharge pulse. Combined with the time-resolved ion distribution function measurements, it is possible to identify which portions of the ion velocity distribution most strongly interact with the electrostatic fluctuations.

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