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Direct Measurements of the Spatial and Velocity Dependence of the Ion Density Fluctuation Spectrum of a Laboratory Plasma with Two Independent LIF Schemes[1] SEAN MATTINGLY, JORGE BERUMEN, FENG CHU, RYAN HOOD, FRED SKIFF, University of Iowa Department of Physics and Astronomy — By using two independently tunable lasers, each with its own collection optics and Ar II LIF transition scheme, we are able to investigate plasma ion density fluctuations as a function of not only spatial scales but also as a function of ion velocities as sampled on different points of a single Doppler - broadened spectral emission line. We do this by measuring the two point correlation $C(x, v, x', v', \tau) = \langle f(x, v, t) f(x', v', t - \tau) \rangle_t$. With the current system, the two carriages determine x and x', while the velocities selected by each laser determine v and v'. Using the two lasers to make two point correlations in phase space demonstrates effects that are not fully understood. In this experiment, we explore the striking difference in correlations when, in the past, the particle orbits overlap in space versus when they do not overlap. This is performed on a small cylindrical laboratory plasma with $n \sim 10^9 cm^{-3}, T_e \sim 5eV, T_i \sim 0.06eV$, and a $1kG$ axial magnetic field. LIF is performed on ions at two locations aligned with the magnetic field line with a viewing volume comparable to the size of the Larmor radius. Results and interpretations from these experiments are presented and discussed.

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