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Measuring Kinetic Plasma Eigenmodes SEAN MATTINGLY, JORGE BERUMEN, FENG CHU, RYAN HOOD, FRED SKIFF, University of Iowa
— We present a method for measuring kinetic plasma eigenmodes of a cylindrical axially magnetized ($1kG$) laboratory plasma ($n \sim 10^9 cm^{-3}$, $T_e \sim 5eV$, $Ti \sim 0.06eV$) by measuring velocity space correlation functions. This method simultaneously observes two separate laser induced fluorescence schemes. Each scheme has its own indepedently tunable laser and its own set of collection optics. With this setup, we are able to measure the time - averaged correlation function as a function of position on the cylindrical axis parallel to the magnetic field (z) and velocity on the deconvolved ion velocity distribution function (v): $C(z, v, z', v', \tau) = \langle f(z, v, t) f(z', v', t - \tau) \rangle_t$. The freedom of two lasers allows us to measure a two dimensional velocity correlation matrix. This matrix is investigated with the Vlasov equation in the collisionless and weakly collisional regime. The former case, which is continuous, is diagonalized with an integral transform defined by P. J. Morrison[1] while the latter case, which is discrete, is diagonalized through the use of Hermite polynomials.[2]

[1]P. J. Morrison **Phys. Plasmas** 1, 1447 (1994).
[2]Ng *et al.* **PRL APS** 92, 2004, 065002.

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