Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Numerical solution for linear cyclotron and diocotron modes in a nonneutral plasma column[1] DANIEL WALSH, DANIEL H.E. DUBIN, UCSD — This poster presents numerical methods for solution of the linearized Vlasov-Poisson (LVP) equation applied to a cylindrical single-species plasma in a uniform magnetic field. The code is used to study z-independent cyclotron and diocotron modes of these plasmas, including kinetic effects. We transform to polar coordinates in both position and velocity space and Fourier expand in both polar angles (i.e. the cyclotron gyro angle and θ). In one approach, we then discretize in the remaining variables r and v (where v is the magnitude of the perpendicular velocity). However, using centered differences the method is unstable to unphysical eigenmodes with rapid variation on the scale of the grid. We remedy this problem by averaging particular terms in the discretized LVP operator over neighboring gridpoints. We also present a stable Galerkin method that expands the r and v dependence in basis functions. We compare the numerical results from both methods to exact analytic results for various modes.

[1]Supported by NSF/DOE Partnership grants PHY-0903877 and DE-SC0002451.

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Date submitted: 11 Jul 2014 Electronic form version 1.4