Abstract Submitted
for the 4CF09 Meeting of
The American Physical Society

Novel Numerical Solution to the Plasma Kinetic Equation JOSEPH SPENCER, ERIC HELD, JEONG-YOUNG JI, Utah State University, NIMROD TEAM — The finite element method (FEM) is a numerical approach to solving partial differential equations commonly used in engineering applications. In this work, we discuss the application of the FEM to velocity space to solve plasma kinetic equations. We have approached the investigation one step at a time. At first, we treat an initial value problem with the kinetic equation including the time derivative and Lorentz collision operator, a simplified form of the full, Coulomb collision operator. We show results that verify that the Lorentz operator causes generic distribution functions to evolve toward Maxwellian distributions. We also show that by refining the size of the grid and increasing the order of the 2-D polynomial basis, we obtain exponential convergence. Our next step was to look at the effects of including the speed drag and diffusion part of the Coulomb collision operator. We conclude by discussing the extension to the full Coulomb collision operator, the inclusion of external electric and magnetic fields, and the generalization to multiple spatial dimensions.

Eric Held
Utah State University

Date submitted: 28 Sep 2009 Electronic form version 1.4