Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Test problems for dense kinetic plasmas[1] JOHN LUGINSLAND, NumerEx, ANDREW CHRISTLIEB, Michigan State University — Simulations of dense kinetic plasmas are an area of active research. A variety of devices from high power microwave devices to Hall thrusters involve situations with dense fluid-like plasmas coexisting with important kinetic non-Maxwellian particle distributions. These plasmas exhibit a range of length and time scales, making accurate simulation a challenging and computationally intensive task. The development of algorithms to handle these multi-scale circumstances is facilitated by high-fidelity test problems suitable for verification and validation studies. Specifically, we report on the development of ordinary differential equations appropriate for studying kinetic plasmas with short Debye lengths relative to the system size. Via analytic and numerical solutions, we study the impact of collective shielding on Langmuir waves. Furthermore, we extend these equations to account for typical particle weighting found in particle-in- cell (PIC) software. We compare these solutions to electrostatic PIC simulations with specific attention to computational artifacts, such as numerical heating.

[1]Work funded by AFOSR

John Luginsland
NumerEx

Date submitted: 18 Jul 2008 Electronic form version 1.4