Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

A New Simulation Algorithm Combining Fluid and Kinetic Properties[1] DAVID LARSON, DENNIS HEWETT, LLNL — Complex Particle Kinetics (CPK) [1,2] uses particles with internal degrees of freedom in an effort to simulate the transition between continuum and kinetic dynamics. Recent work [3] has provided a new path towards extending the adaptive particle capabilities of CPK. The resulting algorithm bridges the gap between fluid and kinetic regimes. The method uses an ensemble of macro-particles with a Gaussian spatial profile and a Mawellian velocity distribution to represent particle distributions in phase space. In addition to the standard PIC quantities of location, drift velocity, mass, and charge, the macro-particles also carry width, thermal velocity, and an internal velocity. The particle shape, internal velocity, and drift velocity respond to internal and eternal forces. The particles can contract, expand, rotate, and pass through one another. The algorithm allows arbitrary collisionality and functions effectively in the collision-dominated limit. We will present details of the algorithm as well as the results from several simulations. [1] D. W. Hewett, *J. Comp. Phys.* **189** (2003). [2] D. J. Larson, *J. Comp. Phys.* **188** (2003). [3] C. Gauger, *et.al., SIAM J. Numer. Anal.* **37** (2000).

[1]This work was performed under the auspices of the U.S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48.

David Larson
LLNL

Date submitted: 21 Jul 2007 Electronic form version 1.4