Fast Search and Adaptive Resolution for Complex Particle Kinetics[1] DAVID J. LARSON, DENNIS W. HEWETT, LLNL — A new plasma simulation algorithm, intended to bridge the gap between Eulerian fluid and kinetic regimes, is now being used for a variety of applications in ICF and weapon effects. The CPK method (Complex Particle Kinetic) concept [1] uses an ensemble of macro-particles with a Gaussian spatial profile and a Mawellian velocity distribution to represent particle distributions in phase space. Time evolution is modeled by a combination of Lagrangian motion and internal evolution within each individual macro-particle. Collisional particle-particle interactions [2] are facilitated by sorting particles into bins depending of the particle size. Different bin levels are connected by a linked list. Searching for neighboring particles is highly efficient because the search is limited to particles in neighboring bins with the possibility of interaction. The bin structure also allows the computation of various spatial moments at different resolutions. Combining the results of the moment calculations yields information on where and when increased resolution is necessary. We will present details of the particle binning process along with progress towards our goal of simulating the transition from continuum to fully kinetic physics. [1] D. W. Hewett, J. Comp. Phys. 189 (2003). [2] D. J. Larson, J. Comp. Phys. 188 (2003).

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