

Abstract Submitted
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A New Coulomb Collision Model for PIC Codes¹ DON LEMONS,
B.J. ALBRIGHT, DAN WINSKE, Los Alamos National Laboratory — We develop a
Coulomb collision algorithm for PIC codes based on a Langevin particle pusher that
incorporates velocity sensitive collision rates. According to the algorithm, every time
step of the simulation each particle collides with all other particles in a cell where
the latter are modeled as one or more drifting Maxwellians. Thus, the collisional
particle advance is order N where N is the number of particles in the cell. Particle-
Maxwellian collisions reproduce the usual Spitzer velocity diffusion rates. Each
particle-Maxwellian collision conserves momentum exactly and energy statistically.
Energy conservation can be made exact with a linear velocity shift. Furthermore, the
time step can be either very large or very small compared to equilibration time scales.
We apply a zero-dimensional version of the algorithm to standard equilibration test
problems and compare the results to other (order N^2 and particle pairing) algorithms
exercised on the same problems.

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