Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

An Arbitrary Curvilinear Coordinate PIC Method CHRIS FICHTL, JOHN FINN, Los Alamos National Lab, KEITH CARTWRIGHT, AFRL — We demonstrate the feasibility of a new approach to the PIC method in which a grid generation strategy is coupled to a generalization of the PIC algorithm on the logical domain. Our grid generation strategy conforms to objects of arbitrary shape, eliminating such problems as stair-stepping along curved boundaries, and thus allows us to simulate complicated physical structures very accurately. We then use the mappings from the physical to the logical domain to run our PIC code. We have developed a semi-implicit particle mover for based on a generalization of the leapfrog method to arbitrary (including nonorthogonal) grids. We show our mover is symplectic and thus preserves phase-space area exactly. Extensive testing has shown that it also conserves energy to high accuracy. The electrostatic fields are solved on the logical domain using a preconditioned conjugate gradient method. We show test case results for several standard physics examples on multiple physical domains.

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Date submitted: 20 Jul 2010 Electronic form version 1.4