Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Two-Fluid Plasma Lattice Boltzmann Model JENS VON DER LINDEN, SETTHIVOINE YOU, University of Washington — A two-fluid plasma model based on lattice Boltzmann (LB) methods [1] is developed and extended to include neutrals, free vacuum boundaries and embedded solid targets. LB methods model fluids by evolving distribution functions of a discretized Boltzmann-BGK equation over a limited set of velocities. The continuum equations can be recovered with a Chapmann-Enskog expansion. Similarly the electromagnetic fields are evolved as distribution functions with moments and equilibria chosen such that multi- scale expansions retrieve Maxwell's equations. The Lorentz force couples the plasma and electromagnetic lattices. Neutrals are added with a conventional LB fluid which interacts through source and sink terms at the lattice nodes. Free vacuum boundaries are modeled with modified collisional operators to allow for free streaming in low density regions. The novel numerical tool will support experimental interpretation of a new generalized plasma relaxation experiment and a study on the innovative use of plasma jets for deflection of space targets.

[1] M. Mendoza & J. D. Munoz. (2008) Three-dimensional lattice Boltzmann model for magnetic reconnection. Phys. Rev. E 77, 026713

Jens von der Linden
University of Washington

Date submitted: 25 Jul 2011 Electronic form version 1.4