Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Magnetic Field Generation, Particle Energization and Radiation at Relativistic Shear Boundary Layers EDISON LIANG, WEN FU, JAKE SPISAK, Rice University, MARKUS BOETTCHER, Northwest University, South Africa — Recent large scale Particle-in-Cell (PIC) simulations have demonstrated that in unmagnetized relativistic shear flows, strong transverse d.c. magnetic fields are generated and sustained by ion-dominated currents on the opposite sides of the shear interface. Instead of dissipating the shear flow free energy via turbulence formation and mixing as it is usually found in MHD simulations, the kinetic results show that the relativistic boundary layer stabilizes itself via the formation of a robust vacuum gap supported by a strong magnetic field, which effectively separates the opposing shear flows, as in a maglev train. Our new PIC simulations have extended the runs to many tens of light crossing times of the simulation box. Both the vacuum gap and supporting magnetic field remain intact. The electrons are energized to reach energy equipartition with the ions, with 10% of the total energy in electromagnetic fields. The dominant radiation mechanism is similar to that of a wiggler, due to oscillating electron orbits around the boundary layer.

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Date submitted: 24 Jul 2015 Electronic form version 1.4