Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Effects of in-plane magnetic field on the transport of 2D electron vortices in non-uniform plasmas[1] JUSTIN ANGUS, ANDREW RICHARDSON, JOSEPH SCHUMER, Naval Research Laboratory, PULSED POWER TEAM
— The formation of electron vortices in current-carrying plasmas is observed in 2D particle-in-cell (PIC) simulations of the plasma-opening switch. In the presence of a background density gradient in Cartesian systems, vortices drift in the direction found by crossing the magnetic field with the background density gradient as a result of the Hall effect. However, most of the 2D simulations where electron vortices are seen and studied only allow for in-plane currents and thus only an out-of-plane magnetic field. Here we present results of numerical simulations of 2D, seeded electron vortices in an inhomogeneous background using the generalized 2D electron-magneto-hydrodynamic model that additionally allows for in-plane components of the magnetic field. By seeding vortices with a varying axial component of the velocity field, so that the vortex becomes a corkscrew, it is found that a pitch angle of around 20 degrees is sufficient to completely prevent the vortex from propagating due to the Hall effect for typical plasma parameters.

[1]This work is supported by the NRL Base Program

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Date submitted: 22 Jul 2015 Electronic form version 1.4