Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

The impact of the Hall effect on the dynamics of radial foils[1]
PIERRE GOURDAIN, JOHN GREENLY, DAVID HAMMER, BRUCE KUSSE, CHARLES SEYLER, Cornell University — Radial foils can generate high energy density plasmas with Mbar pressures on the COBRA generator. However, this experimental setup exhibits peculiar behaviors which the magnetohydrodynamics (MHD) model falls short to describe. Anode-cathode asymmetries are one clear example of non-MHD effects. The break in symmetry observed experimentally can be understood if one includes the Hall term in the Ohm's law. Under the condition of sufficiently low density in which relevant scales are of the order of the ion inertial length, the Hall term will be on the order of the **u** x **B** induction term. However any large electric field will generate a polarization current which, through the **J** x **B** force, will generate a flow in the direction of the electric field, even in regions of larger plasma densities. This additional non-MHD flow affects noticeably the plasma density, temperature and velocity in foil experiments. This research focuses on experimental results to highlight anode cathode asymmetries, showing the importance of the Hall term on plasma dynamics and the underlying instabilities that it can trigger. We will supplement experimental observations with numerical modeling using the three dimensional code PERSEUS.

[1]Research supported by the NNSA/DOE Grant Cooperative Agreement # DE-FC52-06NA 00057.

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Date submitted: 11 Jul 2011 Electronic form version 1.4