Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Numerical modeling of the Parker instability in a rotating plasma
IVAN KHALZOV, BEN BROWN, NOAM KATZ, CARY FOREST, University of Wisconsin-Madison — We study numerically the analogue of the Parker (magnetic buoyancy) instability in a rotating plasma screw pinch confined in a bounded cylinder. The goal of the study is to show the possibility of reaching the Parker instability for the plasma parameters achievable in the Madison Plasma Couette Experiment (MPCX). Simulations are performed using the extended magnetohydrodynamic (MHD) code NIMROD for an isothermal compressible plasma model. Both linear and nonlinear regimes of the instability are studied, and the obtained results are compared with analytic results for a slab geometry. It is shown that the effect of plasma rotation in a cylindrical geometry is two-fold: first, centrifugal acceleration acts as analogue of gravity and provides the equilibrium density stratification; second, the presence of Coriolis force results in increase of critical gradient of magnetic field required for the onset of instability.

Ivan Khalzov
University of Wisconsin-Madison

Date submitted: 14 Jul 2011

Electronic form version 1.4