Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Experimental evidence for MHD plasma centrifugal confinement in open magnetic field configuration CATALIN TEODORESCU, University of Maryland, RICHARD ELLIS, ADIL HASSAM, CARLOS ROMERO-TALAMAS, WILLIAM YOUNG — In the Maryland Centrifugal Experiment, the plasma is created in a shaped open-field magnetic configuration. Plasma rotation perpendicular to the magnetic field at supersonic speeds (sonic Mach number larger than unity) is controlled by an externally-applied E .$\times$ B drift. This work documents the centrifugal confinement effect produced by the plasma rotation from interferometric measurements of plasma density at the magnetic minimum (midplane) and 85 cm off-midplane. Complete time histories of density at these two locations are obtained and compared to deduce the efficacy of axial confinement. Other key parameters are also directly measured at midplane (rotation velocity profiles, ion temperature, and diamagnetic flux) and off-midplane (diamagnetic flux). The observed scaling of the average density ratio at midplane and off-midplane is obtained as a function of the shape of the magnetic field (mirror ratio) and the data are compared with the MHD (Grad-Shafranov equation) solution of the centrifugally confined density. The theory depends on the sonic Mach number and mirror ratio and the data are shown to be in agreement with the predictions of the ideal MHD equilibrium theory.

Catalin Teodorescu
University of Maryland

Date submitted: 16 Jul 2009 Electronic form version 1.4