Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Plasma Control in Symmetric Mirror Machines[1] W. HORTON, W.L. ROWAN, University of Texas at Austin, IGOR ALVARADO, National Instruments, X.R. FU, Los Alamos National Laboratory, A.D. BEKLEMISHEV, Budker Institute of Nuclear Physics, Novosibirsk 630090, Russia — Plasma confinement[2] in the symmetric rotating mirror plasma at the Budker Institute shows enhanced confinement with high electron temperatures with end plates biasing. Improved confinement is achieved by biasing end plate cells in the expansion tanks so as to achieve an inward pointing radial electric field. The negative potential well produces vortex plasma rotation similar to that in the negative potential well of Ohmic heated tokamaks. This plasma state has similarity with the lower turbulence level regimes documented in the Helimak[3] where negative biasing of the end plates produces an inward radial electric field. To understand this vortex confinement we carry out 3D simulations with nonlinear partial differential equations for the electric potential and density in plasmas with an axially localized region of unfavorable and favorable magnetic curvature. The simulations show that the plasma density rapidly adjusts to be higher in the region of favorable curvature regions and remains relatively well confined while rapidly rotating. The results support the concept of using plasma-biasing electrodes in large expander tanks to achieve enhanced mirror plasma confinement.

[1]Supported by US-DoE grant to UT, LANL and the Budker Institute for Nuclear Physics.
[2]Vortex Confinement, A.D. Beklemishev, et al. 2010.
[3]Helimak, Perez et al. PoP 2006.

W. Horton
University of Texas at Austin

Date submitted: 03 Jul 2014 Electronic form version 1.4