Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Suppression of cross-field diffusion resulting from biased rotation of a cylindrical plasma[1] J.E. MAGGS, T.A. CARTER, R.J. TAYLOR, UCLA — Results reported here are from experiments conducted in the LAPD at the BaPSF (Basic Plasma Science Facility). The LAPD produces a cylindrical, 17 meter long, plasma column using an electron beam emitted from an oxide coated cathode. The configuration used in these studies is a helium plasma with a uniform axial magnetic field. The plasma surrounding the main plasma core is rotated by externally applying a bias between an electrically floating section of the vacuum chamber wall and the cathode. The rotating plasma reaches a steady state within 1-2 t_c after the application of the bias, where t_c is the parallel particle confinement time, L/c_s. The edge gradient is observed to dramatically steepen due to the application of the bias. The unbiased plasma column exhibits an extended edge gradient with a scale length of about 100 ion gyro-radii, while the biased plasma can exhibit gradient scale lengths as small as 5-10 ion gyro-radii. End losses in the cylindrical plasma play a dominant role in the plasma dynamics, and the extended radial profile observed in the unbiased plasma requires cross-field particle diffusion at Bohm rates. The profile steepening observed in the rotating, biased plasma is consistent with complete suppression of anomalous cross-field particle diffusion.

[1]work supported by NSF/DOE basic plasma partnership

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Date submitted: 24 Jul 2005 Electronic form version 1.4