Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Those Ubiquitous Trapped-Particle-Mediated Transport and Damping Effects[1] C.F. DRISCOLL, A.A. KABANTSEV, UCSD — Trapped-particle-mediated (TPM) transport and damping effects often dominate in long pure electron plasmas with low collisionality, even though only a few percent of the particles are trapped by weak magnetic ripples ($\delta B/B \sim 10^{-3}$), or by wall voltage variations ($\delta V_w \sim 0.1$ Volt). Plasma rotation or other currents cause strong phase-space discontinuities at the trapping separatrix, so small velocity scatterings cause large changes in particle orbits and energy. Initial theory work shows that TPM effects scale with the square root of the electron-electron collisionality, so they dominate for low collisionality. To date, TPM experiments have characterized damping of electron plasma modes (adjacent abstract), and damping of the novel "trapped particle diocotron modes." When confinement θ-asymmetries are also present, TPM effects produce strong particle transport and strong damping of conventional diocotron modes. The observed rates for all these processes are related by simple scalings for magnetic field, electron density, and asymmetry strength, since they are all caused by the same separatrix crossings. However, these strikingly simple experimental signatures are only partially understood theoretically.

[1]Supported by NSF PHY-0354979.

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Date submitted: 25 Jul 2005 Electronic form version 1.4