Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

A Novel Damping Mechanism for Diocotron Modes[1] CHI YUNG CHIM, THOMAS M. O'NEIL, UCSD — Recent experiments with pure electron plasmas in a Malmberg-Penning trap have observed the algebraic damping of $m = 1$ and $m = 2$ diocotron modes.[2] Transport due to small field asymmetries produces a low density halo of electrons moving radially outward from the plasma core, and the mode damping begins when the halo reaches the resonant radius, where $f = mf_{E\times B}(r)$. The damping rate is proportional to the flux of halo particles through the resonant layer. The damping is related to, but distinct from spatial Landau damping, in which a linear wave-particle resonance produces exponential damping. This poster explains with analytic theory and simulations the new algebraic damping due to both mobility and diffusive fluxes. The damping is due to transfer of canonical angular momentum from the mode to halo particles, as they are swept around the "cat's eye" orbits of resonant wave-particle interaction. Another picture is that the electrons in the resonant layer form a dipole ($m = 1$) or quadrupole ($m = 2$) density distribution, and the electric field for this distribution produces $E \times B$ drifts that symmetrizes the core and damps the mode.

[1]Supported by NSF/DOE Partnership grants PHY-0903877 and DE-SC0002451.
[2]A.A. Kabantsev *et. al.*, Phys. Rev. Lett. **112**, 115003, 2014. See also the invited talk by C. F. Driscoll.

Chi Yung Chim
Retired

Date submitted: 11 Jul 2014 Electronic form version 1.4