Abstract Submitted
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A Novel Damping Mechanism for Diocotron Modes[1] C.Y. CHIM, T.M. O'NEIL, UCSD — Recent experiments with pure electron plasmas in a Malmberg-Penning trap have observed the algebraic damping of $m = 2$ diocotron modes.[2] Transport due to small field asymmetries produces a low density halo of electrons moving radially outward from the central plasma core, and the mode damping begins when the halo reaches the resonant radius of the mode [i.e., where $\omega = m\omega_{E\times B}(r)$]. Here we propose a theoretical explanation for the damping using conservation of canonical angular momentum. As the wave sweeps halo electrons across the resonant layer, it imparts canonical angular momentum to the electrons, and in response the wave angular momentum decreases, that is, the wave damps. An alternative more mechanistic picture of the process is that the electrons in the resonant layer form a quadrupole density distribution, and the electric field from this quadrupole produces $\mathbf{E} \times \mathbf{B}$ drift motion that symmetrizes the surface of the plasma core, that is, damps the mode.

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[2]A.A. Kabantsev, T.M. O'Neil and C.F. Driscoll, NNP 2012 Workshop, Greifswald; AIP Conf. Proc. **1521**, 35-42 (2013).

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