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Nonlinear Coupling of Plasma Waves Modified by Separatrix Dissipation[1] A.A. KABANTSEV, C.F. DRISCOLL, T.M. O'NEIL, UCSD — Quantitative measurements of the nonlinear coupling of diocotron modes characterize both the expected conservative coupling term and a new term arising from separatrix dissipation. Here, the pure electron plasma columns have a controllable axial trapping separatrix created by an applied θ-symmetric wall "squeeze" voltage. Prior experiments[2] established that this separatrix 1) enables and damps the "Trapped Particle" diocotron mode, and 2) damps $m_\theta \neq 0$ $k_z \neq 0$ plasma modes; and, in combination with external θ-asymmetries, 3) damps $m \neq 0$ $k = 0$ diocotron modes, and 4) causes enhanced bulk plasma expansion and loss. The present experiments observe the resonant interaction between the traditional $m=2$ $k=0$ diocotron mode and the $m=1$ TP diocotron mode. The initial parametric decay of $m=2$ into $m=1$ is adequately predicted by the conservative nonlinearity arising from the continuity equation. However, the late-time evolution clearly requires (and quantifies) a dissipative nonlinear term which is not yet understood theoretically. This same dissipative coupling is also observed for *non-resonant* interactions, as in bulk plasma transport from field errors.

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[2]A.A. Kabantsev and C.F. Driscoll, *Phys. Rev. Lett.* **97**, 095001 (2006).

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