Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Spatial Landau Damping of Diocotron Modes Caused by a Particle Flux[1] C.F. DRISCOLL, A.A. KABANTSEV, T.M. O'NEIL, UCSD — Diocotron modes exhibit a novel *algebraic* (not exponential) damping when there is a flux of particles through the spatial resonance layer. Here, a magnetized pure electron column with density $n(r)$ and drift rotation $f_E(r)$ exhibits $m = 1, 2$ diocotron mode frequencies $f_m \sim \langle f_E \rangle [(m-1) + (R_p/R_w)^{2m}]$. *Exponential* mode damping is predicted (and observed) due to spatial Landau damping at the resonance layer where $f_E(r_s) = f_m$; but with small $n(r_s)$ this damping may saturate due to wave-particle trapping. In contrast, when background asymmetries cause (slow) plasma expansion and a (weak) radial particle flux Γ through r_s, the diocotron mode damps to zero algebraically with time, as $A_m(t) = A_m(0) - \gamma_m t$. Experiments and nascent theory show damping rates proportional to the radial particle flux Γ through the relevant separatrix, with $\gamma_m \sim \Gamma$. For $m = 1$, Γ represents particles lost to the wall; but for $m = 2$, even a small plasma expansion can cause strong damping. This algebraic damping will be compared to the exponential growth (or damping) observed from resistive (or feed-back) wall voltages, from neutral collisions, and from axial ejection (or injection) of electrons.

[1]Supported by NSF grant PHY-0903877 and DOE DE-SC0002451.

C.F. Driscoll
UCSD

Date submitted: 16 Jul 2012 Electronic form version 1.4