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**Spatial Landau Damping of Diocotron Modes in Nonneutral Disc Plasmas.**[1] J.C. QUINN, D.H.E. DUBIN, UCSD — We study the $\mathbf{E}\times\mathbf{B}$ dynamics of a thin disc of charge confined in a cylindrical Penning trap. The axial extent (thickness) of the disc is assumed to be negligible. An eigenvalue equation for density perturbations of the form $\delta n(r)\exp(im\theta)$ is obtained by linearizing the 2d equations of motion. A complete set of eigenmodes can be found numerically for an arbitrary equilibrium density profile, and were found analytically for the special equilibrium density profile of a flattened spheroid that rotates rigidly. In general, for a given $m$ there are a finite number of discrete (undamped) $\mathbf{E}\times\mathbf{B}$ drift eigenmodes, which are generalizations of diocotron modes. There is also an infinite continuum of eigenmodes, which can lead to spatial Landau damping of initial density perturbations. We find the damping rate using three methods: Landau contour integration, a conservation of canonical angular momentum argument, and by expressing an initial perturbation as a wave packet of continuum eigenmodes. The results of the three methods match closely. A preliminary analysis of the effects of non-zero temperature and length has also been done, and experiments to observe these modes are in progress.

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