

Transverse Coupled Bunch Mode Growth due to Photoelectron Trapping in the CESR Vacuum Chamber^{*}, T. HOLMQUIST, J.T. ROGERS, Lab. of

Nuclear Studies, Cornell Univ. - An anomalous damping or growth of transverse coupled bunch modes is observed¹ in CESR. The growth rates and tune shifts of these modes are a highly nonlinear function of current. The effect is associated with the operation of the distributed ion pumps and disappears when the pumps are not powered. We show that this effect is due to the presence of electrons trapped in the CESR chamber by the field of the dipole magnets and the electrostatic leakage field of the distributed ion pumps. Photoelectrons are introduced into the chamber by synchrotron radiation and can be ejected from the chamber by the passage of an e^+ or e^- bunch. The transverse position of the beam thus modulates the trapped photoelectron charge density, which in turn deflects the beam, creating growth or damping and a tune shift for each coupled bunch mode. We have successfully simulated this process numerically.

* This work has been supported by the U.S. National Science Foundation.

1 L.E. Sakazaki, R.M. Littauer, R.H. Siemann and R.M. Talman, IEEE Trans. Nuc. Sci. 32 (1985) 2353.