Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Assessing confinement limitations and scaling for a toroidal electron plasma using the m=1 diocotron frequency D. P. RYAN, BAO HA, M. R. STONEKING, Department of Physics, Lawrence University, Appleton, WI 54911 — Confinement issues for toroidal electron plasmas are experimentally addressed using the Lawrence Nonneutral Torus. Electron plasmas confined in a partially toroidal trap ($B = 200$G, $R_0 = 43$cm $a = 5$cm) exhibit an unstable $m = 1$ diocotron mode. Suppression of this mode is necessary to prevent plasma loss via scrape off on the wall. By detecting the flow of image charge to and from a wall probe, an active feedback circuit suppresses the growth of the mode, extending the confinement time to the order of 40ms. By modulating the feedback and allowing small amplitude diocotron oscillations to grow, measurement of the evolution of the total charge is made. This technique is non-destructive and implies an initial charge of 12nC or a mean density of 5×10^6cm^{-3}. The effects of the magnetic field on the confinement time and charge evolution were measured by scanning the field strength between 100G and 200G. Stronger magnetic fields yielded longer confinement times. Data was also taken for pressures between 2.0×10^{-7} Torr and 1.2×10^{-5} Torr. Higher pressures resulted in less trapped charge. This work is supported by NSF and USDOE.

Duncan Ryan
Lawrence University

Date submitted: 20 Jul 2005

Electronic form version 1.4