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Confinement Time Exceeding One Second in a Toroidal Electron Plasma M.R. STONEKING, J.P. MARLER, BAO HA, J.C. SMONIEWSKI, Lawrence University — Pure electron plasmas ($n = 2 \times 10^7$ cm^{-3}, $a = 1.27$ cm, $R_p = 17.4$ cm) are confined for times exceeding one second in a new toroidal device, the Lawrence Non-neutral Torus II. The plasma is trapped in a 270° toroidal arc by application of gate potentials to sections of a sectored gold-plated toroidal boundary ($b = 3.81$ cm, $R_0 = 18$ cm). At base vacuum pressures below 10^{-8} torr and magnetic field strengths approaching 700 gauss, the $m = 1$ diocotron mode is excited by applying several cycles of rf near the resonant frequency to a section of the wall. The $m = 1$ frequency, which is approximately proportional to the trapped charge, decays on a three second timescale, a confinement time that exceeds by at least an order of magnitude the confinement observed in all other toroidal traps for non-neutral plasmas. Numerical simulations that include toroidal effects are employed to accurately extract plasma charge and $m = 1$ mode amplitude from the experimental data. Future work will include attempts to withdraw the electron source in order to study confinement in a full torus. This work is supported DOE-NSF Grant 0317412.

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