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Attempts to launch and detect the $m = 2$ diocotron mode in a toroidal electron plasma J. SMONIEWSKI, M.R. STONEKING, BAO HA, Lawrence University — The Lawrence Non-neutral Torus II (major radius = 17.4 cm, minor radius = 1.27 cm, B $\sim$ 700 G) traps electron plasmas in a purely toroidal magnetic field with confinement times exceeding one second. The observed long confinement times indicate the production of nearly steady state conditions and permit study of intrinsic toroidal effects on dynamics and transport. The plasma is diagnosed by measuring the flow of image charge to and from isolated sectors of the fully segmented conducting shell. Electron plasmas (n $\sim 10^7$ cm^{-3}) are confined and exhibit toroidal versions of diocotron modes. The $m = 1$ mode has been observed and is very similar to the mode observed in cylindrical traps. Numerical modeling including toroidal effects yields the total charge in the plasma from the frequency of the $m = 1$ mode. We will report on the ongoing effort to experimentally observe the $m = 2$ mode, and to numerically model the mode in toroidal geometry. Measurement of the $m = 2$ mode frequency will determine average charge density, which in combination with the total charge information obtained from the $m = 1$ mode frequency will permit measurement of radial transport rates. This work is supported by the National Science Foundation.

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