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Experimental Investigation of Rotational, Pumping, Magnetic Pumping and Toroidal Asymmetry Modes in a Toroidal Electron Plasma[1]
A.R. DOARES, K. WANG, A.S. PATTERSON, M.R. STONEKING, Dept. of Physics, Lawrence University, Appleton, WI 54911 — Electron plasma is confined with a purely toroidal magnetic field in the Lawrence Non-Neutral Torus II (R_0 =18 cm, $a \sim 2$ cm), for times (~ 1 s) that are much longer than any of the dynamical timescales of the system. The experiment can be operated as a variable-length partial torus or a full torus trap. The damping rate for the m =1 diocotron mode in a partial torus trap is found to depend on the equilibrium position (major radius) and on magnetic field (150 G – 550 G). We report on efforts to explain these results in terms of rotational and magnetic pumping effects using 3D (Poisson-Boltzmann) equilibria calculations. Novel full torus asymmetry modes are examined with multiple separatrices and a new charge tomography is developed to infer charge density from image charge measurements on the conducting boundary.

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