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Pure Electron Equilibrium and Transport Jumps in the Columbia Non-neutral Torus M. HAHN, T. SUNN PEDERSEN, Q. MARKSTEINER, J. BERKERY, P.W. BRENNER, Columbia University — CNT is a simple stellarator being used to study pure electron plasmas. The dependence of the equilibrium on the location of the electron source has been studied. When the emitter is displaced from the magnetic axis the equilibrium on the inner surfaces is consistent with a global thermal equilibrium, as demonstrated by comparing measurements with the results of a numerical equilibrium solver. The equilibrium of a pure electron plasma depends on electrostatic boundary conditions. Recently a conducting boundary conforming to the last closed flux surface was installed. Experimental studies have been done to characterize the equilibrium with this new boundary condition and compare it to the results with the non-conforming boundary. For an internal emitter in a steady state plasma the loss rate of electrons is the same as the total emission current. As parameters are varied to increase transport abrupt jumps in the emission current occur at particular currents. The jumps imply discontinuous changes in the confinement time and are accompanied by measureable changes in the equilibrium. Using multiple emitters it has been shown that the jumps occur at the local emission current not the total transport rate, which strongly suggests that the jumps are caused by a cathode instability. Supported by NSF-DOE grant NSF-PHY-04-49813.

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