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Pure Electron Equilibrium and Transport Jumps in the Columbia Nonneutral Torus M. HAHN, T. SUNN PEDERSEN, Q.R. MARKSTEINER, J.W. BERKERY, Columbia University — The Columbia Non-neutral Torus (CNT) is a simple stellarator, which is being used to study electron rich plasmas. At very low neutral pressures the plasmas are pure electron plasmas. The equilibrium depends on electrostatic and transport effects.The dependence of the equilibrium on the characteristics of the electron source have been studied. The plasma may be created by a single negatively biased filament either on or off the magnetic axis, or by multiple filaments. The toroidal location of the emitter has also been varied. Because of the large toroidal variations of the magnetic field strength in CNT the toroidal location affects the ratio of passing versus trapped particles, which affects transport. For an emitting filament within the plasma the loss rate of electrons from the plasma is the same as the emission current. As parameters that increase transport are varied abrupt jumps in emission current occur. These jumps imply discontinuous changes in the confinement time. The jumps occur at specific values of the emission current, i.e. at specific transport rates. Other parameters that affect transport, such as neutral pressure and magnetic field strength, only affect the jumps to the extent that they affect transport. The jumps show hysteretic behavior indicative of regions in the current-voltage characteristic of the plasma-diode system with negative differential resistance.

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