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Numerical Studies of Transport in the Columbia Non-neutral Torus[1] BENOIT DURAND DE GEVIGNEY, THOMAS SUNN PEDERSEN, ALLEN H. BOOZER, Columbia University — The Columbia Non-neutral Torus (CNT) is a stellarator dedicated to the study of non-neutral plasmas on magnetic surfaces. Due to space charge imbalance such plasmas exhibit a very large radial electric field. With ideal electrostatic boundary conditions the induced $\vec{E} \times \vec{B}$ rotation balances the radial magnetic drifts and closes the orbits. However the confinement of trajectories is sensitive to the boundary conditions at the plasma edge and variations in the electric potential on magnetic surfaces, inherent to the CNT equilibrium, can lead to bad orbits. In addition, probes within the plasma in many CNT experiments create very localized potential variations leading to $\vec{E} \times \vec{B}$ plasma flow out of the confining region. A Monte Carlo code was written to integrate the electron drift trajectories and to evaluate both neoclassical transport and losses due to unconfined trajectories. This code coupled with a plasma equilibrium code for the electric potential has shown the sensitivity of unconfined trajectories to the electrostatic potential at the plasma edge as well as to the internal probes. The numerical results have been parameterized in terms of magnetic field strength, electron-neutral collisions, and the number of Debye lengths in the plasma.

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