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Numerical Studies of Transport in the Columbia Non-Neutral Torus BENOIT DURAND DE GEVIGNEY, THOMAS SUNN PEDERSEN, ALLEN H. BOOZER, Columbia University — The confinement of pure electron plasmas in the Columbia Non-neutral Torus (CNT) stellarator is limited by the presence of internal probes and electron-neutral collisions. The probes can be removed, so the transport of fundamental interest is the neoclassical transport associated with the electron-neutral collisions. This transport depends on the distance the electron trajectories deviate from the magnetic surfaces. The magnetic fields in CNT have not been optimized to minimize the deviation of trajectories from the surfaces. The reason is the electric potential is very large compared to the temperature, and the $E \times B$ drift dominates the magnetic drifts. In particular, the variation in the electric potential across the magnetic surfaces greatly reduces the radial drift of the electrons. However, unlike the situation in a quasi-neutral plasma, the electric potential also varies within the surfaces, which adds to the complexity of the trajectories and can increase the radial drifts. We have written a code using magnetic coordinates to integrate the electron drift trajectories in the electric and magnetic fields expected in CNT equilibria. A Monte-Carlo code including both electron-electron collisions and electron-neutral collisions will be used to determine if the plasma transport in CNT is neoclassical, how it depends on the electron density and how it is affected by the potential not being a function of flux only.

Benoit Durand de Gevigney
Columbia University

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