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Pure Electron Equilibrium Experiments in the CNT Stellarator
J.P. KREMER, T. SUNN PEDERSEN, R.G. LEFRANCOIS, Q. MARKSTEINER, J. BERKERY, M. HAHN, Columbia University — CNT is a simple stellarator designed to study non-neutral, partly neutral and positron-electron plasmas on magnetic surfaces. Pure electron plasmas are currently being studied. These plasmas are created by a single negatively biased, tungsten filament on the magnetic axis. Plasmas are also diagnosed by tungsten filaments — when heated these filaments act as emissive probes and when cold, Langmuir probes. Local plasma potential, temperature and density are measured from probe filament I-V characteristics. The CNT device, diagnostics and measurement techniques will all be described.
Particle confinement times of $\tau_c \approx 20\,\mathrm{ms}$ have been measured, limited by the presence of bulk insulating materials in the confining region. These plasmas are in macroscopically stable equilibrium. Radial equilibrium potential, temperature and density profiles have been measured. $N \approx 10^{11}$ particles have been confined corresponding to an average density of $n_e \approx 10^{12}\,\mathrm{m}^{-3}$. The temperature profiles are flat through most of the confining region at $T_e \approx 5\,\mathrm{eV}$. These measurements of n_e and T_e indicate that relatively cold, small Debye length plasmas have been created. Comparisons between experimental profile measurements and numerical predictions have shown good agreement. These experiments, their results and comparisons to numerical predictions will be discussed.

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