Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Creation of pure electron plasmas in a stellarator using internal, multifilament emitters[1] QUINN MARKSTEINER, THOMAS SUNN PEDERSEN, JASON P. KREMER, REMI LEFRANCOIS, Columbia University — Pure electron plasmas have been created by injecting electrons from a set of tungsten filaments held inside the magnetic surfaces of the CNT stellarator. By changing the negative bias on these emitters as well as the voltage drop across each filament, we can control the plasma potential profile, allowing us to explore its effects on plasma confinement, density profile, temperature, and stability. First results have shown that the physical design of the electron emitter also strongly affect the plasma parameters. By simply reducing the length of the tungsten filaments and the amount of exposed metal, we observed an increase by a factor of two in confinement time. The insulating ceramic rods contribute significantly, perhaps dominantly, to particle losses. An order of magnitude calculation shows that the rod charges up negative and becomes self-shielding on a microsecond timescale, and that the ExB drifts in the vicinity of the rod from this self-shielding leads to convective transport across the surfaces. We will present a detailed discussion of the importance of the emitter design and operation on plasma parameters, and discuss theoretical estimates and experimental measurements of the cross-field losses due to insulating rods penetrating deep into the plasma.

[1]Supported by DOE Grant # No. DE-FG02-02ER54690.

Quinn Marksteiner
Columbia University

Date submitted: 22 Jul 2005 Electronic form version 1.4