First non-neutral plasmas created with 4-filament emitter

Method:
- 4 Filament heated and biased to emit electrons
- 3 Filaments used as emitting floating probes

Results:
- Electrons fill the volume
- Electron inventory ~10^3
- Slows ion accumulation
- Confinement improves with lower neutral pressure and higher magnetic field, and appears to degrade at higher bias voltages

3-D numerical equilibria in CNT geometry

Theory
- Low density: \( n \ll c_B \sqrt{\varepsilon_0 m} \)
- Electron fluid force balance
- \( \nabla \cdot F_e = -e n_e \left( c_B \frac{\varepsilon_0}{m} \right) \nabla \Phi \)
- Temperature equilibration along field lines and self-consistency with Poisson equation:
  \( \varepsilon_0 \Phi - \varepsilon_0 \rho_{\text{trapping}} \left( \frac{\nabla \Phi}{\varepsilon_0} \right) \)
- Solved in 2D and 3D using a pseudospectral method on a cartesian grid, and a method of image charges for BC.

Large poloidal and toroidal density variations seen for ~1cm Debye length.
Potential variations much smaller.