# Possibilities for a CHI Simulation Study with NIMROD

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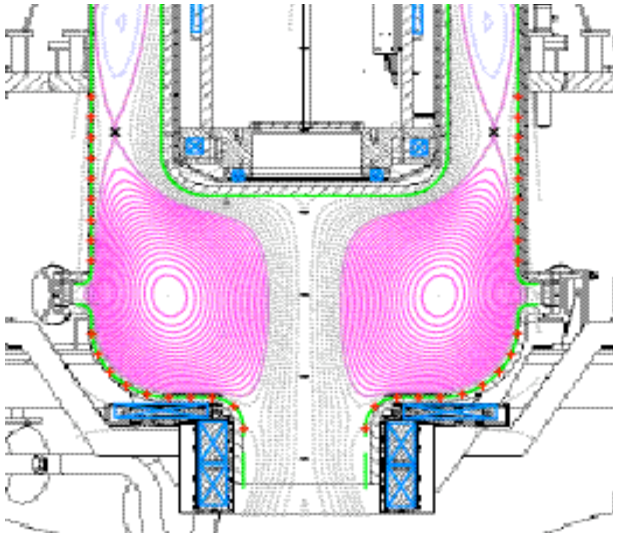
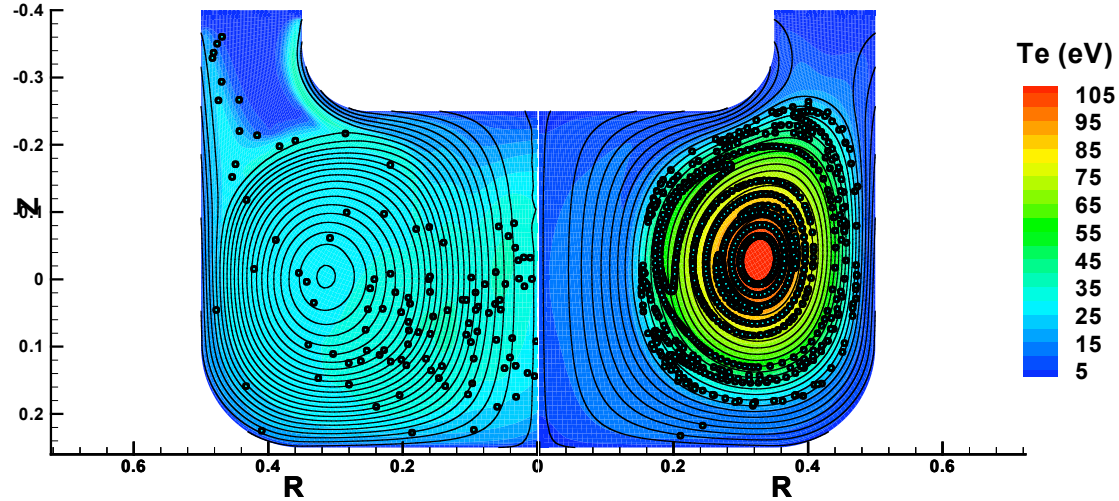
- Goals:
  - Provide basic information on 2D dynamics as CHI is applied in STs with and without Ohmic drive.
  - Investigate CHI-driven MHD activity and poloidal flux amplification and determine whether it is important/desirable for startup.
  - Optimize CHI startup for Ohmic drive (resources permitting).
- Available NIMROD (http://nimrodteam.org) features:
  - Flexible geometry
  - Collisional anisotropic heat transport (*T*-dependent coefficients)
  - *T*-dependent resistivity / Ohmic heating
  - Open or closed magnetic topology
  - Ohmic and DC current drive
- Easy extensions:
  - Absorber boundary for CHI in a torus
  - Time-dependent vertical field
- Longer-term extensions
  - Two-fluid effects (part of SCIDAC development)
  - Atomic effects
- Plan:
  - Start with geometry and absorber for HIT-II
  - Compare simulations with HIT-II results to assess physics modeling
  - Move to relevant NSTX CHI start-up modeling

# Simulations of SSPX Demonstrate Important Features

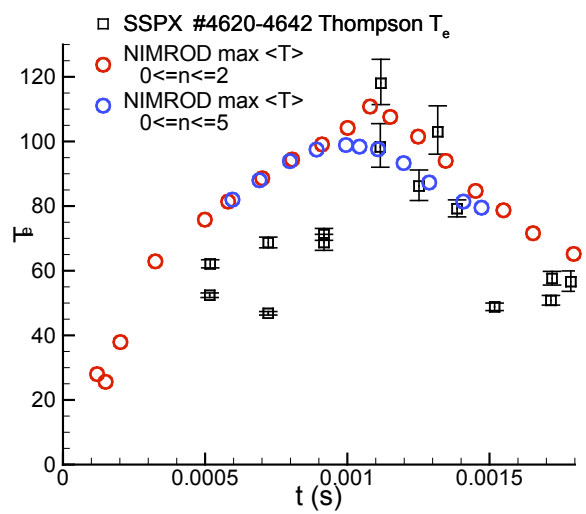
- Realistic geometry and DC injection in comprehensive simulations of the SSPX 4620-4644 discharge series.



SSPX schematic and CORSICA poloidal flux reconstruction overlay.




NIMROD results on poloidal flux (solid lines), magnetic topology (punctures), and temperature profiles (color) during initial formation (left) and partial drive (right).

- Three-dimensional MHD evolution with strong coupling to transport physics.

Simulation results for peak temperature as a function of time are plotted along with Thompson-scattering measurements from SSPX in the figure to the right. [SSPX data courtesy of H.S. McLean.]