3D Plasma Response Data for MHD and Transport Code Validations

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NSTX-U Research Forum 2015
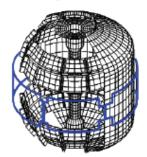Macroscopic Stability
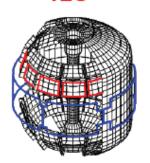Topical Science Group

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GENERAL ATOMICS

Goal: Acquire NSTX-U Plasma Response Data Using the Ex-vessel RWM/EC Coil with Individual SPAs on Each Coil Loop

- **NSTX-U RWM/EC plasma response data can be used to:**
  - Compare with results from other machines such as DIII-D, MAST, JET, etc.
  - Test theoretical transport and stability models
  - Validate numerical simulation
  - Provide guidance for developing ITER operating scenarios with 3D coils
  - Develop advanced RMP pedestal control concepts
  - Provide input for the NSTX-U NCC design activity
- **RWM/EC plasma response measurements are needed in FY15 to:**
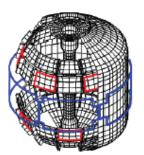 - Make a decisions on which NCC FY17 reduced coil option to implement
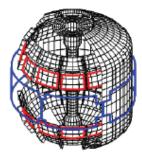

Midplane   *12U*   *2x6-Odd*   *2x12*

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Plan: Use Individually Powered RWM/EC Coil Loops to Scan Configurations with Full and Partial Sets of Coil Loops

- **High rotation H-modes:**
  - Determine maximum stable n=1, 2 and 3 coil currents
  - Dynamic toroidal phase scans at maximum stable n=1 and 2 coil currents
  - Toroidal phase flips at maximum stable n=3 coil current, f_{flip} 5->50 Hz
  - Document best n=1, 2 and 3 cases
- **Reduced rotation H-modes (lower NBI acceleration voltage):**
  - Repeat best cases form high rotation H-mode discharges
  - Document best low rotation case with n=1, 2 and 3 perturbations
- **L-mode comparison discharges**
  - Compare best H-mode cases to low power L-mode cases
- **Extensive diagnostic coverage is required for the best possible results**
  - Key systems include:
    - Calibrated high n magnetics, pedestal and divertor measurements, toroidal and poloidal CHERS, fluctuation measurements, reflectometry, Thomson scattering, MSE, line density, recycling and impurity measurements

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