# Status of Boundary Condition Work in NIMROD

- Numerical reimplementation of boundary conditions in NIMROD complete
  - Benchmarks underway
- Numerical conversion of VACUUM matrices from Fourier basis functions to finite-element matrix needs to be done

# Targeted applications for NIMROD using non-homogeneous B.C.

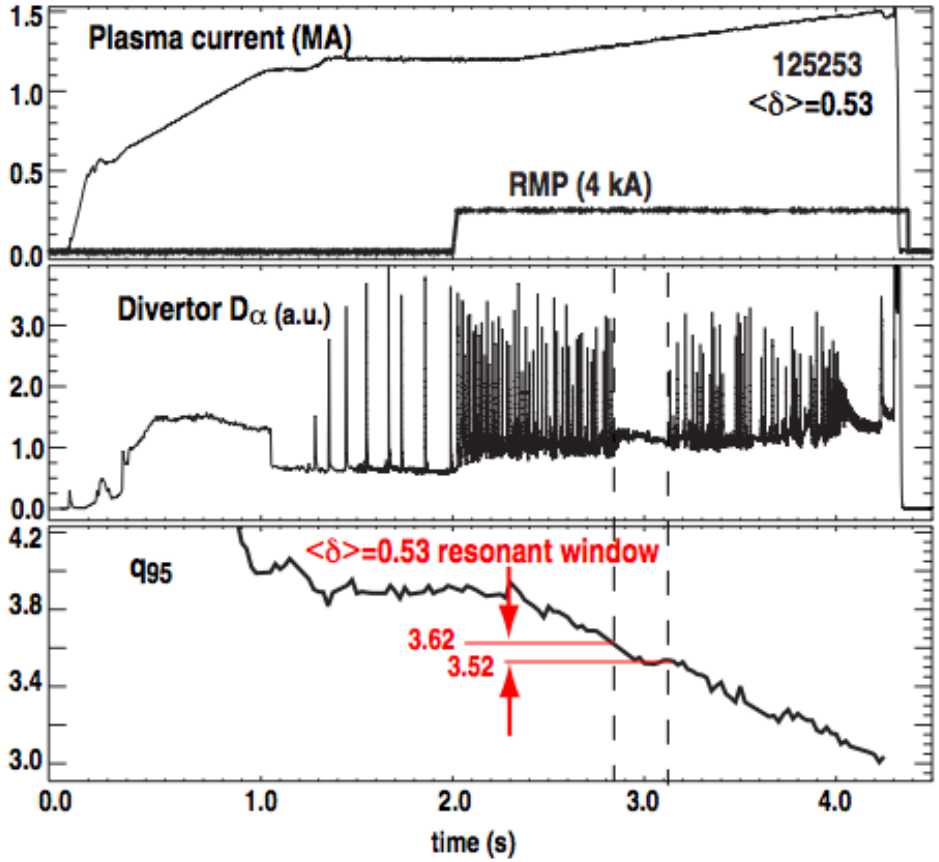
- Resonant Magnetic Perturbation (RMP) Experiments
  - Apply perturbation to plasma using coils. Has demonstrated suppression of ELMs
- Resistive Wall Modes
  - Ideal modes that are stable to a perfectly conducting wall, are allowed to grow due to the finite resistivity of the walls
  - Near ideal boundary, intrinsic fields become larger (Field Error Amplfiication) and interact with tearing modes
- Locked modes
  - Rotating islands slow down due to interaction with field errors, grow, and cause problems

# Tokamak Experimental Collaborations Have Been Established

- Resonant Magnetic Perturbation (RMP) Experiments
  - Valerie Izzo (UCSD @ GA) has begun simulations (see Sherwood poster)
  - Ilon Joseph (UCSD) post-doc working with R. Moyer and T. Evans will do slab geometry studies using NIMROD
  - E. Held (USU) will do near-term transport studies based on cases from the RMP JEM group.
- Resistive Wall Modes
  - H. Remeirdes and A. Garafalo have provide a series of equilibria (beta scan)
  - Cases have been studied with MARS and will serve as benchmark cases
  - Ming Chu has provided some inverse equilibria cases, but getting vacuum fields would require some work

# Different Experimental Issues in Different Regimes

- Resistive wall modes
  - Experimentally static error fields known to be important
- RMP Experiments
  - Field-error penetration problem
- NTM Seeding
  - Forced reconnection problems



# Taylor Problem Canonical Problem For Studying Effects of Boundary Perturbations

- Start with stable slab plasma
- Perturb boundary by adding sinusoidal displacement
- Island forms

- Well studied in literature. A sampling:

  Hahm and Kulsrud, Phys. Fluids **28**, 2412 1985.
  - Analytic studies of problem

  Wang and Bhattacharjee, Phys. Fluids B **4**, 1795 1992.
  - Analytic studies of problem with flow

  Ma, Wang, and Bhattacharjee, Phys. Plasmas **3**, 2427 1996.
  - Numerical studies of problem with flow

  Fitzpatrick, Phys. Plasmas **11**, 937 2004.
  - Analytic and numerical studies with Hall MHD

  Fitzpatrick, Phys. Plasmas **10**, 1782 2003.
  - Extended problem to study field-error penetration problem