NSTX

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Update on HHFW Theory and Modeling Activities for NSTX

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NSTX Research Forum - PPPL
December 1-3, 2009

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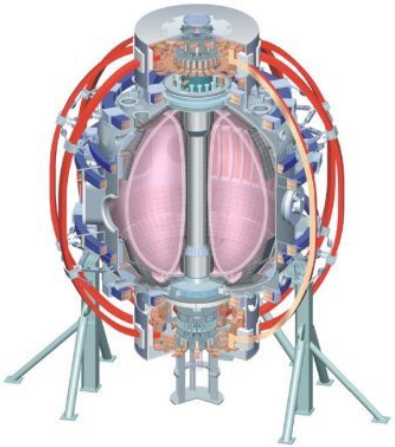

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Near-term modeling efforts will focus on code verfication for combined RF and NBI plasmas

- Resolve remaining differences between AORSA, GENRAY and TORIC, particularly for plasmas with fast ions *[(C. K. Phillips with R. W. Harvey and Y. Petrov (CompX); E. F. Jaeger (ORNL); and P. T. Bonoli & J. C. Wright (MIT)]:*
  - Verify that codes are using:
    - ➟ *the same equilibrium and edge conditions;*
    - ➟ *consistent definitions of coordinate systems and mode numbers.*
  - TORIC currently predicts more ion damping than AORSA or GENRAY
    - ➟ *Verify conductivity formulation for large* ($k_\perp \rho_i$)
- Benchmark codes for HHFW-only heating L-mode and H-mode discharges
  - Compare predictions for electron power deposition against that inferred from Thomson Te response to rf power notches

Near-term efforts will also focus on developing models for rf edge interactions

- Improve edge profile treatment in 2D reconstructions of wave fields, including regions beyond the separatrix, using AORSA *[D. Green, ORNL]*
  - Extend 2D reconstructions of wave fields to 3D and include Poynting flux in reconstructions
  - Add collisional dissipation to models – may be important in edge

- Utilize GENRAY to explore wave propagation in common flux regions (outside separatrix) and edge regions *[Harvey and Petrov, CompX]*

- Begin studies of wave propagation near antenna using time-domain codes and realistic model for NSTX antenna (PIC codes; VORPAL, etc) *[D. Smithe, Tech-X]*

- Continue detailed comparisons of PDI observations with 1D nonlinear AORSA simulations *[G. Chen, ORNL]*

Longer term efforts will focus on improved models for TRANSP analysis, and CAE-modes

- TORIC is available in TRANSP for RF only discharges
  - TRANSP Modules are inadequate for combined NBI and HHFW heating because the Monte Carlo beam package can not communicate with TORIC
    - RF terms for NUBEAM have been programmed but not debugged
    - Revisit choice of RF Monte Carlo operator for NUBEAM
    - Explore possible simplified short-term fixes
  - Implementation of new parallel solver in TORIC to allow strong scaling with low processor number ($N_p \approx 32$-64) ***[J. P. Lee, MIT]***
    - Will significantly reduce run times In TRANSP (run 127 modes in time comparable for 31 modes with current algorithm)
- Determine if short wavelength mode seen in TORIC and AORSA simulations is real and if it can be identified in the experimental observations