NSTX

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HHFW Modeling Directions

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Theory & Computation Brainstorming
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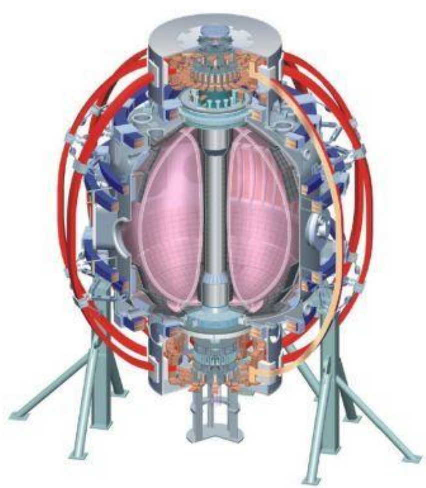

NSTX HHFW Experiments show RF power losses in the scrape off layer ➡ need predictive model

Initial AORSA studies show rf wave excitation in SOL but power absorption details unclear

Models to compare to measurements

GENRAY + SOL model + collisions + scattering model

➡ rays follow power flow in 3D
  - compare to field-line mapping studies by R. Perkins et al

➡ include collisions as well as kinetic effects to estimate linear rf power losses in SOL as opposed to divertor and vessel wall

➡ revisit importance of scattering effects on power loss
  - adapt and implement advanced scattering model used for LH
  - compare to experimentally inferred power losses in SOL

Develop finite element method (FEM) code for edge and couple to core full wave solver

➡ better spatial resolution and inclusion of 3D equilibrium effects

➡ may provide better core to edge modeling in cold startup plasmas

Experiments show that HHFW interactions modify fast ion distributions ➡ zero orbit width models inadequate

Ongoing comparisons have found differences between observations (eg. FIDA) and models

Improvements needed and future applications

Generalize TORIC-HHFW to include non-Maxwellian ions

➡ nearly complete; will compare to AORSA

Couple CQL3D-FOW to TORIC-HHFW to model combined HHFW+NBI heating and redo comparisons to FIDA

➡ build CQL3D-FOW into TRANSP for time-dependent analysis

Analyze HHFW effects on unstable fast ion distributions

➡ compare qualitatively to observed changes in EPM dynamics

➡ collaboration with EP group (Fu, Breslau et al).

Couple TORIC-HHFW with SPIRAL code

➡ model HHFW affects on EPMs and compare to observations evaluate HHFW resonance overlap and examine data for evidence of stochastic in heating(e.g. anomalous loss or heating)