NSTX

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NSTX Research Forum FY2010
Transport and Turbulence Topical Science Group
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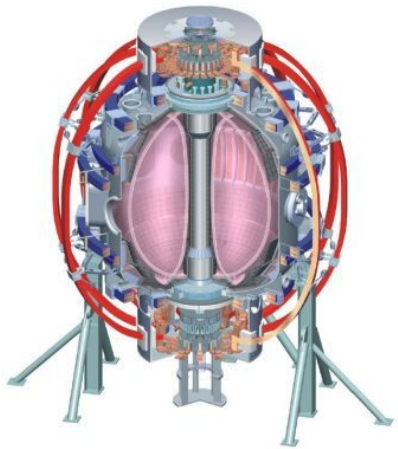

Characterization Of Intrinsic Torque Using NBI Torque Transients

- Goals
  - Infer the effective torque associated for driving intrinsic rotation.
  - Further investigate and characterize the previously observed "edge rotation clamping"
- Plan
  - Step torque down and follow angular momentum evolution to determine momentum confinement time
  - Determine what, if any, missing torque to be attributed to an intrinsic source in steady state portions of discharge before step.
  - For these steps, use
    - Uncompensated power steps (ie turning on or off a beam)
    - Compensated NBI power steps (change the mix of tangential to perpendicular beams)
    - Compensated power substituting HHFW for NBI power.
  - Directly observe effect of the HHFW on intrinsic drive by comparing the inferred torque with and without HHFW.
- Requirements
  - The XP requires MHD quiescent plasmas, that are also resilient to changes to the plasma rotation and the NBI torque.

Determination Of NTV Offset Rotation On NSTX

- Goals
  - Confirm existence and test scaling of neoclassical offset rotation associated with neoclassical toroidal viscosity (NTV) driven by non-axisymmetric non-resonant magnetic fields
- Plan – most direct approach…
  - Begin with plasma with very low toroidal rotation, using counter NBI to overcome intrinsic rotation as needed
  - Observe if plasma spins up in the counter direction with n=3 NR field
  - Repeat for a rapidly rotating plasma to see if braking is again observed.
  - Find offset rotation by tweaking the beam voltage and/or duty cycle to find a condition where no braking is observed
- Requirements
  - Reverse I_p

Determination Of NTV Offset Rotation On NSTX

- Goals
  - Confirm existence and test scaling of neoclassical offset rotation associated with neoclassical toroidal viscosity (NTV) driven by non-axisymmetric non-resonant magnetic fields
- Plan – alternate approach
  - Deduce existence of offset rotation by measuring the NTV torque as a function of initial rotation.
  - Use n=3 braking to change initial rotation to new steady state condition, ideally maintaining β_N (perhaps incrementing the NBI power if necessary)
  - Then, **on top of the n=3 baseline for a given rotation level**, apply an incremental step of n=3.
  - Produce plots of NTV torque vs initial velocity (or in control room, delta(V) vs V), and extrapolate to the condition required for NTV torque equal to zero.