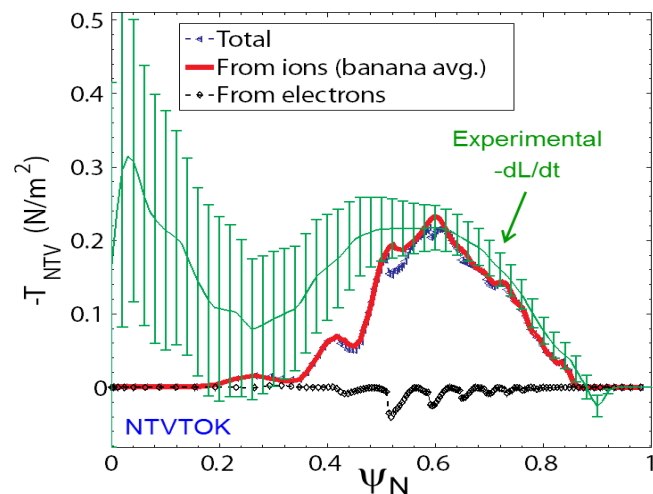


EX/1-4: Physical Characteristics of Neoclassical Toroidal Viscosity in Tokamaks for Rotation Control and the Evaluation of Plasma Response

Highlights

- **Experimental NTV characteristics**
 - NTV experiments on NSTX and KSTAR
 - NTV torque T_{NTV} from applied 3D field is a radially extended, relatively smooth profile
 - Perturbation experiments measure T_{NTV} profile
- **Aspects of NTV for rotation control**
 - Varies as $\delta \mathbf{B}^2$; $T_{NTV} \propto T_i^{5/2}$ in primary collisionality regime for large tokamaks
 - **No hysteresis** on the rotation profile when altered by non-resonant NTV is key for control
 - Rotation controller using NTV and NBI tested for NSTX-U; model-based design saves power
- **NTV analysis to assess plasma response**
 - Non-resonant NTV quantitatively consistent with fully-penetrated field assumption
 - Surface-averaged 3D field profile from M3D-C¹ single fluid model consistent with field used for quantitative NTV agreement in experiment

Perturbation experiments measure NTV torque profile and compare to theory



Rotation controller using NTV and NBI

