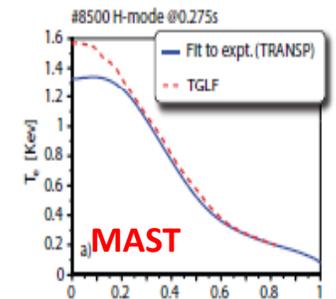
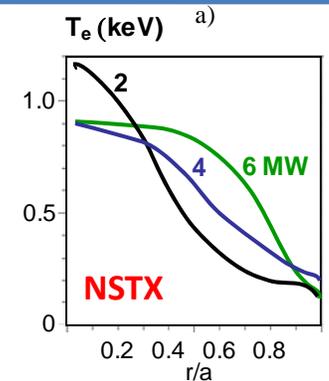


Correlation between Electron Transport and Shear Alfvén Activity in NSTX

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and the NSTX Team

Talk outline

- **Puzzle: T_e flattens, central χ_e increases in NSTX H-mode as P_{NB} increases**
- **Effect possibly apparent also in MAST (Akers 08)**
- **Low frequency MHD not the cause for T_e flattening:**
 - Negligible NTM-TAEs after $t > 0.4-0.5$ s
 - No internal reconnections or large ELMs
- **Flattening of the fast ion profile not the cause either:**
 - Assuming flat FI profile neutrons decrease strongly, χ_e changes little
 - Fast ion data support peaked FI profile, no anomalies in NPA spectra
 - Electron/ion heating partition dominantly classical (at high n_e $T_i \approx T_e$, $\chi_i \approx \chi^{neo}$)
- **Perturbative experiments also confirm rapid central electron transport at high P_{NB}**
- **T_e flattening is genuine electron transport effect**



- **What drives rapid central electron transport?**

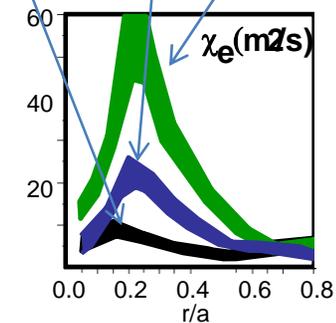
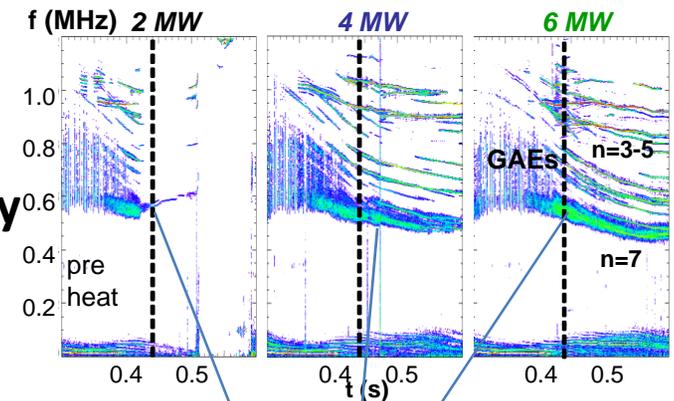
- $D_{\text{neon}}, \chi_i \approx$ neoclassical \rightarrow no low-k turbulence
- μ -wave scattering shows also no high-k turbulence
- GS2 shows central gradients too low for any instability
- Fast ion gradients only free energy source
- Broadband, central GAEs in high P_b NSTX H-modes

- **Experiments on GAE/electron transport connection**

- P_{NB} changes at fixed $q, n_e, \omega_{\text{ExB}}$
- V_{NB} changes (+ μ -wave interferometry for GAE amplitude)
- *Flat T_e , large central χ_e consistently correlate with GAE level*
- Correlation seen also in in L-modes
- Interplay between GAE and gradient driven (ETG) transport

- **Theoretical support (N. Gorelenkov):**

- *GAEs can resonantly perturb electron trajectories to form phase space "islands"*
- *Multiple islands can overlap and produce stochastic transport*
- *GAE amplitude seems sufficient for observed transport*
- More detailed GAE characterization in 2009 XP (K. Tritz)
- One possible explanation for flat T_e inside tokamak ITBs
- Likely impact for ST-CTF, burning plasma



ORBIT χ_e

