

Introduction to Transport and Turbulence Discussion Topics

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Discussion Overview



- Thermal and Particle Transport in NSTX
 - NSTX/MAST similarity
- Core and Edge Barriers in NSTX
- Dependence of above on aspect ratio
 - NSTX/DIII-D similarity for core transport
 - NSTX/MAST/DIII-D for pedestal and ELM physics

Milestone FY04-2 on Transport and Turbulence: *Measure long wavelength turbulence in spherical torus plasmas in a range of plasma conditions.* (T&T) This likely means recruiting XPs for reflectometry as deep in the core as we can get it (in L mode, where the density gradient is non-zero).

Thermal Transport Topics



1. Electron vs ion thermal transport

- $\chi_e > \chi_i$ in NBI
- Why χ_e so high? High edge positive shear w/finite T ?
- NSTX as ion neoclassical testbed

2. Ion thermal transport

- $\chi_i \geq \chi_i^{\text{neoclassical}}$ (core)
- anomalous heating study status  Data/Analysis
Uncertainties

3. Effect of rotation on confinement/ion thermal transport?

- What is relation between χ_i and ω ?
- Need systematic study

4. Dependence of χ_i on ω , β

- Some theories suggest χ_i and χ_e go down with ω , β
- Need systematic study

5. Effect of q-profile on electron thermal transport

- Suspect negative shear reduces χ_e

Particle Transport and Barriers



6. Particle transport

- Impurity transport ~ neoclassical
- Possibilities with pellets or gas puff?

7. Internal barriers

- Establish criterion for low R/a ITB
- Electron transport reduction in low density RF shots?

8. Critical temperature gradient physics

- L-mode and H-mode profiles non-similar, but are they “stiff”?
- Can't change edge T_e easily by changing edge n_e (e.g. long pulse H-modes 108730...)

9. H-mode barrier

- Data consistent with a particle barrier, and that residual thermal transport near neoclassical (how to prove?)

H-mode pedestal and edge transport physics



10. Role of edge magnetic topology differences in controlling H-mode access and pedestal parameters

- What is role of shape and fuel location on H-mode access?
- What is aspect ratio dependence of pedestal?
- Is pedestal transport or stability limited? (affected by shape?)
- What is role of fueling in setting pedestal heights?
- What is nature of ELMs in NSTX?

11. Nature of edge transport

- Intermittent convective vs. diffusive (boundary group)