

## **Transport and Turbulence Discussion Update**

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Transport and Turbulence Group Session

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## Discussion Overview



- Heat, Momentum 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)
- Contribute to “Joule” Milestone and current drive milestone
- Significant proposed contributions through ITPA groups and multi-machine studies

## T&ET Group priorities and notes (as of 11/11/03)

No	Author	Title	Days	Priority (I, II, III)
2.	Kaye	Intra-machine aspect ratio scaling H-mode scaling Dimensionless scaling experiments <i>Counter injection (Campaign)</i>	1.5 2 2 5	New data systematic com w/4?
3.	Maingi	NSTX/MAST similarity - role of shape on L-H threshold NSTX/MAST similarity - role of fueling on L-H transition NSTX/MAST/DIII-D similarity - pedestal charact.	1 1 1-2	new data new data new data
4.	Synakowski	NSTX/DIII-D similarity – core transport	1	com w/2c?
5.	Field	NSTX/MAST ITB formation & evolution ‘identity’ experiments	1-2	com w/2d? com w/7?
6.	LeBlanc	Investigation of electron transport in NSTX	1 ?	fill in data
7.	Stutman	Exploration of electron confinement in low density / shear reversal regime	2	new data
8.	Kessel	Transport in Plasmas with Varying Fraction of $P_{NBI}$ and $P_{HHFW}$	1-2	<b>I (new)</b>
9.	Darrow	Neutral beam ion confinement in NSTX	1 ?	most PB?
10.	Medley	NPA measurement of the anisotropic NB energetic ion distribution and beam-ion profile in NSTX	1	scan NPA
11.	Redi	Gyrokinetic microstability calculations for NSTX	1 ?	test theory?
12.	Evans	ELM suppression in NSTX with a stochastic boundary	0 ?	calculations
13.	Lee	Study of edge fluctuation and density formation by FIRE TIP	1-2	<b>I (new)</b>
14.	Peebles	Core and edge turbulence measurements	1-2	<b>I (new)</b>
15.	Myra	Blobs and convective transport in theory and experiment	1	com w/13
16.	Zweben	Gas Puff Imaging measurements in FY04	2	com w/13
17.	Ji	Study of angular momentum transport due to magnetic fluctuations by the dynamo probe head	-	status
18.	Raman	CT injector as a tool for transport studies in NSTX	-	status
19.	S. Paul	Examining radially localized poloidal ExB flows	-	proposal
	LeBlanc	RF H-modes	1 ?	disc. in RF

Talks above took 4 hrs

Discussion for 30 minutes

Follow-up discussion TODAY in [B205](#) from 2-3 PM

# Backup



# Thermal Transport Topics



## 1. Electron vs ion thermal transport

- $\chi_e > \chi_i$  in NBI
- Why  $\chi_e$  so high? High edge positive shear w/finite  $T_e$
- 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  $\chi_i$  and  $\omega$ ?
- Need systematic study

## 4. Dependence of $\chi_i$ on $\omega$ , $\beta$

- Some theories suggest  $\chi_i$  and  $\chi_e$  go down with  $\omega$ ,  $\beta$
- Need systematic study

## 5. Effect of q-profile on electron thermal transport

- Suspect negative shear reduces  $\chi_e$

# 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)