

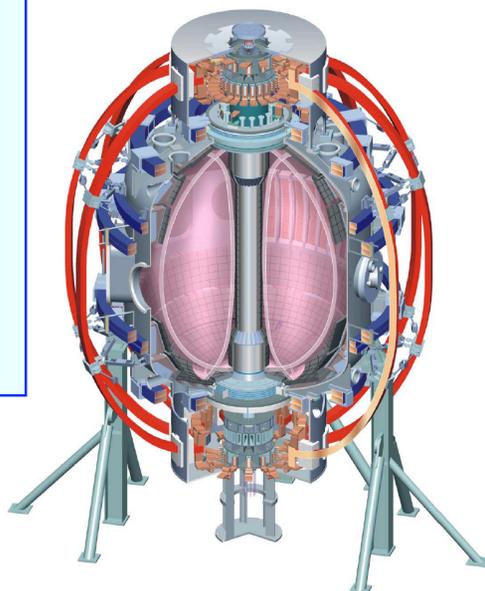
# NSTX Edge Physics ETG update

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**NSTX EPETG Meeting**  
**25 January 2007**

**Princeton Plasma Physics Laboratory**  
**Princeton, NJ**

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# Experimental program is guided by Milestones, ITPA, Joint Proposals, ST development path needs

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## ▪ **NSTX Edge Physics Milestones:**

- **FY08** Study variation and control of heat flux in SOL
- **FY09** (incremental) Characterize performance of a liquid lithium divertor

## ▪ **ITPA participation**

- **PEP-6** Pedestal Structure and ELM stability in DN
- **PEP-9** NSTX/MAST/DIII-D pedestal similarity
- **PEP-16** C-Mod/NSTX/MAST Small ELM regime comparison
- **DSOL-15** Inter-machine comparison of blob characteristics
- **DSOL-17** Cross-machine comparison of pulse-by-pulse deposition
- **DSOL-19** Impurity generation mechanism and transport during ELMs (considering)
- **DIAG-2** First Mirror Qualification (considering)

## ▪ **ST-CTF development path needs**

# Highest priority in 2007 is given to the lithium, milestone-related, and ITPA experiments (Tier I)

Mile-stone	ITER / ITPA	ST phys.
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## ▪ Lithium experiments

- Injection and Dispersion of Li powder for Improvement of H-Mode
- Investigate Effect of Lithium on H-Mode Performance with LPI
- Investigate Effect of Lithium-Coated Divertor on Plasma Performance with LITER-1d

## ▪ Comparison of Small ELM Regimes in Alcator C-MOD, MAST, and NSTX

## ▪ SOL width scaling

## ▪ Dependence of Pedestal Structure on Aspect Ratio

	✓	
	FY 2009 incremental	
		✓
		✓
	✓	
	FY 2008	
		✓
		✓

# Highest priority in 2007 is given to the lithium, milestone-related, and ITPA experiments (Tier II)

- **Edge turbulence characterization**

“Testing Theory on Blob transport-Blob velocity, Holes and Blob size, Intermittency... “

“Edge Turbulence and Blobs During H-mode”

“Characterization of Blobs/filaments on NSTX in Support of ITPA Research Task DSOL-15 - Multi-Machine Scaling of Blob Characteristics”

- **Divertor heat flux control with radiative/dissipative divertor**

- **ELM characterization experiment**

“Characterization of Interaction of ELMs with NSTX Edge/Divertor using Fixed Langmuir Probes”

“Type V ELM Rotation and Toroidal Origin”

“Multi-diagnostic ELM Characterization”

“ELM Character vs. Collisionality XP”

- **Electrode Biasing for SOL Control**

- **Dependence of ELMs and Power Balance on Magnetic Balance and Fueling\*** *\* Special status*

- **Dust particle Injection for Benchmarking the DUSTT Code**

- **MARFE characteristics**

“MARFE Space in NSTX”

“Hot Electron Component of the MARFE”

- **High-pressure Supersonic Gas Jet Fueling (SGI-Upgrade)**

Mile-stone	ITER / ITPA	ST phys.
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✓	✓	✓
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FY 2008

Higher Tier II priority

Next in line

# EP ETG is getting ready for FY07 run with several XPs to be ready for early execution

<b>Lithium experiments (2.5 days)</b>	<ul style="list-style-type: none"> <li>• EP ETG review 01/25/2007</li> <li>• Good candidate for first 1/3 run</li> <li>• Hardware dependent</li> </ul>
<b>Small ELM Regime (1 day)</b>	<ul style="list-style-type: none"> <li>• Reviewed in 2006, same plan for 2007</li> <li>• Good candidate for early execution</li> </ul>
<b>SOL width scaling (1 day)</b>	<ul style="list-style-type: none"> <li>• EP ETG to review 01/2007</li> <li>• Must run before lithium</li> </ul>
<b>Dependence of Pedestal Structure on Aspect Ratio (.5 day)</b>	<ul style="list-style-type: none"> <li>• 30-pt MPTS data analysis in progress</li> <li>• Candidate for second 1/3 run</li> </ul>
<b>Edge turbulence characterization (1 day)</b>	<ul style="list-style-type: none"> <li>• Initial EP ETG discussion 01/26/2007</li> <li>• Candidate for second 1/3 run</li> </ul>
<b>Divertor heat flux control with radiative divertor (1 day)</b>	<ul style="list-style-type: none"> <li>• EP ETG review 01/25/2007</li> <li>• Must run before lithium</li> <li>• Good candidate for early execution</li> </ul>
<b>ELM characterization experiment (1 day)</b>	<ul style="list-style-type: none"> <li>• EP ETG to review 01/2007</li> </ul>

# Limited run time should be effectively utilized

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## ▪ Run day allocation for FY07 presented at PAC-21

- Initially 4 days allocated to EP ETG
- Later revised to 6 days
- Some contingency days may be allocated to EP ETG after mid-run review

## ▪ Concerns and Suggestions

- High priority EP ETG experiments take 8 days at a minimum
- Lithium work may take longer than 2.5 days
- Need to plan experiments for success
- EP ETG should take active role in screening proposed XPs for
  - expected physics results
  - feasibility of proposed physics analysis

# Proposed EP ETG XPs should take full advantage of FY07 upgrades in diagnostics and facility

## Facility upgrades

- Lithium deposition tools
- Improved vacuum bake-out
- Supersonic Gas Injection-Upgrade
- Edge biasing electrode
- Hypervelocity dust injector

## Diagnostic upgrades

- FIRETIP (2 new channels)
- SWIFT SOL flow diagnostic
- Deposition quartz microbalance
- Dust detector
- New divertor 1D and 2D cameras (for lower and upper divertor)
- Midplane edge  $D_{\beta}$  camera
- New p-CHERS system
- Fast reciprocating Mach probe

