

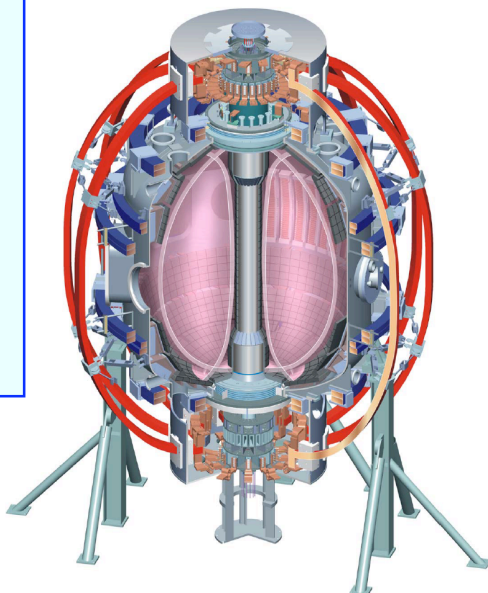
Edge Physics ET Group Mid-run FY2007 summary

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NSTX FY07 Mid-run Assessment Meeting
18 May 2007
Princeton Plasma Physics Laboratory
Princeton, NJ

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

- **NSTX Edge Physics Milestones and decision points:**
 - **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**

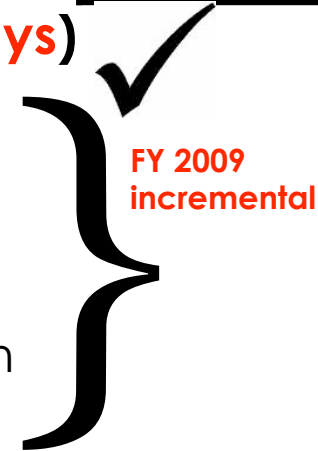
Highest priority in FY2007 run is given to the lithium, milestone-related, and ITPA experiments

In red: run time allocated at FY 2007 Forum
 In blue: Leading authors

Mile-stone	ITER / ITPA	ST phys.
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- **Lithium experiments (Kugel, Mansfield, 2.5 days)**

- 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

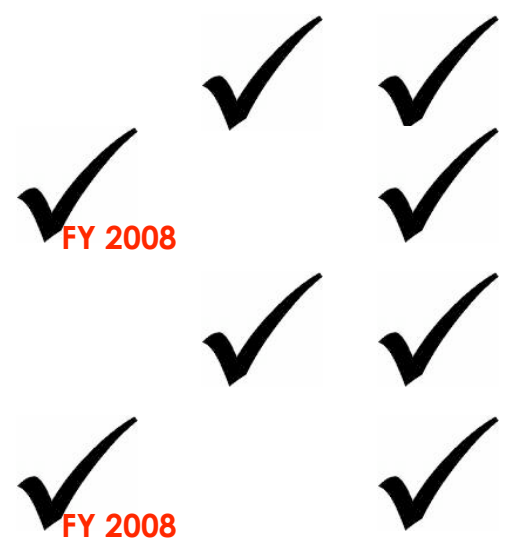


- **Comparison of Small ELM Regimes in Alcator C-MOD, MAST, and NSTX (A. Hubbard, R. Maingi, H. Meyer, 1 day)**

- **SOL width scaling (J.-W. Ahn, R. Maingi, J. Boedo, 1 day)**

- **Dependence of Pedestal Structure on Aspect Ratio (R. Maingi, 0.5 day)**

- **Divertor heat flux reduction and detachment* (V. A. Soukhanovskii, 1 day)**



* Assigned Priority Two at FY07 Forum and later upgraded to Priority One

Priority Two XPs are of high priority, however can not run all of them due to little run-time

Milestone	ITER / ITPA	ST phys.
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- Edge turbulence characterization (J. Boedo, R. Maqueda, J. L. Terry, 1 day)
- Electrode Biasing for SOL Control (S. Zweben, 0.5 day)
- ELM characterization experiment (J. Boedo, C. Bush, K. C. Lee, R. Maqueda, K. Tritz, 1 day)
- Dust particle Injection for Benchmarking the DUSTT Code (C. Skinner, 0.5 day)
- MARFE characteristics (R. Maqueda, K. Tritz, 0.5 day)
- High-pressure Supersonic Gas Jet Fueling (V. A. Soukhanovskii, 0.5 day)
- Dependence of ELMs and Power Balance on Magnetic Balance and Fueling (R. Maingi, 0.5 day)



Status of Priority One XPs

- **XP 719 LITER-1d (2 days used)**

- ✓ LITER-1d worked well, deposited 11.2 g of Li over two days
- ✓ LITER-1d was also used in several XPs over several days
- ✓ Complex effects on plasma performance are observed - confinement improvement, recycling decrease, late L-H transition, ELM suppression, core radiated power increase (impurity accumulation?), marginal effects on density
- ✓ Nominated for APS 2007 Invited talk
- » **Completed**

- **XP 718 LPI (0.5 day used)**

- ✓ LPI worked well, injected 3.4 mg Li pellets in He and D₂ plasmas
- ✓ H-mode density reduction lasted one shot
- ✓ Direct pellet injection in notched NBI H-modes did not succeed
- » **Completed**

- **XP 738 Lithium powder (1 day)**

- » EP ETG approved XP, XP to be reviewed and run next week

Status of Priority One XPs

▪ XP 721 Small ELMs (1 day used)

- ✓ Could not get H-mode in the MAST - Alcator C-Mod -relevant shape
- ✓ Ran 1.25 day XP on MAST, expect to run 1 day XP on Alcator C-Mod in June 2007
- » **Request 0.25 day to check if H-mode can be obtained in a lower X-point shape**

▪ XP 708 - Radiative divertor in highly shaped plasmas (1 day used)

- ✓ Obtained good high κ, δ shape with stable strike points and inner gap
- ✓ Obtained peak heat flux reduction and possibly partial OSP detachment in 0.8 MA, 4-6 MW NBI H-mode plasmas with divertor D₂ injection
- » **Completed** since cannot measure heat flux in lithium-coated divertor
- ✓ Nominated for APS 2007 Invited talk, results to be reported at EPS 2007

▪ XP 709 - SOL width scaling (1 day used)

- ✓ One of the first XPs run in FY2007
- ✓ LSN plasmas unstable, reconnection events caused probe arcing
- ✓ Obtained SOL profiles with fast probe and IR cameras
- ✓ Results to be reported at EPS 2007
- » **Request 0.5 day to obtain improved probe data**

Status of Priority One XPs

- **XP 529 - Pedestal parameters vs aspect ratio (0.5 day)**
 - » Run need will be determined in ~ 1-2 week time as pedestal analysis progresses

Status of Priority Two XPs

- **XP 742 - H-mode fueling optimization with SGI-Upgrade (1 day used)**
 - ✓ Commissioned SGI-Upgrade - **1)** higher plenum pressure (5000 Torr) - higher flow rate (< 130 Torr l / s) **2)** Independent gas handling system **3)** Multi-pulse capability
 - ✓ Obtained reduced HFS H-mode plasmas with SGI-U fueling
 - ✓ Obtained good set of data on SGI-U fueling efficiency for SOFE 2007 conference
 - » **Completed**

Edge Physics ETG suggested priorities (Vlad) for FY 2007 run

Finish Priority One XPs (1-2 days needed)

- » Lithium powder XP is scheduled to run next week
- » XP 529 - Pedestal structure vs aspect ratio - conditional if need more data
- » Several XPs would benefit from extra time - need ~ 1 run day

Suggested Priority for Priority Two XPs (1.5 - 3.5 days needed)

1. **Edge turbulence XP (reviewed in EP ETG) - 1 day**
2. **Edge biasing XP (XP ready for EP ETG review) - 0.5 day**
3. ELM characterization XP - 1 day
4. MARFE operating space - 0.5 day
5. DUSTT dust transport code benchmarking - 0.5 day

EP ETG did not have a chance to discuss possible modifications to the plan derived from FY 2007 Research Forum, such as experiments to lead to APS 2007, IAEA 2008, PSI 2008 invited talk nominations