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Mid-run 2006 Summary

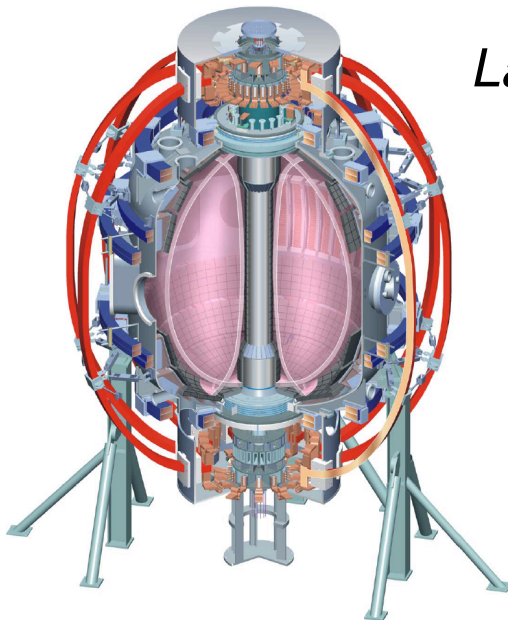
Boundary Physics ET Group

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NSTX FY06 Research Forum
16 December 2005
Princeton, NJ



Edge Physics ET Group topics in FY06

- Recycling control with lithium coatings on walls**
- ELM and pedestal physics, including scaling and stability
- Edge, SOL and divertor plasma transport
- Power balance and plasma fluxes on first-wall
- Detachment and MARFE physics
- Fueling optimization
- Impurity sources, transport, and deposition
- Dust generation, transport, deposition, and and effects

** Working milestone for FY 2006

NSTX has agreed to participate in several ITPA edge and boundary physics experiments

- ✓ PEP-9: Dependence of Pedestal on R/a (with DIII-D, MAST)
- PEP-10: ELM Radial Depth and Structure (with MAST, ASDEX-U)
- PEP-16: Small ELM regime comparison (with C-MOD, MAST)
- ✓ PEP-18: Impurity migration and deposition (with JET, ASDEX-U)
- ✓ DSOL-16: Blob comparison (with C-MOD)
- ✓ DSOL-17: Material migration study (with ASDEX-U)
- DIAG-2: Test of Diagnostic mirrors

New commitment during/after NSTX Research Forum

- PEP-6: Dependence of ELMs on magnetic balance near DN (with MAST and ASDEX-U)

Group approved priority list and time allocation

- Top priority experiments
 - ✓ Recycling control with lithium - 2 days (Kugel)
 - ✓ Pedestal parameters vs a/R - complete XP529 - 1 day (Maingi)
 - C-Mod/MAST/NSTX small ELM regimes - 1 day (Hubbard)
 - ✓ Density scan - 1 day (Skinner, Boedo, Williams) [high density part obtained; low density portion in '07?]
- Second priority tier
 - ✓ Divertor heat load mitigation at low aspect ratio - 1 day (Soukhanovskii)
 - Edge turbulence and transport - 1 day (Boedo, Maqueda, et al.)
 - ELM suppression with resonant magnetic perturbation - 1 day (Evans)
 - Type I ELM heat pulse propagation - 1 day (Tritz)
 - ✓ Supersonic gas jet fueling - 1/2 day (Soukhanovskii)
 - Impurity puffing - 1/2 day (Bush, Maqueda)
- Cross-cutting and Enabling category
 - ✓ XMP-43 Moveable Glow probe Evaluation - 1 day (H. W. Kugel)
 - Controlled sweeping of strike point to "calibrate" divertor Langmuir probe positions (C. Bush) and Test of an ELM Trigger Model based on Thermo-electrically driven SOL Current (H. Takahashi) - 1/2 day

Group approved priority list

- Third priority tier (not prioritized)
 - R. Raman, Edge biasing for density control in H modes
 - A. Pigarov, Dust studies on NSTX
 - A. Pigarov, Near-sonic flows and helium migration in the SN SOL
 - V. A. Soukhanovskii, Simple diagnostic optimized plasmas for edge radial transport and turbulence modeling (with UEDGE, DEGAS, BOUT modelers)
 - J. Boedo, Edge/SOL ELM dynamics in NSTX
 - R. Maingi, Dependence of ELM type and power balance on magnetic balance (PEP-6 XP#609, submitted into review and approved)
 - R. Maingi, Small ELM evolution - obtaining a complete dataset with all diagnostics (piggyback on Hubbard small ELMs XP)
 - R. Maqueda, L-H transition sequence (combined into edge turbulence XP in 2nd tier)
 - C. Bush, Characterization of Plasma/Divertor plate interaction during ELM Types I and V using Divertor Langmuir probes
 - L. Dorf, Hypervelocity Dust Injection for Internal Magnetic Field Measurements on NSTX
- “New” since Research Forum (not prioritized)
 - K. Williams, role of turbulence in density limits in ohmic discharges
 - APS invited talk related proposals (to come?)

XP status

- Recycling control with lithium (3.5-4 days used)
 - ✓ Laid down 5-6 different evaporations, different rates, modes, etc
 - ✓ With and without He conditioning discharges
 - ✓ Marginally improved density control with Lithium+He as c/w He conditioning only in CSL/marginally diverted L-mode discharges
 - ✓ Observed a ~20% reduction in n_e in 1 MA DN long pulse discharge - reproducibility? (#119874/#119854 ref. @0.165sec just before L-H)
 - Re-aim LITER snout? Would that improve coverage?
 - Re-examine effect on diverted discharges in controlled manner
- Pedestal parameters vs a/R (1.5 days used)
 - ✓ Obtained target shape at ~ 350ms and performed β scan
 - ✓ Reduced v^* by using He conditioning discharges and started β scan
 - Would like to finish β scan at low v^* (2 hours?)
- Small ELM regime comparison (0.25 days used)
 - ✓ Began shape development; need to finish)
 - Need β scan to find small ELM onset point (6 hours)

XP status

- Density scan and deposition study (0.75 days used)
 - ✓ Obtained desired deposition data
 - ✓ Obtained good density scan in high density range
 - Finish density scan after Lithium scenarios are developed (4 hours)
- Divertor heat load mitigation at low aspect ratio(1.5 days used)
 - ✓ Obtained heat flux data with various gas injectors
 - Need to begin mitigation study at high δ (4 hours)
 - Need to begin mitigation study with impurity puffing (4 hours)
- SGI fueling (0.5 days used)
 - ✓ SGI successfully used to minimize CS gas and change ELMs
 - ✓ Many other experiments beginning to make use of SGI
- Insertable HeGDC studies (1 day used)
 - ✓ Wall probe compared with fixed probe - no immediate difference in performance
 - ✓ HeGDC pressure scanned; scenarios with 10-12.5 shot cycle developed

Boundary Physics Suggested Priority for Remaining XPs in 2006 run (RM)

- C-Mod/MAST/NSTX small ELM regimes - 3/4 day
- Controlled sweeping of strike point for div. Langmuir probes - 1/2 day
- Edge turbulence and transport - 1 day
- Type I ELM heat pulse propagation - 1 day
- Turbulence in ohmic density limit discharges - 1/2 day
- Dependence of ELMs on magnetic balance (PEP-6) - 1 day
- ELM suppression with resonant magnetic perturbation - 1 day
- Impurity puffing - 1/2 day