

Research Operations Division Boundary Physics (*H. Kugel*)

- ◆ Began experiments with the LLD
 - ▶ LLD partially filled (~1g) by LITER evaporation with LLD at 220°C
 - One plate remained cold due to heater failure
 - ▶ Performed startup XMP-64 with LITER running, LLD cold (20°C)
 - Reliable H-mode operation remarkably quickly (without boronization)
 - ▶ Operated cold, warm (220–250°C) and hot (>300°C) in XP-1000 with OSP on inner divertor, “bullnose” and LLD itself
 - No miraculous effects yet (*“first, do no harm ...”*)
- ◆ Lithium Evaporators
 - ▶ 4 new LITERs available
 - ▶ Implemented new liquid-lithium filling system (LIFTER) (*J. Timberlake*)
 - Significantly larger loads: up to 95g *c.f.* <50g as solid pellets
 - ▶ LITER Bay-K TIV stuck closed after last LITER changeout
 - Replacement of TIV now underway while vessel filled with argon

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Boundary Physics [2]

- ◆ LLD Diagnostics
 - ▶ Fast visible Phantom cameras provided images of interaction with LLD
 - ▶ Divertor imaging spectrometer (DIMS) installed in NSTX diagnostic room, input fibers run and controls being implemented
 - ▶ IR cameras, including 2-color system, are installed and taking data
 - ▶ Exposing samples on PMI probe for analysis at Purdue U.
 - ▶ High-density Langmuir probe array (“supertile”) (UIUC collaboration) and divertor biasing electrode (BEaP) system operational
- ◆ Lithium Powder Droppers
 - ▶ Prof. Jiansheng Hu, head of the boundary physics / wall conditioning effort on EAST and HT-7 at ASIPP Hefei, China, visited NSTX
 - ▶ NSTX is providing a lithium powder dropper to EAST
 - ▶ Second dropper loaded with paraffin-stabilized lithium powder for use on NSTX this run

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Boundary Physics [3]

- ◆ Other work in progress
 - ▶ Lithium Laboratory investigations of lithium coating characteristics
 - ▶ Investigation of molybdenum PFCs for inner divertor
 - ▶ Purdue students visiting to plan for replacement of PMI probe with Materials Analysis and Particle Probe (MAPP) next year

Research Operations Division Diagnostics (*R. Kaita, B. Stratton*)

- ◆ Completed calibrations of magnetics and MSE which require fields
- ◆ New Transmission Grating Spectrometer routinely taking data for determining impurity behavior (JHU)
- ◆ New Lyman-alpha Diode Array (LADA) installed (with LLNL)
- ◆ Performing Rayleigh scattering calibration of MPTS during current vent
 - ▶ Also continuing routine window calibrations for MPTS
- ◆ Beam Emission Spectroscopy (U. Wisc)
 - ▶ Installation complete, eight detectors (spatial channels) now available
 - ▶ Off-line testing is making progress
 - ▶ Initial plasma data when NSTX operation resumes
 - ▶ G. McKee visited last week to port analysis codes to PPPL
 - ▶ Plan to install and operate additional 16 detectors later in the run

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Diagnostics [2]

- ◆ MSE-LIF:
 - ▶ Procurements and fabrication of components making good progress
 - ▶ Preparing to install system during next shutdown
- ◆ MPTS additional channels to be installed during next shutdown
 - ▶ All procurements underway: many components now delivered
 - ▶ Begin assembling new polychromators in May
 - ▶ Fabrication of electronics underway
- ◆ Other diagnostic installations planned for next shutdown
 - ▶ Tangential FIDA (UC-Irvine) – needs new tangentially viewing ports
 - ▶ Edge soft x-ray array (JHU)
 - ▶ Real-time velocity measurement (PPPL)

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RF systems (*J. Hosea*)

- ◆ Vacuum conditioning of HHFW antenna
 - ▶ March 19, 22 (prior to lithium use): easily conditioned to 22 – 24 kV
 - ▶ March 26 (after lithium evaporation): conditioned to 22 - 24 kV but more time required
 - ▶ April 14 (after LLD operation): conditioned to ~17 kV
 - More difficult to achieve arc free operation but time limited
 - Time will be required for successful high power operation with lithium
- ◆ RF probe prepared and tested for installation at Bay J bottom
 - ▶ Will provide measurements of RF edge power loss in the region of the "hot" spot in the divertor
- ◆ Developing XPs for HHFW physics and preparing to support other studies

Research Operations Division Physics Operations (*D. Mueller*)

- ◆ Training of 3 new Physics Operators is progressing well
- ◆ Started operation without either boronization or extensive GDC, but benefitting from:
 - ▶ Scrubbing oxidized lithium from PFCs and walls before closing
 - ▶ Longer bakeout (3 weeks)
 - ▶ Routinely applying 150 - 200 mg/shot of Li evaporation
- ◆ Achieved reliable start-up, low impurity, low I_i , H-mode plasmas
 - ▶ Conditions previously required 2+ weeks of operation
- ◆ New challenge will be to recover from present argon vent

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Physics Operations [2]

- ◆ Control System progress
 - ▶ Recovered from software infrastructure upgrades
 - rtEFIT basis functions can now be changed
 - Upper outer strike point target R value can now be changed
 - ▶ Demonstrated feedback control of the upper and lower inner strike point heights (with strike point on the midplane side of the PF1A coils)
 - ▶ Developed feedback control of lower outer strike point radius for $0.45 < R_{\text{LOSP}} < 0.71$ m, upper outer strike point for $R_{\text{UOSP}} = 0.6$ m only
 - ▶ β_N feedback used successfully and ready for use in experiments
 - ▶ New rtEFIT basis functions were used successfully for high- κ , high- δ shots and reduced fit noise on real-time β_N signal
 - Need to assess whether they can also be used for LLD equilibria