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

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- ◆ Lithium Pellet Injector fired into plasmas
  - ▶ Pellets passed through OH plasmas; ablated in edge of NB plasmas
  - ▶ Changed penetration by varying NB - pellet timing
  - ▶ Some evidence for Li accumulation over several shots
- ◆ Performed first experiments with Supersonic Gas Injector (SSGI)
  - ▶ Highly collimated plume observed by fast cameras
  - ▶ Measured electron density increase
  - ▶ Edge Magnetic Sensors used in experiments on startup with PF4
  - ▶ Bay-I port will be enlarged for reliable reciprocal motion
- ◆ Performed post-run inspections of VV interior
  - Lithium residue observed in pellet strike zone on center stack
    - Surface being analyzed [Allain, ANL]

# Research Operations Division

## Boundary Physics [2]

- ◆ Third IR camera received
  - ▶ View Upper Divertor to improve power accountability
    - 2 existing cameras view Lower Divertor and CS
  - ▶ Calibrate during bakeout
- ◆ Planning to install third deposition monitor for next run
- ◆ Planning for moveable-anode GDC system
  - ▶ Try to use the same drive & controls as SSGI Probe
  - ▶ Awaiting quotes and delivery information from vendor
  - ▶ Goal to have Design Review in about 2 weeks.
  - ▶ Existing Bay-K anode to be relocated to Bay-L for bakeout and backup

## Research Operations Division Diagnostics (*D. Johnson, R. Kaita*)

- ◆ Obtained MSE data on 8 channels, 4 at a time, with 10ms resolution
  - ▶ Simultaneous channels limited by delivery of detectors
    - Substantially met FY'04 diagnostic milestone D(04-1)
  - ▶ Performed 'gas-filled torus' calibration
  - ▶ Pitch-angle data agrees quite well with EFIT – some differences
  - ▶ Add 4 detectors before next run  $\Rightarrow$  14 channels by end of FY'05 run
- ◆ Substantially met FY'04 diagnostic milestones: MSE - D(04-1); ultra-fast tangential SXR camera - D(04-2)
- ◆ Obtained data with fast camera [Hiroshima U] on tangential divertor port
- ◆ Fluctuation diagnostics addressed Research Milestone FY04-2 – *Measure long-wavelength turbulence in ST plasmas*
  - Correlation reflectometers
  - GPI
  - FReTIP
  - Reciprocating edge probe

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## Diagnostics [2]

- ◆ Adding, upgrading, repairing diagnostics during outage
  - ▶ Additional 10 spatial channels for MPTS - Milestone D(05-1) (9/05)
    - Polychromators, filters delivered from GA
    - Awaiting detectors and fabricating electronics
    - Should be operational but may be uncalibrated at start of run
  - ▶ Installing High-k microwave scattering
    - Milestone D(05-2) (9/05)
    - Carcinotron tested and detectors being assembled at UC Davis
    - Modifying Bay K port for detectors, Bay G & NB armor for input beam
      - Very tight schedule with respect to pumpdown
  - ▶ Priority of TF, PF1a, High-k has forced postponement of PCHERS installation and ERD upgrade
  - ▶ Fabricating new  $I_p$  rogowski coils
    - Replace one apparently damaged by heat during bakeout

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## Diagnostics [3]

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- ▶ Repairing malfunctioning  $B_p$ ,  $B_z$  magnetic sensors and wiring
- ▶ Modifying ports at Bays G, I, K – FDR on 10/11
  - Enlarging port for electron Bernstein wave antenna
  - Improving view for visible bremsstrahlung diagnostic
  - Additional clearance for SSGI and associated magnetic sensors
  - Rear view of pellet trajectory
- ◆ Need to define and schedule pre-operational diagnostic calibrations
  - ▶ Bob Kaita is compiling the list
    - Already has 11 calibration activities

# Research Operations Division

## RF Systems (*R. Wilson*)

- ◆ Successful run: over 400 shots with HHFW
- ◆ Need to understand phasing dependence of heating efficiency
  - ▶ Parametric decay into waves absorbed near the plasma edge
  - ▶ Losses due to RF driven sheaths: near or far
  - ▶ Surface waves
- ◆ During opening:
  - ▶ Instrument passive plate Rogowski loops to detect sheath currents
  - ▶ Modify ORNL edge reflectometer to look for density fluctuations at  $f_{\text{HHFW}}$ 
    - Parametric decay as well as 30MHz wave penetration
  - ▶ New rf probe electronics to measure time dependence of decay wave
  - ▶ Move outer antenna protective tiles in 5 mm to alter near sheaths
    - Also better protect from energetic beam ions

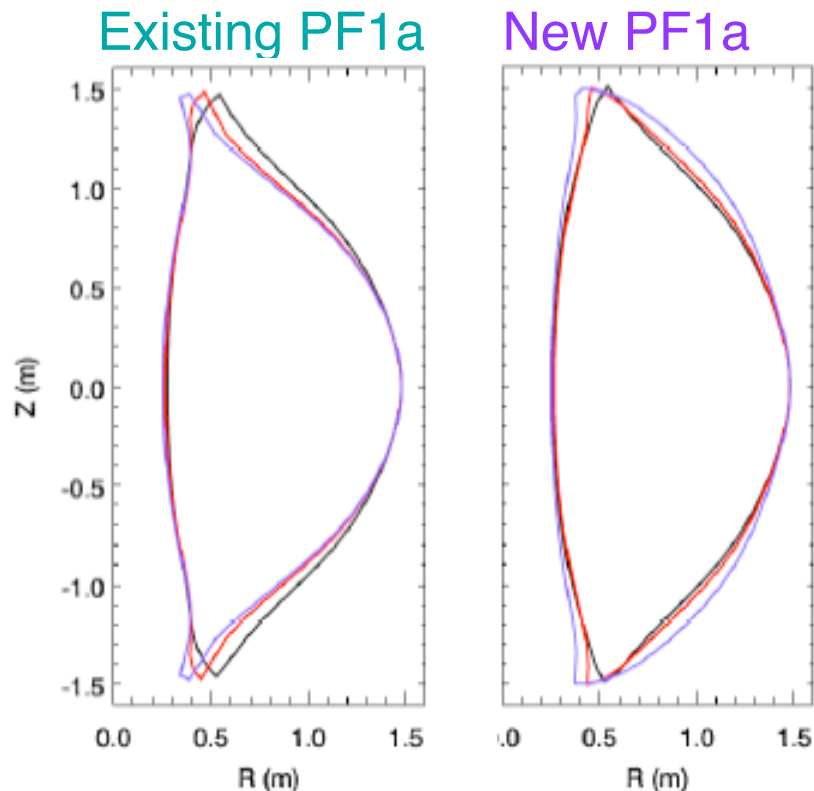
## Research Operations Division

### Physics Operations (*D. Mueller, D. Gates, R. Raman*)

- ◆ Made first use of PF4 coil, RWM coil, CHI capacitor bank late in run
- ◆ Long list of upgrades to control system to prepare for FY'05 experiments
  - ▶ Add capability to control SPA for RWM coils
  - ▶ Including internal  $B_r$ ,  $B_\theta$  coils for real-time detection of RWM
  - ▶ Update coil (PF1a), vessel model in rtEFIT
  - ▶ Implement  $I_{TF} \times I_{PF}$  interlock to reduce stress on TF flags joints
  - ▶ RF loading control (held over from last year)
- ◆ Desirable to implement controllable inner-wall gas feed
  - ▶ Investigating using a much larger pipe to upper shoulder
- ◆ Modifications being developed to improve breakdown for CHI
  - ▶ Inject ECH preionization and gas into lower divertor chamber

# Taking Advantage of Removing TF Bundle to Perform PF1a Upgrade

- Five-Year Plan proposed modifying PF1a coils for high-triangularity, high-elongation operation to achieve high  $\beta_T$
- Install new PF1a coils in this opening  $\Rightarrow$  Milestone F(05-3) (9/05)



- Two new 20 turn  $\times$  24kA coils avoid problems with existing PF1a
  - Permit high triangularity without reducing squareness and volume
  - Higher  $I_N = I_p/aB_T$  at fixed  $q_{95}$
- Fabricating coils in house
  - Conductor available
  - Procuring insulation
  - Preparing forms and curing oven
- Proceed to FDR when analysis and redesign of supports complete