

Radiation issues at RHIC

RHIC Layout



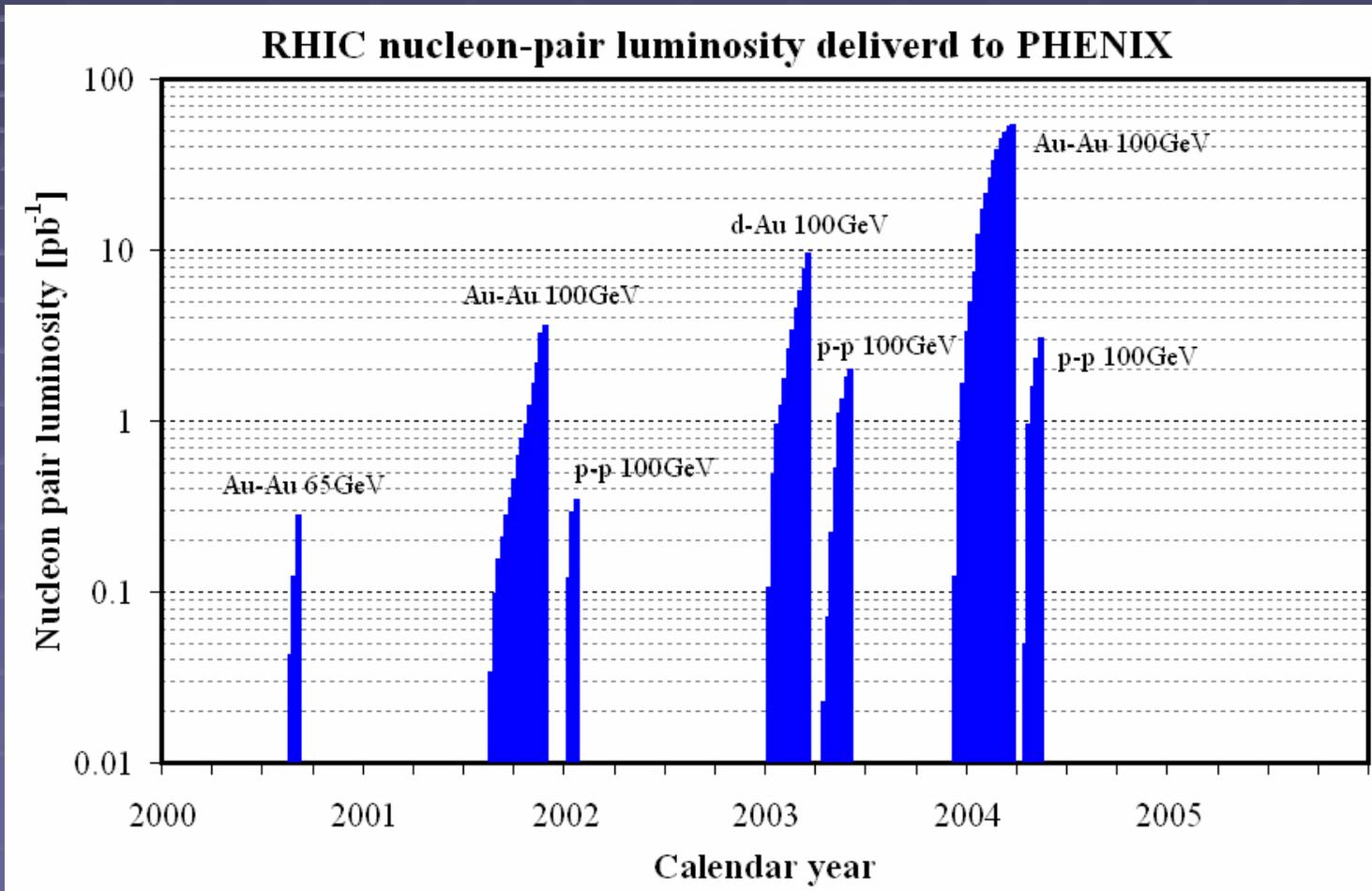
RHIC Tunnel



Alcove



RHIC Intensity



Equipment affected

- Recoverable errors
 - PLCs
 - Network switches
 - VME Processors (no ECC)
 - Waveform generator program memory
- Hardware problems
 - VME chassis power supplies
 - BPM chassis in ring
 - Cryo PLCs and power supplies

VME chassis Power supplies

~250 chassis installed at C-AD

- 20 replaced during 2004 run
- 15 power supply failures in alcoves
- 3 power supply failures in service buildings
- 2 others (loose connection, overtemp, etc.)
- MTTR ~ 3 hours
- Failure mode
 - All alcove PS fail on the AC side
 - Switching transistors shorted
 - Feedback or PFC circuit latches up or timing is altered increasing power dissipation

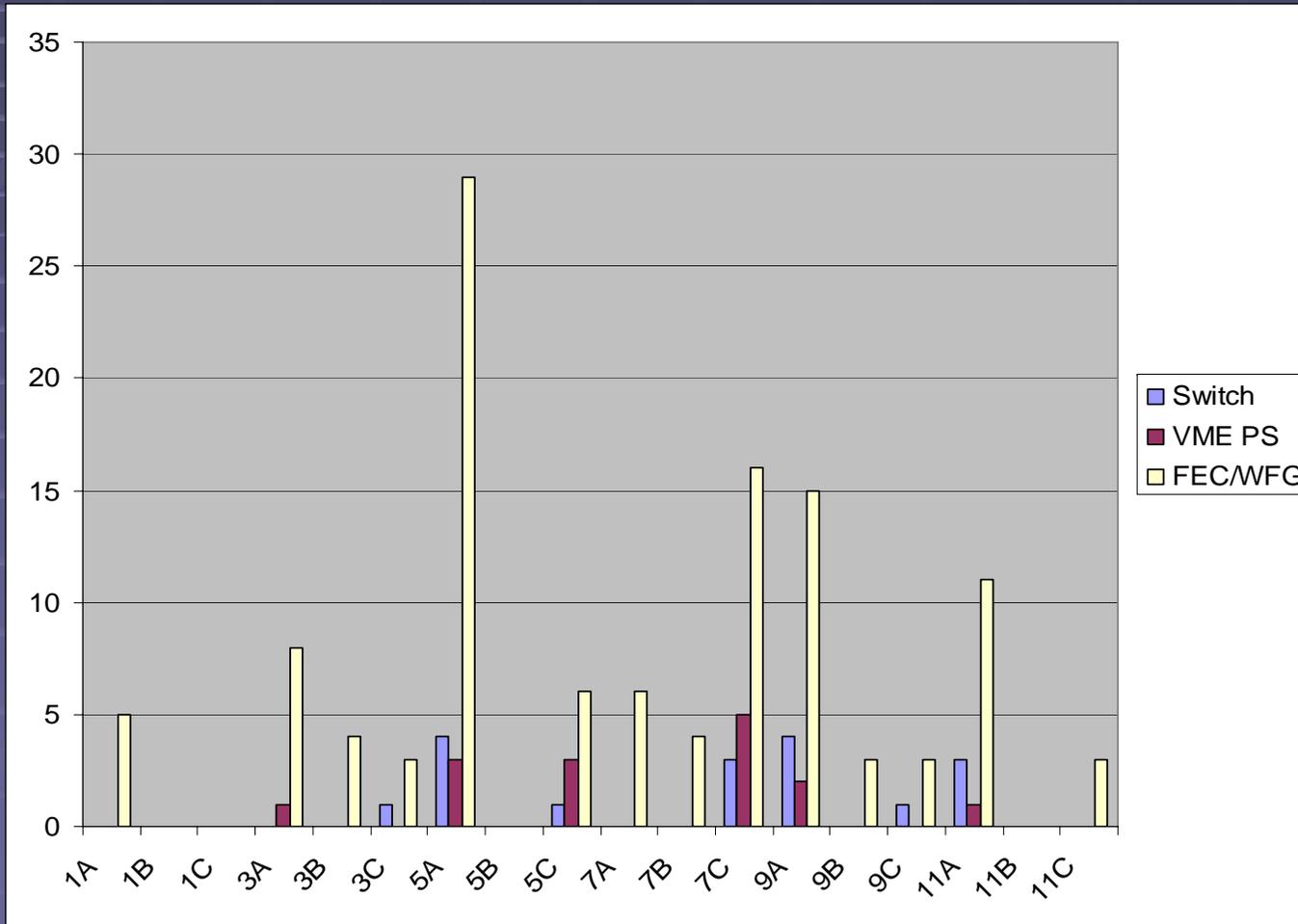
VME power supply con't

- Rad testing power supplies
 - Vicor power supply tested in the tunnel during the PP run without failure.
 - TLD neutron limits were exceeded
 - ~70 Rem Photons > 100 Kev

Beam Position Monitors

- More than 300 IFE chassis installed in RHIC
- ~Half are in the tunnel
- ~50 chassis damaged by radiation during the 2004 run
- Mostly digital circuits affected (DSP & Sram)

Controls failures FY04



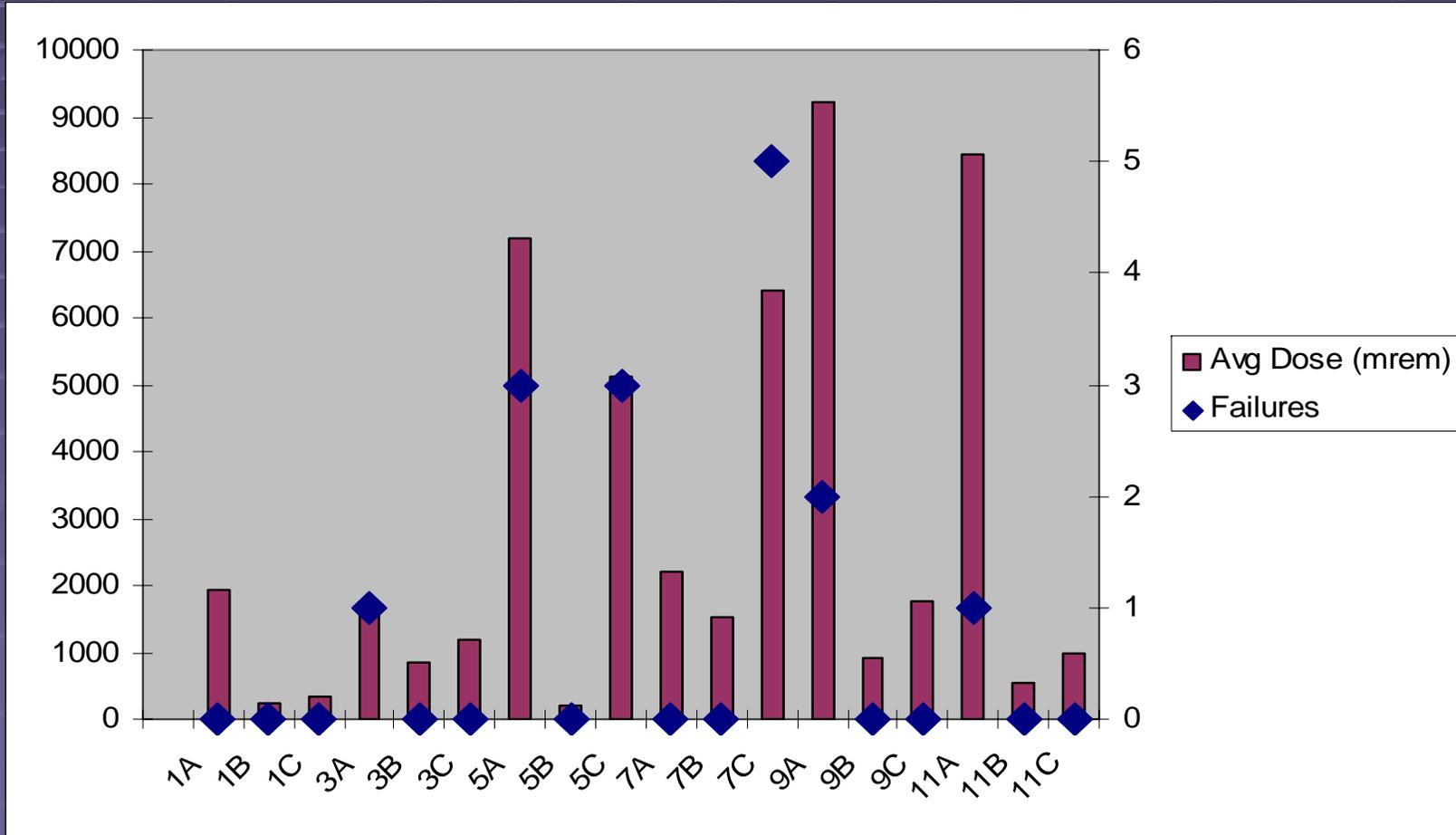
Radiation monitoring

- TLDs installed on all VME chassis in alcoves prior to start of the gold run (04)
 - Looking for correlation between controls failures and radiation levels
 - Photon (X-Ray and Gamma)
 - Beta
 - Neutron

Radiation Monitoring

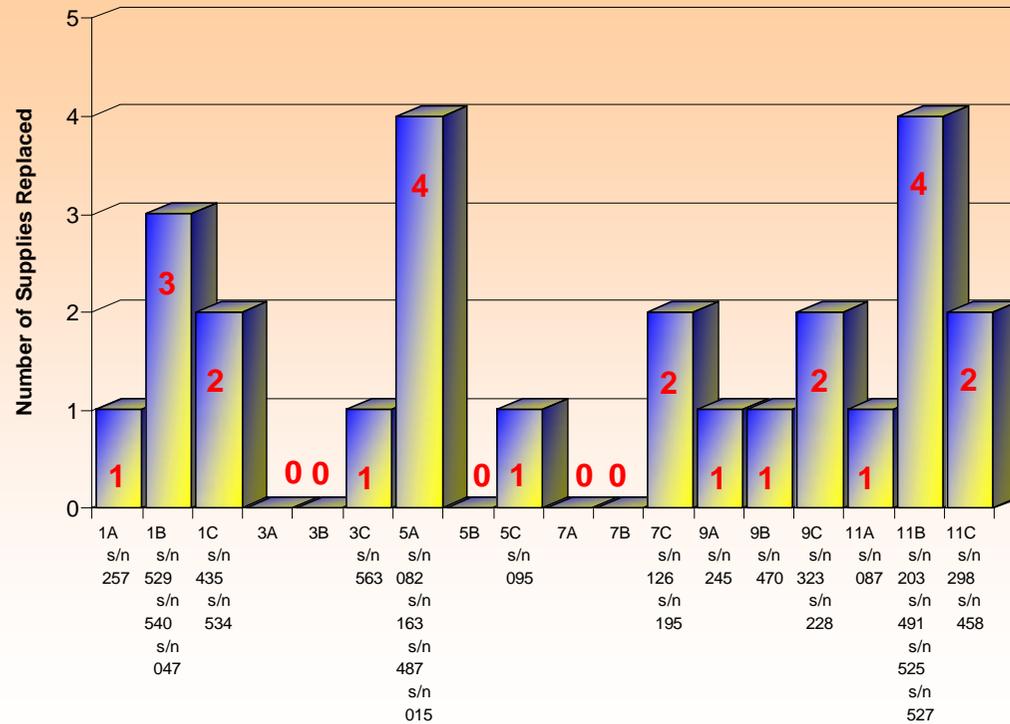
- Radiation Types detected
 - Fast Neutrons ~65%
 - High energy photons (>200 KeV) ~ 30%
 - Thermal Neutrons ~5%
 - Some low energy photons (<40 KeV)

Average Alcove Dose



Power Supply Stats 2004

**RHIC Physics fy04
Corrector Power Supply Replacements per Alcove**



Location by Alcove / Serial Number Removed

Changes for 05

- Move equipment out of alcoves?
 - Technically possible
 - Cost prohibitive
- Switch to rad tested components where possible
 - Radiation tolerant power supplies for VME chassis
 - ECC memory for VME processors & WFG
 - Move equipment out of tunnel where possible

Changes for 05 con't

- Waveform generator memory
 - ECC memory board designed to replace existing memory
 - One location retrofitted (28 WFG)
 - Ram based gate arrays a concern?
- Moved all BPM chassis to alcoves
- Cryo PLCs – PS changed