

**RHIC POWER
SUPPLY
HARWARE PLANS
FOR
FEBRUARY 2002
TO
OCTOBER 2002**

RHIC Power Supply Hardware Plans

- **Quench Protection Assembly Control Card**
Replace defective transformers on Control Cards

- **IGBT Driver Board Quench Protection System**
Replace Old Driver Board with Newly Designed Board
450 new cards required

- **6000 Ampere Quench Switch Failure**
Addition of Barriers Between Arc Shoots and Snubber Capacitors

- **Faulty Contactor Coils on Suncraft 150 Ampere Power Supplies**
Replacing Contactors

- **Susceptibility to Power Line Disturbances**
Procurement and Installation of Transient Suppressors and UPS's

- **Firing Board Instability in Dynapower Power Supplies**
Modifying Firing Board and adding Interlock Circuit

- **Suncraft Auxiliary Housekeeping Power Supplies**
Conformal Coating of Printed Circuit Boards and Replacing 208Vac Connector
Susceptible to Arcing

- **Suncraft Converter Boards**
Conformal Coating of Printed Circuit Boards and Replacing 208Vac Connector
Susceptible to Arcing

- **Current Regulator Board Relay and Control Card Switch Replacement**
New Relays for Current Regulator Card and RS Latch for Pushbuttons on Control Card

- **Installation of Power Transformers with Grounded Neutral in Alcoves**
Prevent loss of Firing Circuitry References in Sextupole Power Supplies

- **Improve Air Cooling in Bipolar Power Supplies Racks**
Changing Rear Door of Power Supply Racks

- **Quicken Diagnosis Time after a QLI Occurs**
Modification of QPAIC chassis and Installation of Timing Resolver

RHIC Power Supply Hardware Plans – continued

- **Installing Ground Current Monitoring**

This is for the tq Power Supplies and already exists for the Sextupole Power Supplies

- **Installing Monitoring Chassis for 6000A Quench switches in 1010A**

Monitoring Current Sharing of SCR's remotely, quicken diagnosis and repair time

- **Installation of AC Power Line Monitoring in Service Buildings**

Will help diagnose QLI's caused by AC power disturbances

- **Repairing Suncraft 150A Power Supply DC Bus Bar**

Bus Bar is now soldered and has a tendency to snap when stressed

- **Installing New Harnesses In Some Dynapower Stand Alone P.S.'s**

Some Stand Alone Dynapower power supplies had setpoint problems which this seems to fix

- **Error Bypass Daughter Board Modification**

This is being added to the current regulator card to stop false error faults

- **Installation of High Precision Meters and DCCT's for P.S. Readbacks**

This is for dhx, dh0, qtrim and main power supplies

- **Fixing all Loose Connections**

All K-Lock connections and AC and DC Connections will be checked and tightened. K-Lock Connections will get a Conductive Paste applied to them.

- **Collider Electrical Power Supply Group WEB Page**

Reference material and Trouble Logs for Power Supplies including QLI Analysis

- **Installation of Isolation Transformers in Service Buildings**

This will be done for Air Conditioning Single Phase Fan Motors

- **Substation Ground Fault Monitoring**

This will make Diagnosing Ground Fault Problems much quicker

- **Installation of AC Disconnect Switches for Main Power Supplies**

Line Crew Not Needed to Trouble Shoot Main P.S.'s

RHIC Power Supply Hardware Plans – continued

- **15KV Switchgear Indoor Insulator Problem**

Heaters added to Outdoor Enclosures, funding needed to Upgrade Insulators

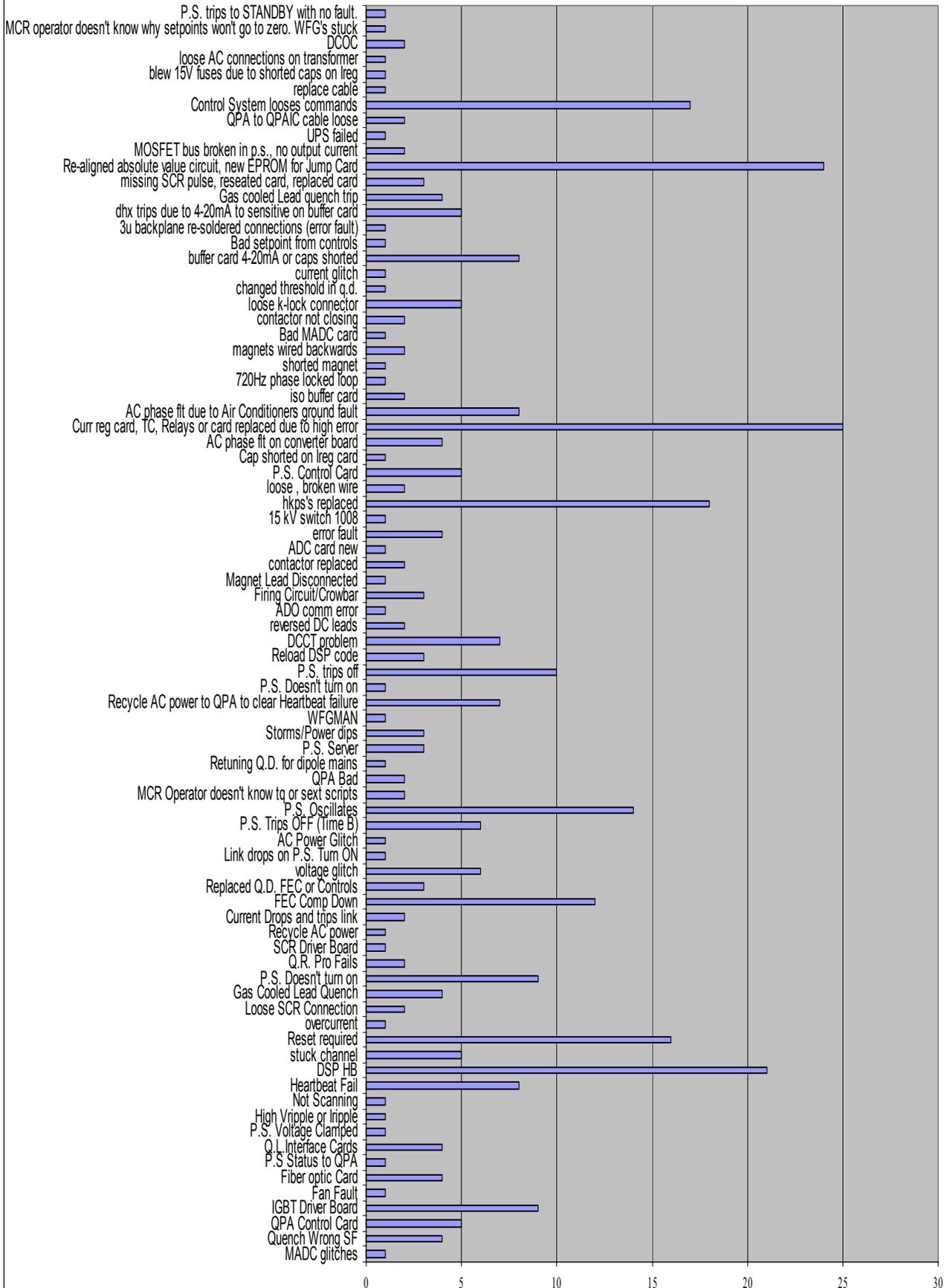
- **Possible Future Power System Upgrades**

Dynamic Voltage Restorer for Booster, Powerplant in Yaphank, New Power Feed through LI
Sound

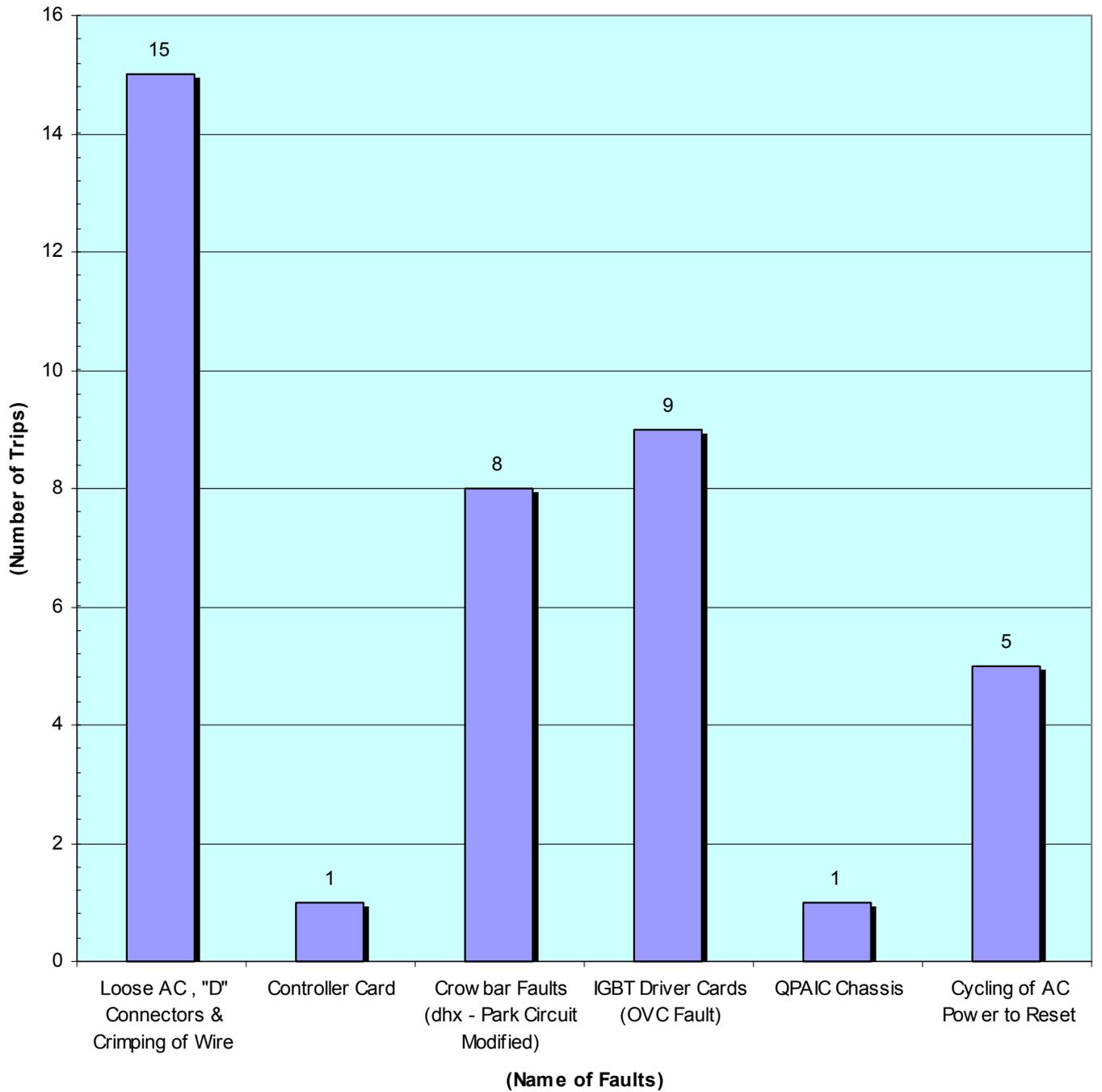
Major Problems and Solutions from June 2001 to January 2002

QPA IGBT Driver Card Failures	There was a flaw in the design of the IGBT card which was fixed during the run. Cards were replaced as they failed during the run and all are now being replaced during the shutdown.
Sextupole Firing Card Problems due Ground Faults or other AC Disturbances	Removed ground wire form Firing card. This was solved during the run. Isolation transformers are being installed for the Air Conditioner Motors. Installation of Power Transformers with grounded Neutral in alcoves
Current Regulator Card Relays	The relays will be tested on the bench and replaced if they fail. This was being done during the run and will continue during the shutdown.
Suncraft Housekeeping Power Supply Failures	Dirt and Moisture cause the 208Vac to arc between pins on connector. The connector is being removed and replaced with wires, the board is being cleaned and conformally coated. This was solved during the run and is on going during the shutdown
Quench Detector DSP Heartbeat Failures	This was solved during the run. Software was removed from the quench detection system and the Bandwidth of the PLL at 1004 was reduced.
Loose K-Lock Connections and other loose Connections	All connections will be checked, tightened and re-constructed if necessary. A conductive paste will also be applied to the k-lock connections so they cannot come loose again.
Main p.s causing QLI when switching from Flattop to Ramp During DownRamp	This was fixed in software during the run.
Dynapower P.S. Firing Cards	This was not a major problem but is being improved upon during the shutdown.
Steering Beam into Snake Magnet Causing Beam Induced Quenches and Dirty Dumps causing Beam Induced Quenches	This was not a power supply problem but still was a major problem.
Corrector Power Supplies	This was not a major problem but we are looking at the causes of all of these corrector p.s. failures

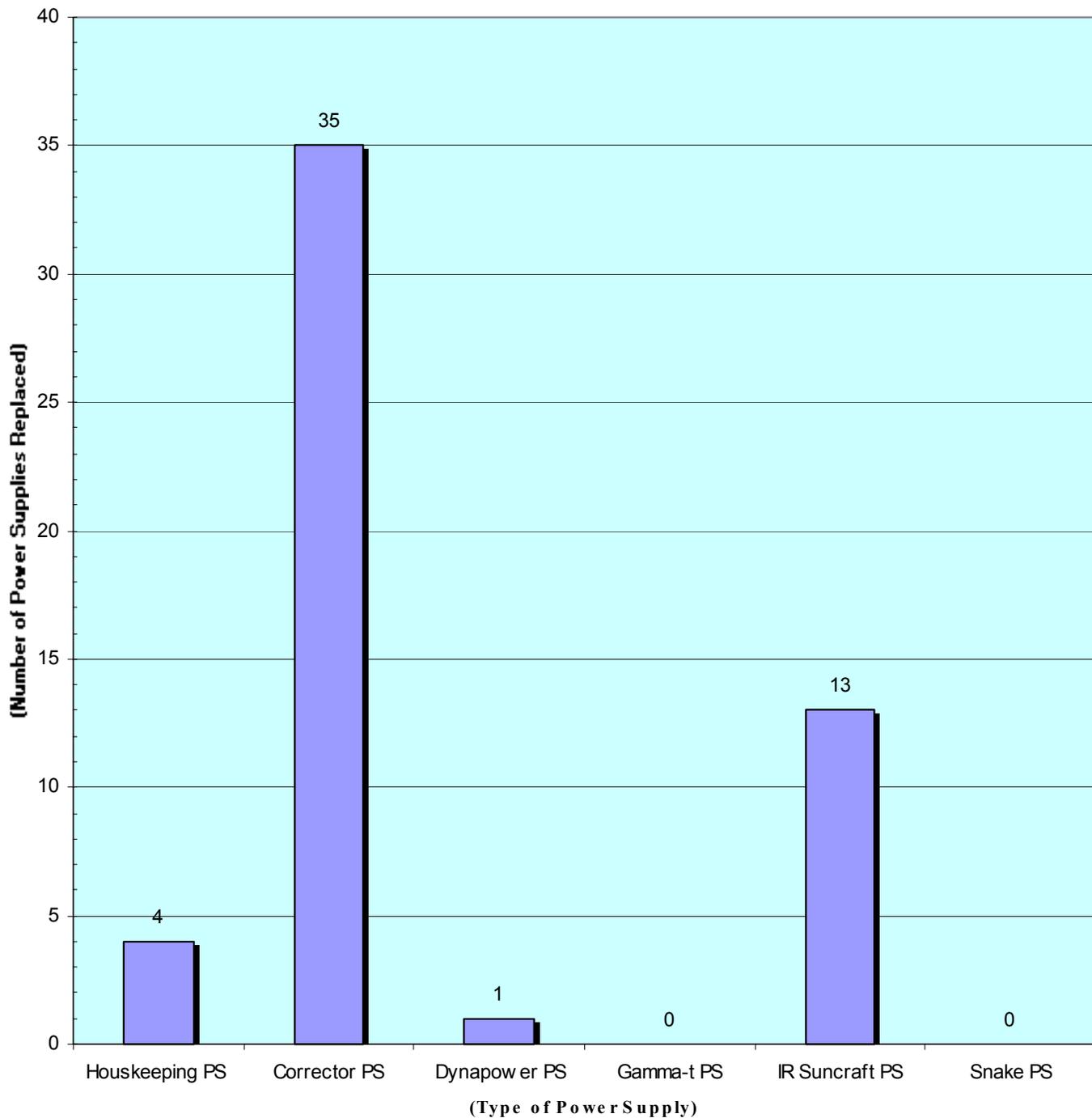
June 1, 2001 - August 7, 2001 Faults



RHIC - QPA Faults for the Months of August 2001 - January 2002

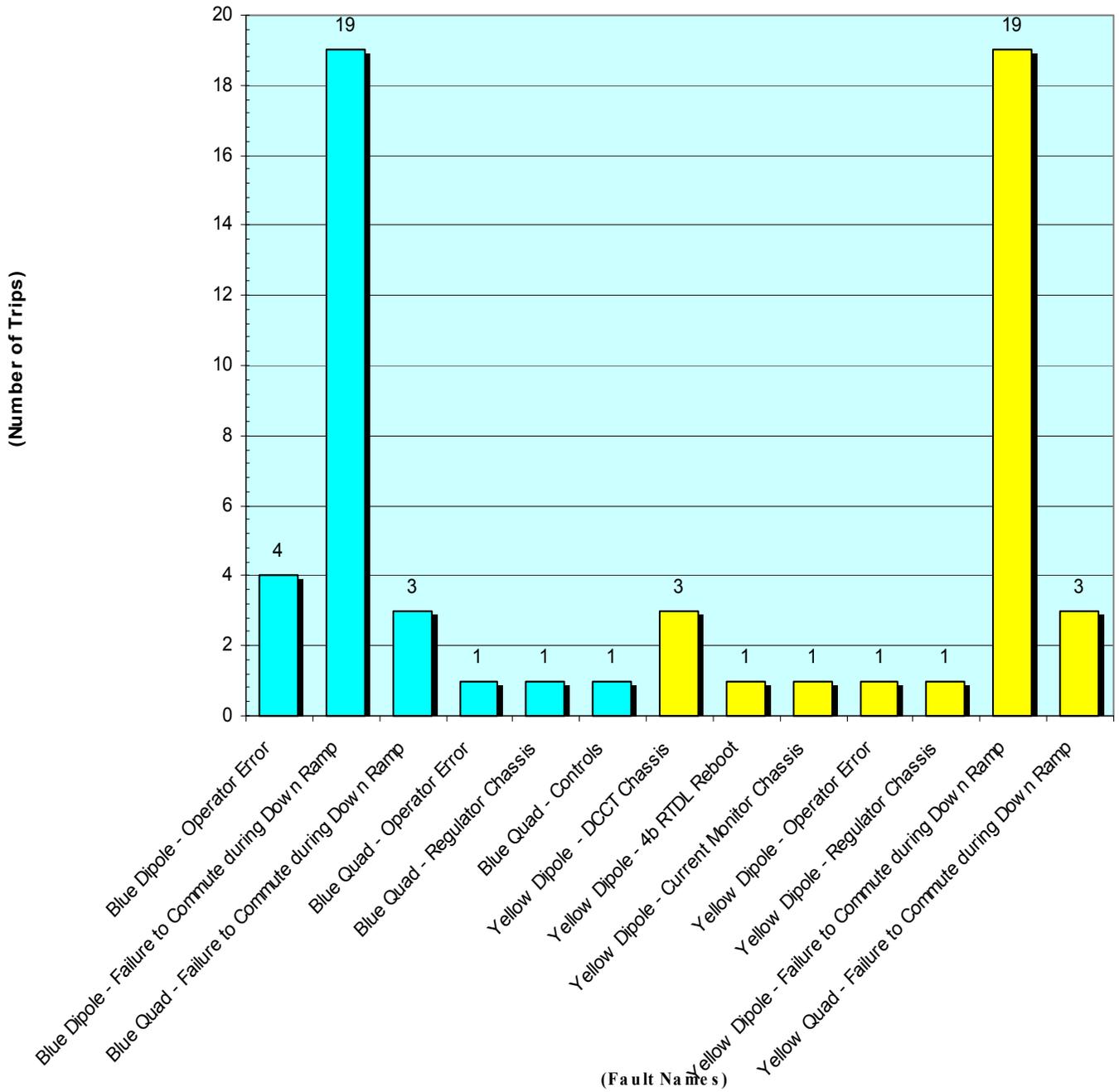


RHIC - Power Supplies Replaced during the Run for the Months of August 2001 - January 2002

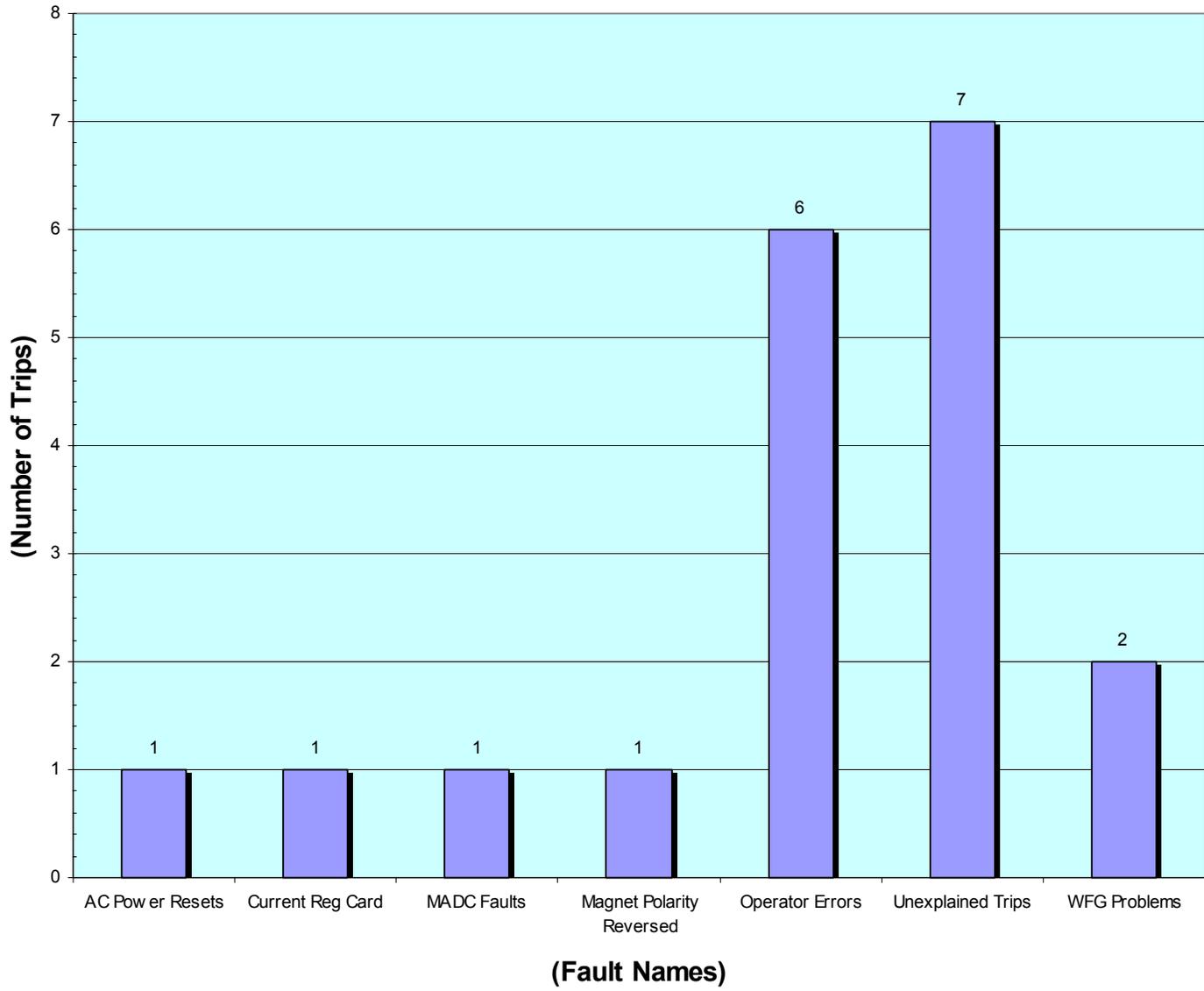


RHC - Blue & Yellow Main Power Supply Faults

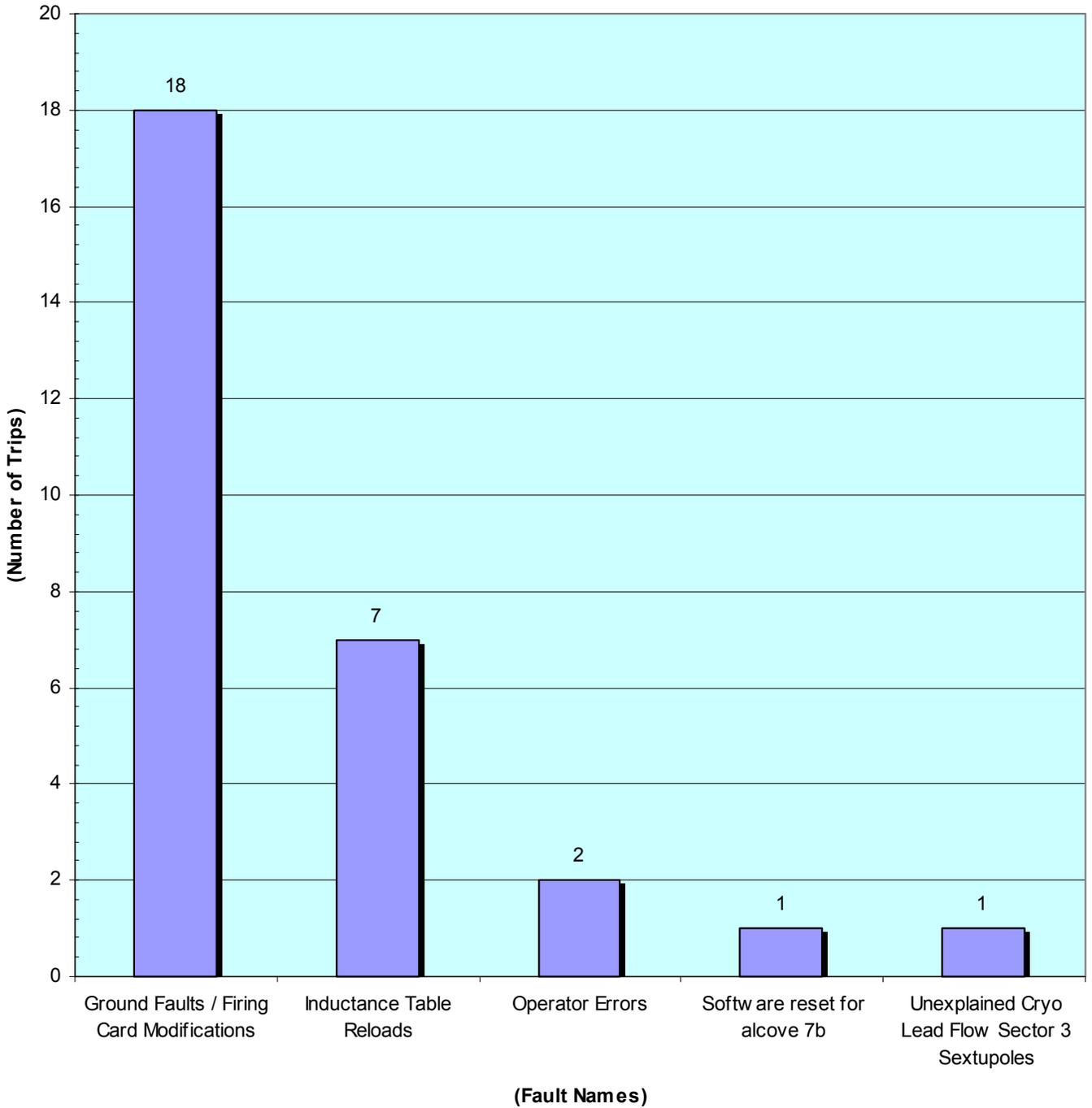
for the Months of October 2001 - January 2002



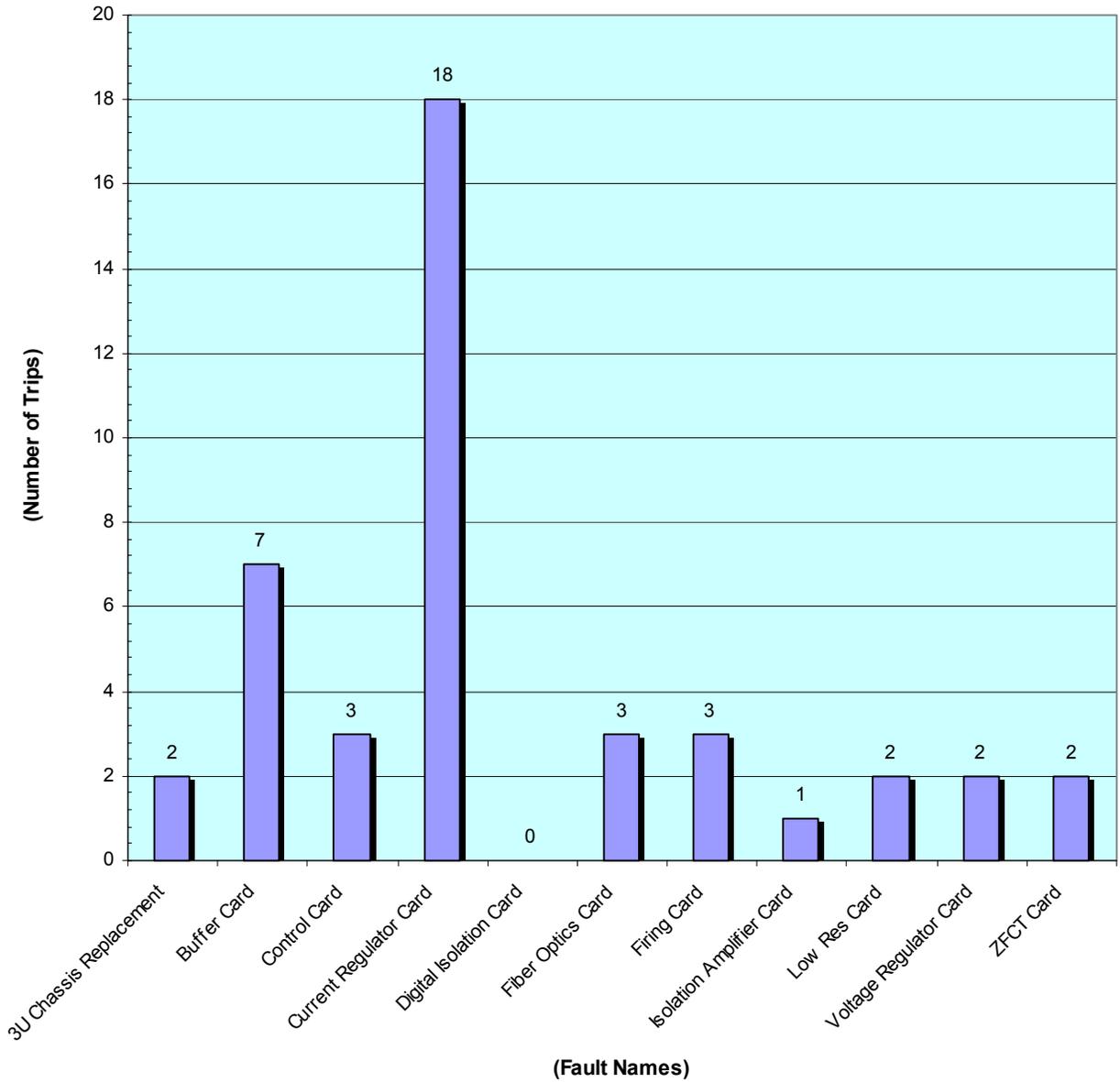
RHIC - Gamma-T Power Supply Faults for the Months of August 2001 - November 2001



RHIC - Sextupole Power Supply Faults for the Months of August 2001 - January 2002

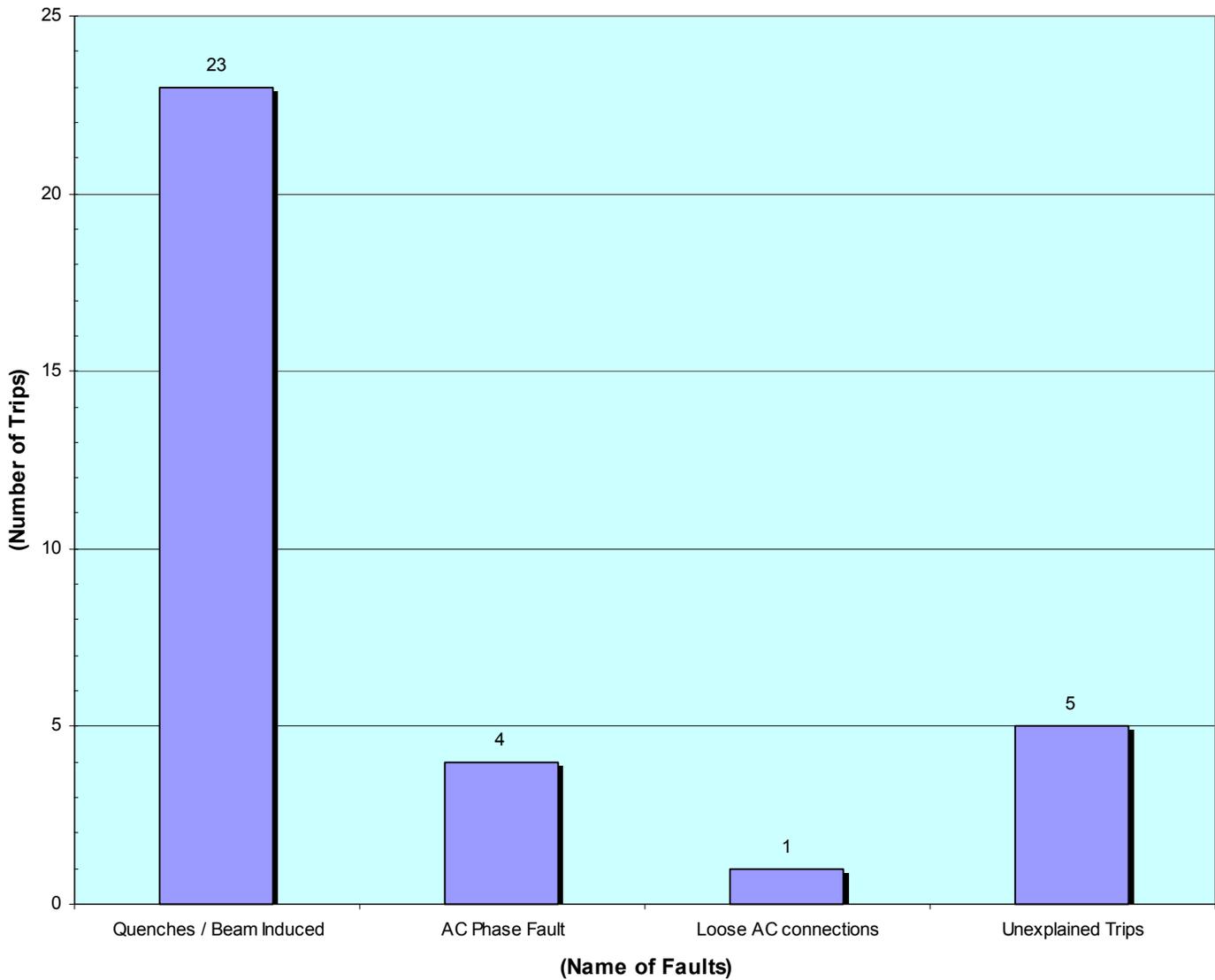


RHIC - Power Supply Card Failures for the Months of August 2001 - January 2002



RHIC - Snake Power Supply Faults

for the Months of December 2001 - January 2002



Collider
Electrical Power
Supply Group
Web Page
Address:

<http://www.c-ad.bnl.gov/ceps/>

Please Submit any Comments or Questions to
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Photos

PS Group Call In List

Quench Call In List

C-A Broadcast

MCR E-Log

Physics Log

C-A Particle Post

Training

Information

The Collider Electrical Power Supply Group is part of the Electrical Systems section of the [Collider-Accelerator Department](#).

Responsibilities include over 1000 magnet power supplies and associated electronics for the RHIC ring.

We are also associated with the [Pulsed Power Group](#).

This page was last updated
Tuesday January 15, 2002 10:21 AM

Website created and maintained by [Rich Conte](#)

For the moment - best viewed with
Internet Explorer

Bulletin the Laboratory's newspaper

See videos of various Brookhaven programs at WBNL

Tour Brookhaven's **HISTORY**

Local intranet

Start Collider Electri... Microsoft Word - ... 10:03 AM

Quench Analysis

Click here to access:

- 1) Power Supply Trouble Reports
- 2) Quench Data Reference Guide
- 3) Real Magnet Quench Events
- 4) QLI - Power Supply Weekly Diagnostic Reports

QLI Analysis Links - Microsoft Internet Explorer

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Address <http://www.c-ad.bnl.gov/ceps/qilinks.htm> Go Links

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QLI Analysis Links

Power Supply Trouble Report

Daily Log ([MS Excel Spreadsheet](#)) ([PDF unsortable](#))

Quench Events

RHIC Quench Data Reference ([MS Excel Spreadsheet](#)) ([PDF unsortable](#))

RHIC 2001 - 2007 Real Magnet Quench Events ([pdf](#))

Controls Post Mortem QED Analysis Log can be found [here](#)

QLI - Power Supplies Diagnostic Reports

2001

January	February	March	April

Local intranet

Start QLI Analysis L... Microsoft Word - ... 10:04 AM

Power Supply Trouble Report

A summary report categorizing types of power supply by dates, faults and corrections made.

Quench Data Reference

A quick reference guide listing all Quench Link Interlocks by date, locations and time of trip.

Real Magnet Quench Events

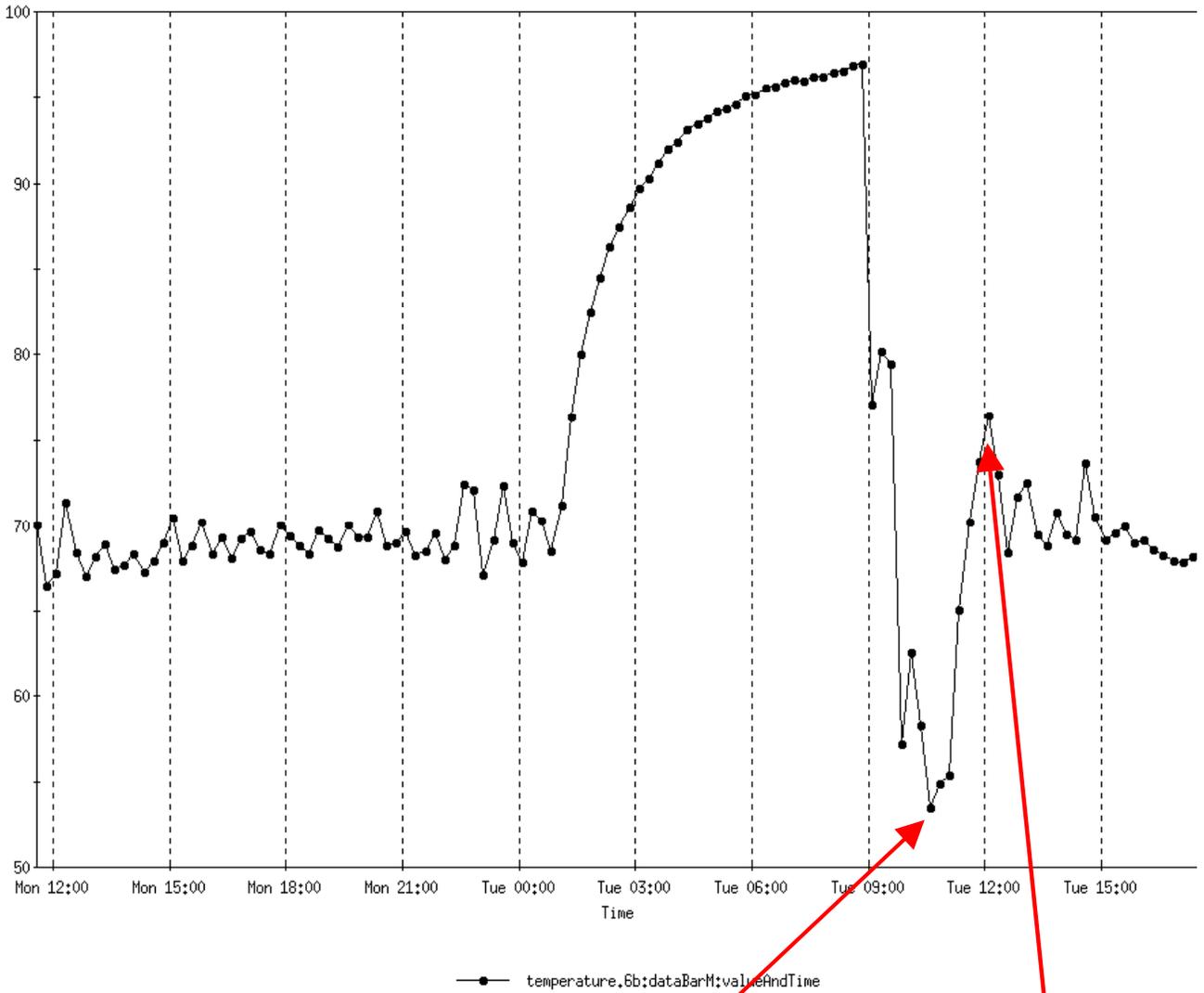
A list containing only Real Magnet Quenches.

QLI - Power Supply Diagnostic Reports

Weekly reports that include more in depth explanations of QLI's, Power Supply failures and comments pertain to analysis of types.

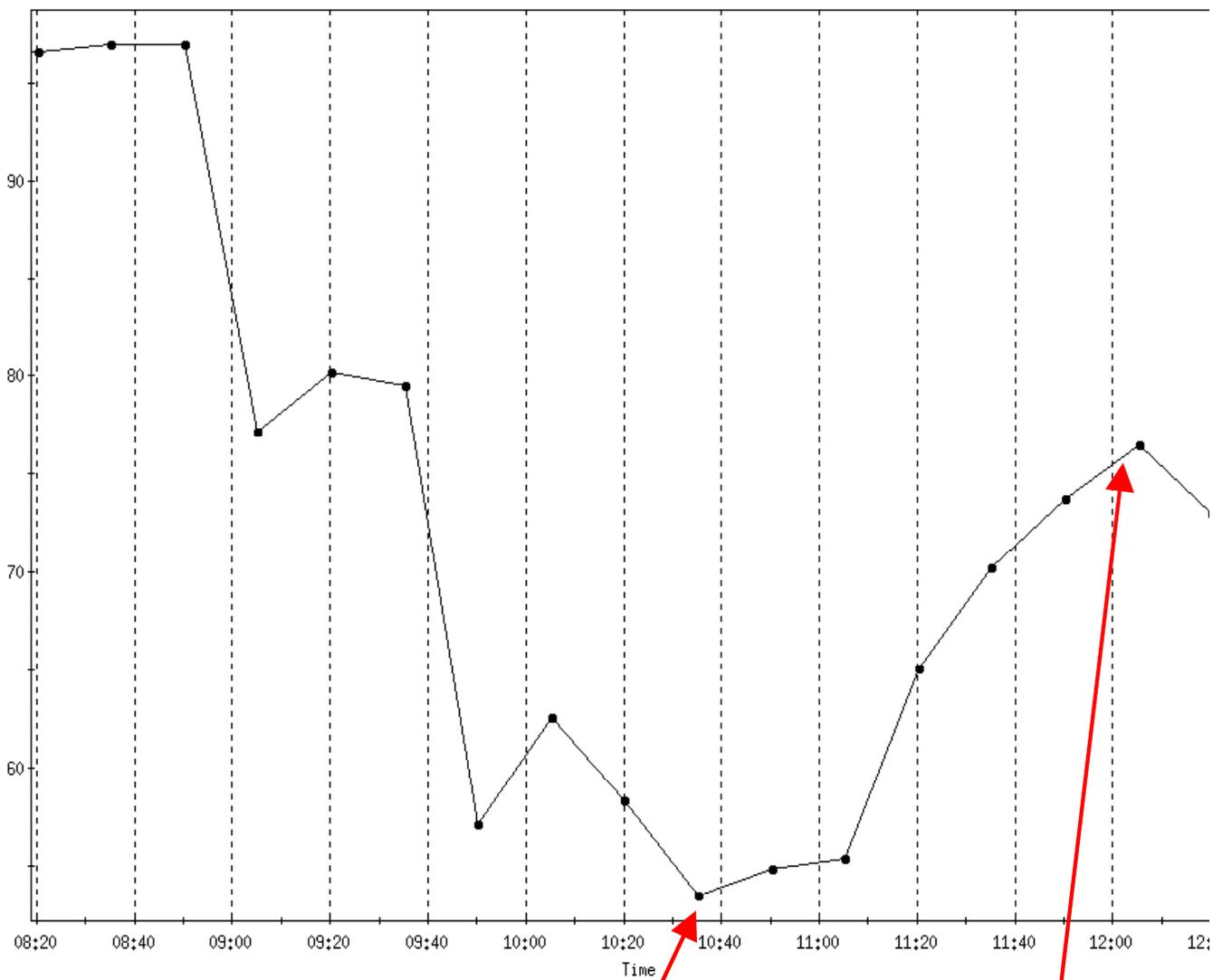
Other Interesting Slides

These next two slides show one temperature log of the control room in 6b. We had two unexplained yellow QLI's that originated in 6b, this day, and they occurred when there was a large, fast, temperature variation in the 6b control room. We have not been able to explain this yet.



First Unexplained Yellow QLI (10:32)

Second Unexplained Yellow QLI (12:01)



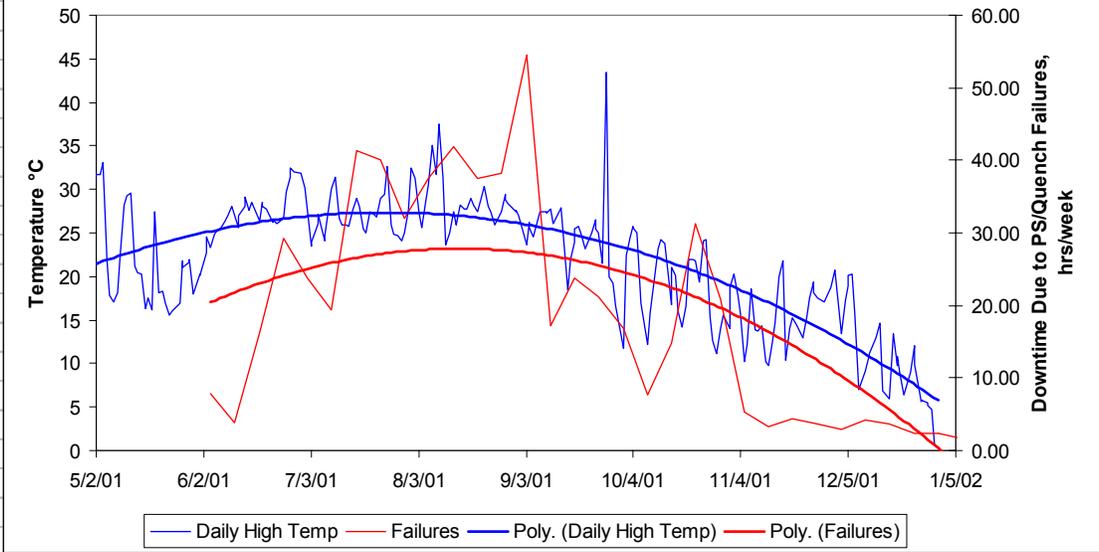
First Unexplained Yellow QLI (10:32)

Second Unexplained Yellow QLI (12:01)

This next slide is a plot of RHIC Power Supply Failure Hours per Week and Daily Maximum Temperature and Daily Maximum Humidity. Trend Lines are plotted for both.

Failure Hours is defined as
P.S.'s (Y&B) + Main
Magnet P.S.'s + QLI's

Max Daily Temperature and Power Supply Failures



Max Daily Humidity and Power Supply Failures

