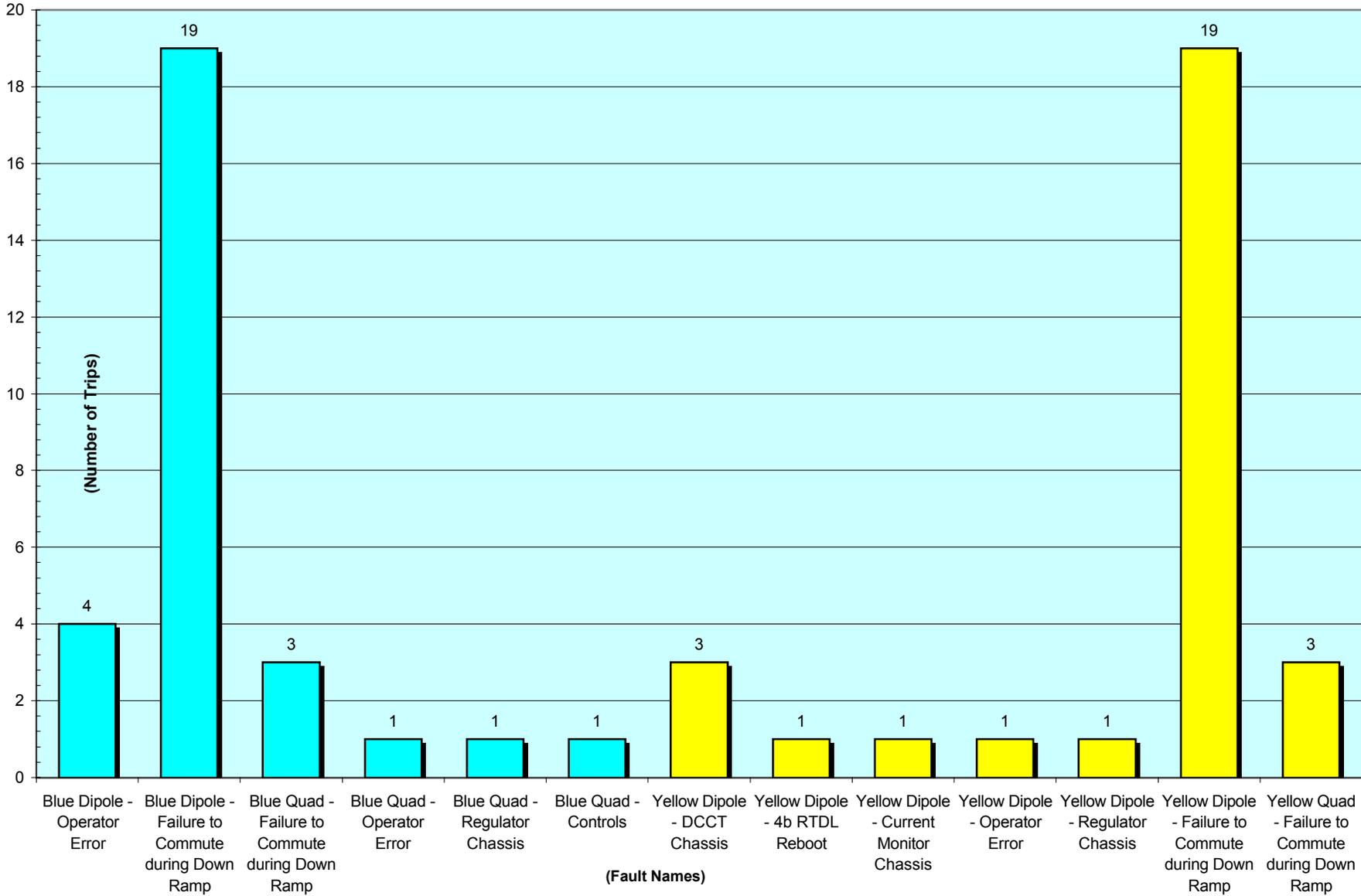
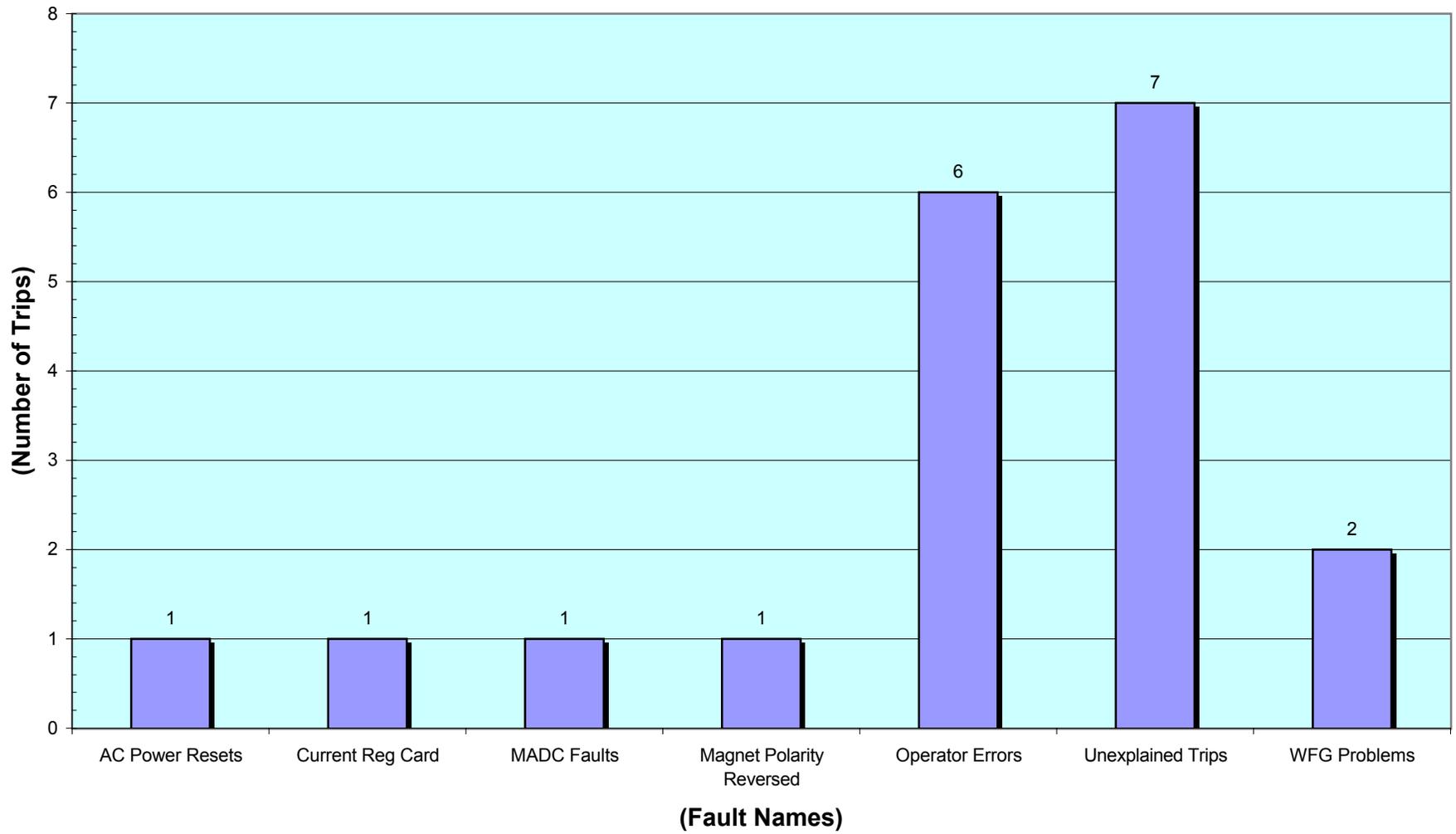


RHIC - Blue & Yellow Main Power Supply Faults

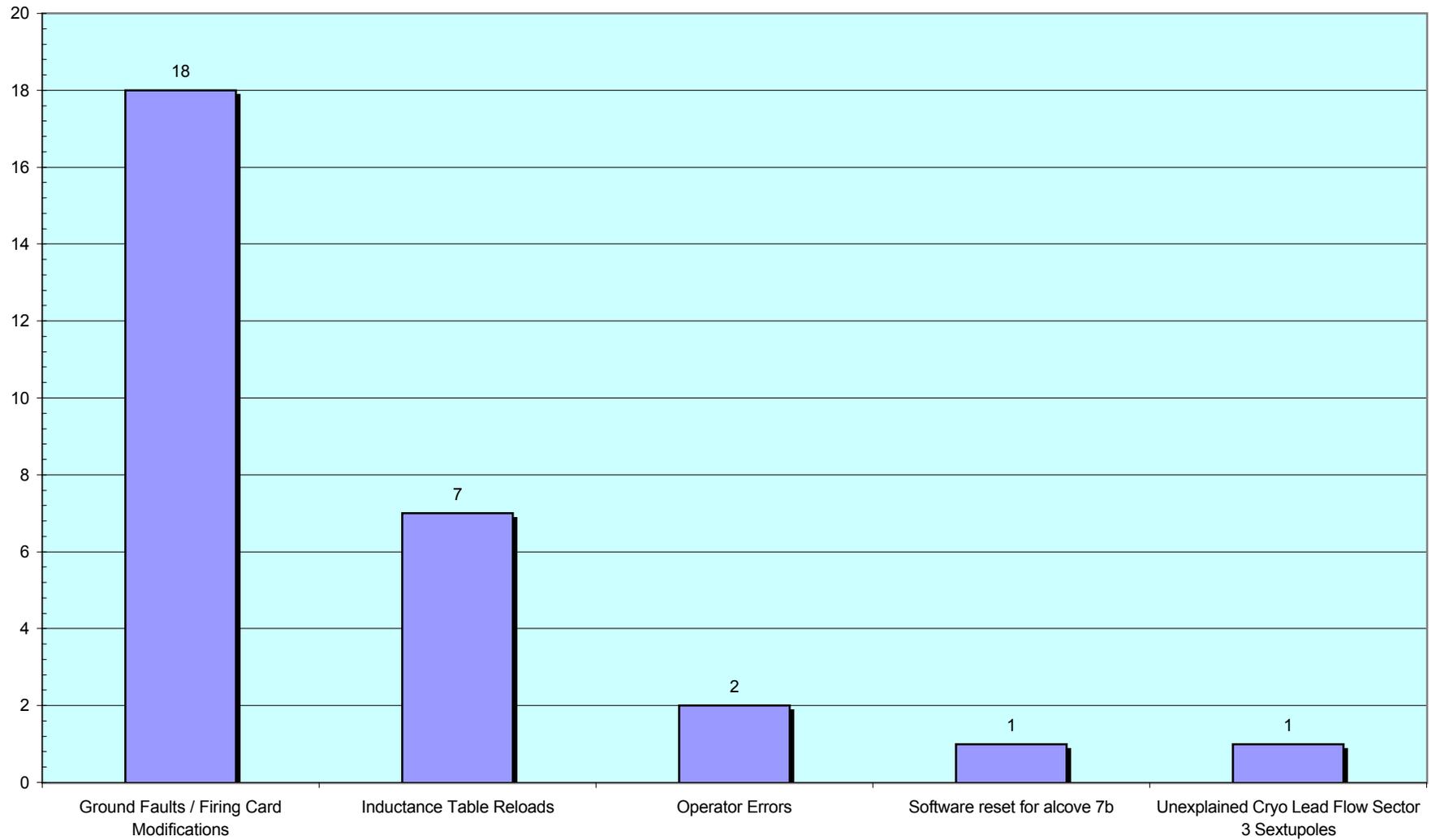
for the Months of October 2001 - January 2002



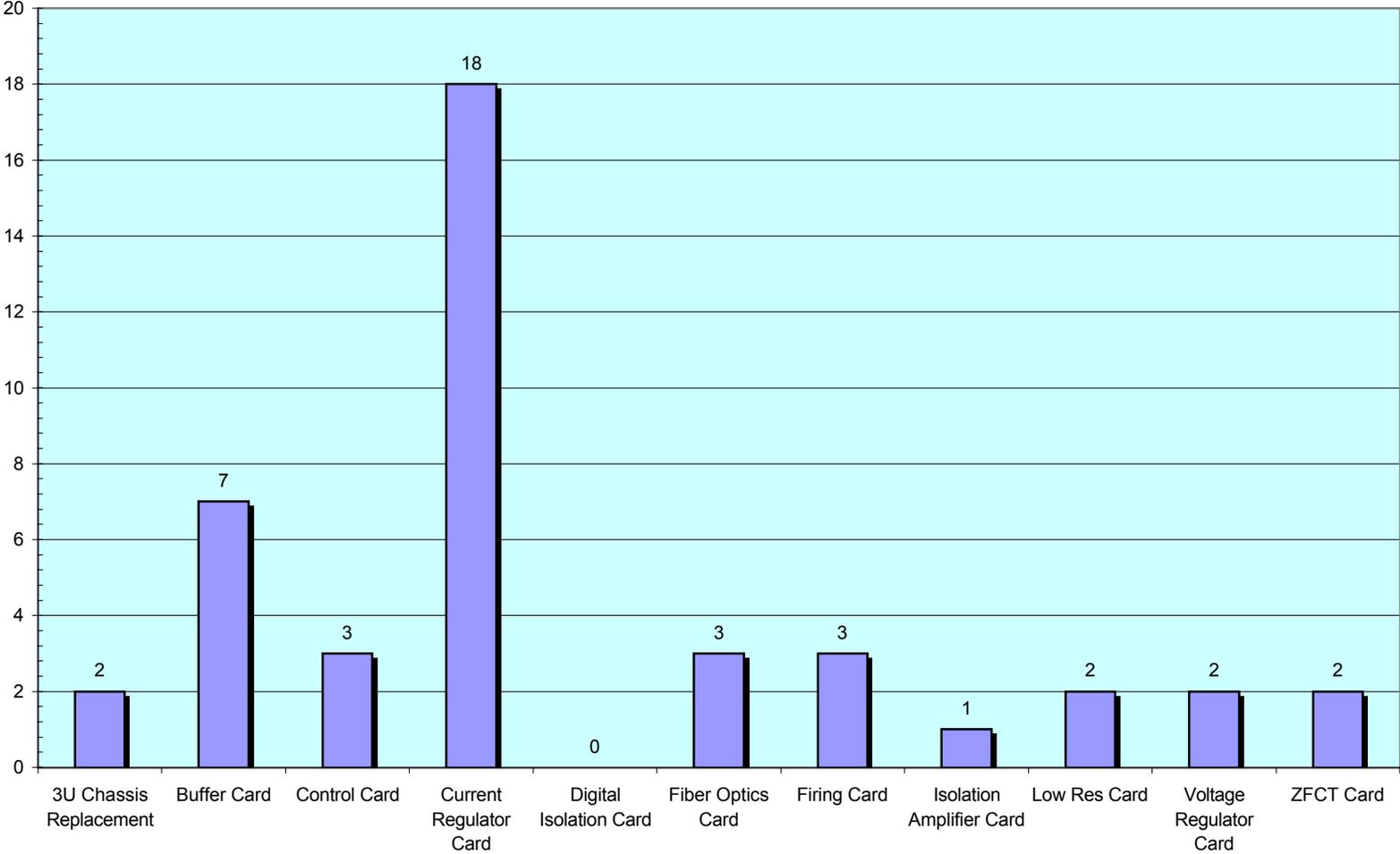
RHIC - Gamma-T Power Supply Faults for the Months of August 2001 - November 2001



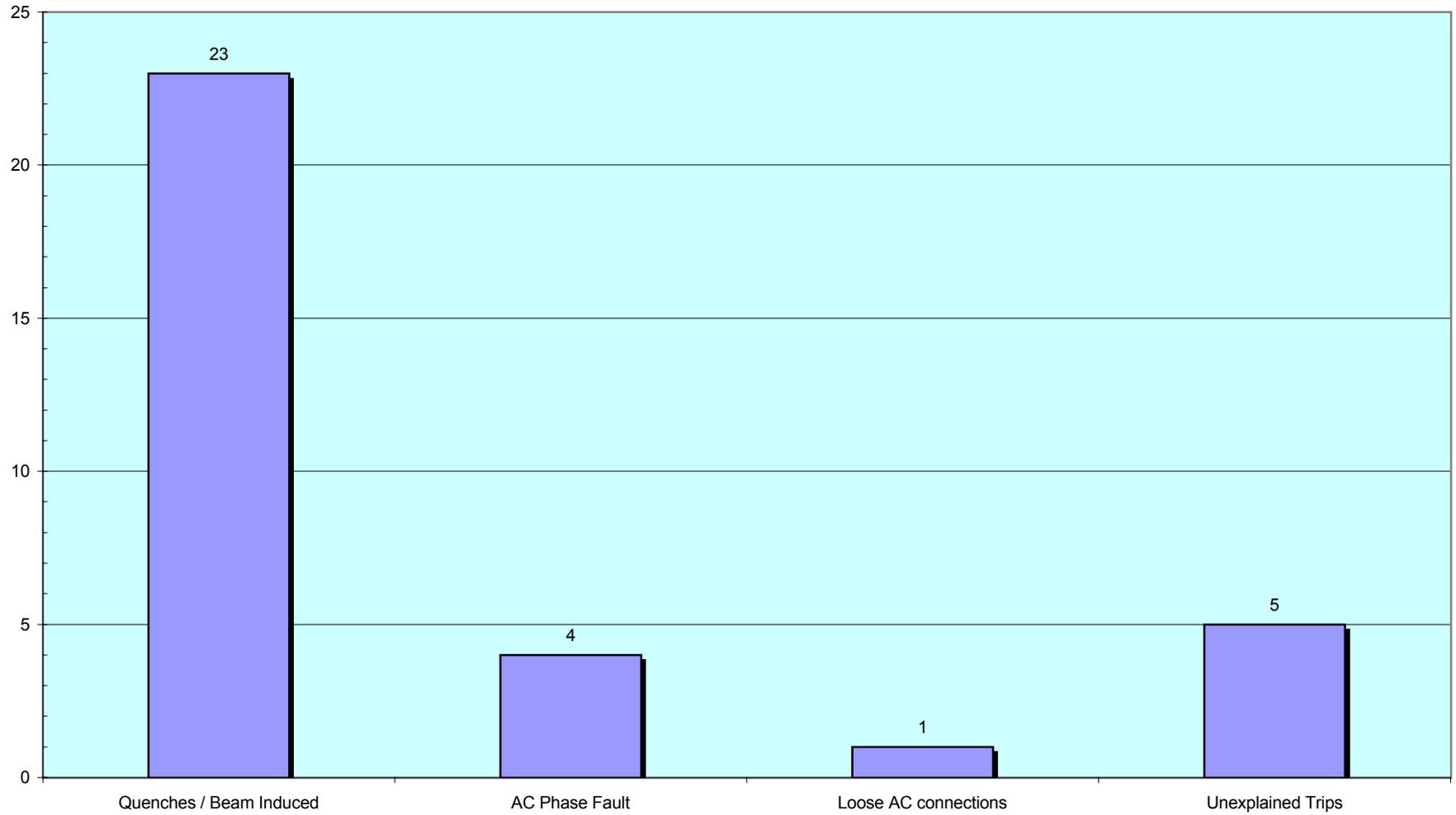
RHIC - Sextupole Power Supply Faults
for the Months of August 2001 - January 2002



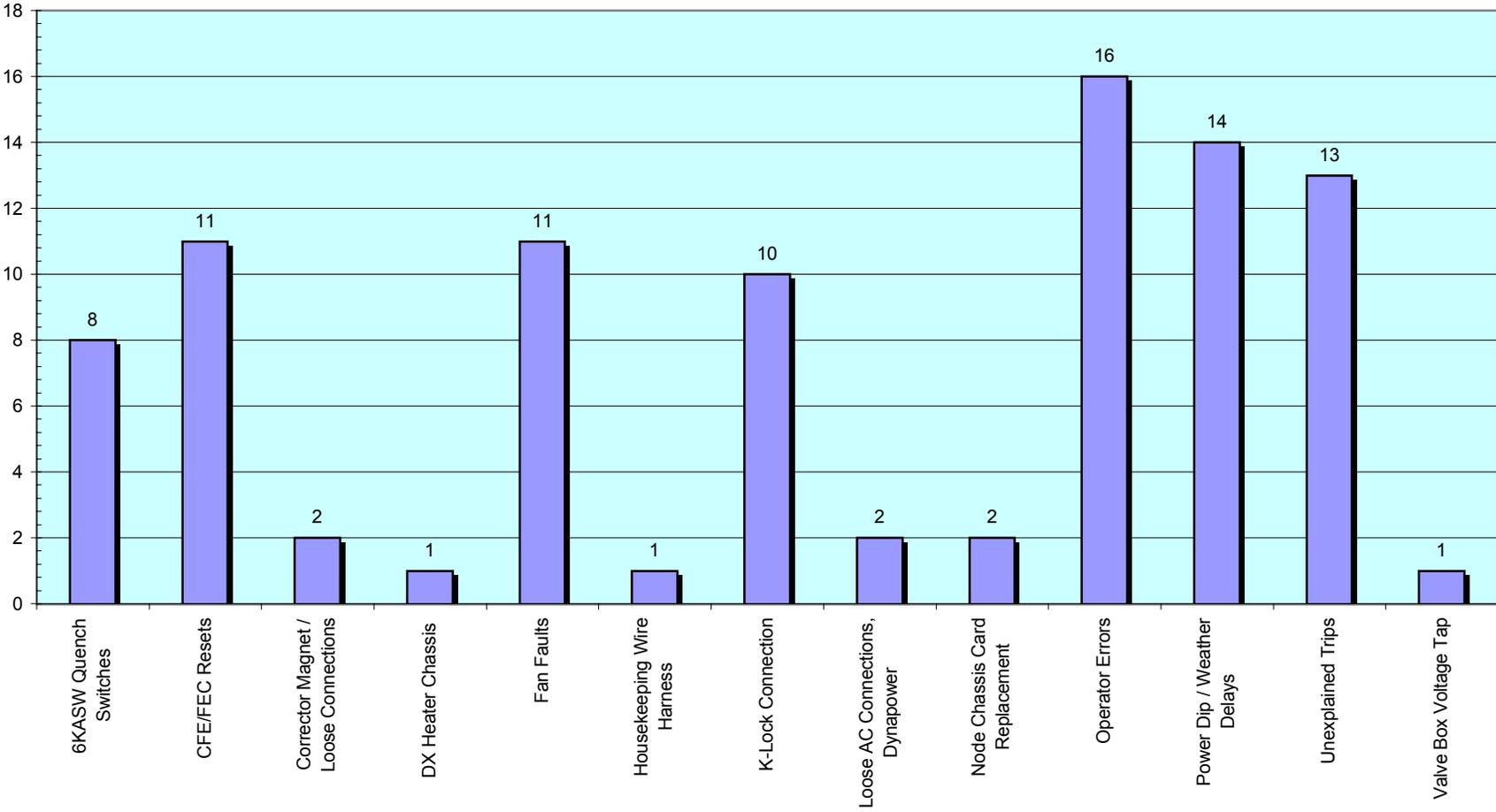
RHIC - Power Supply Card Failures
for the Months of August 2001 - January 2002



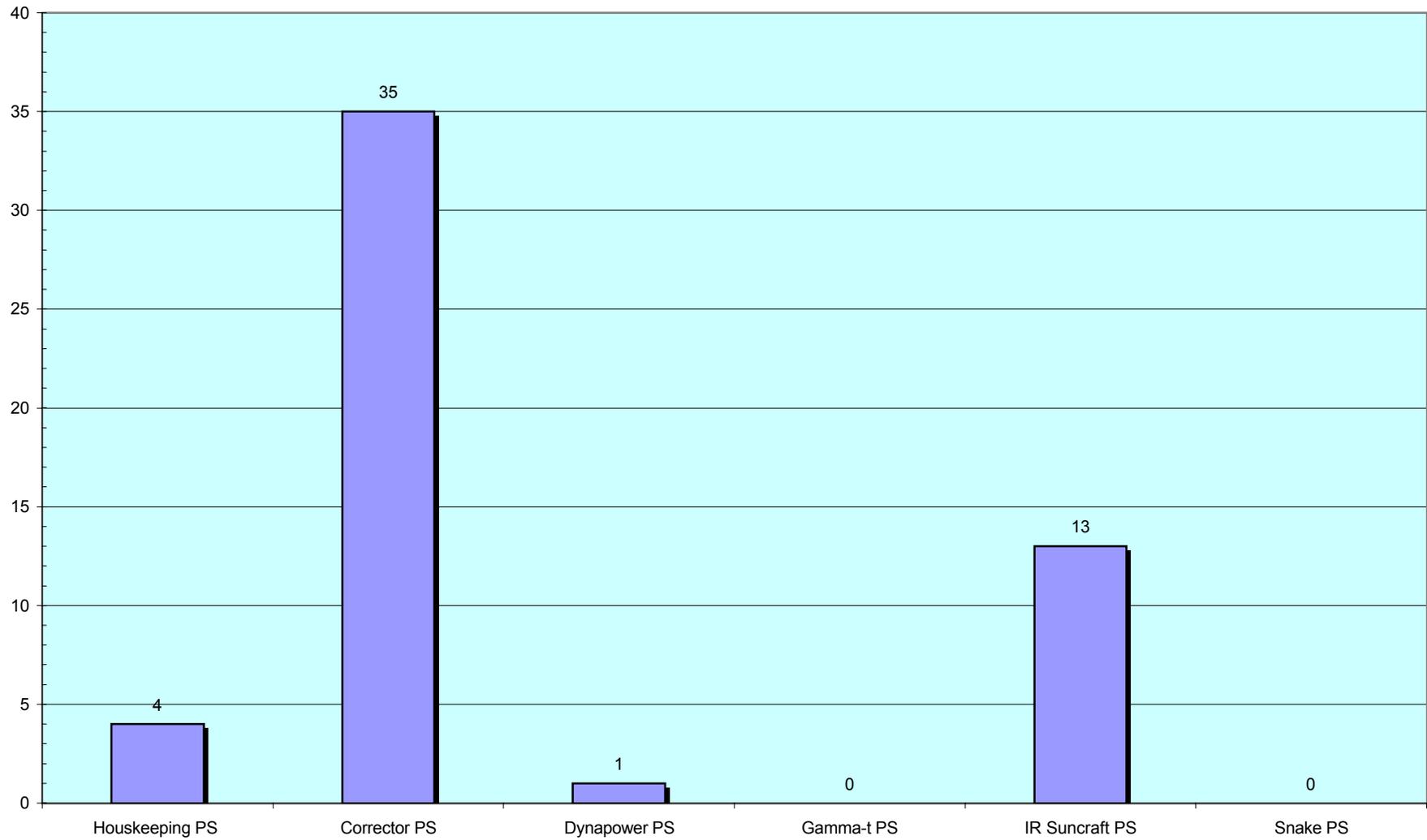
RHIC - Snake Power Supply Faults
for the Months of December 2001 - January 2002



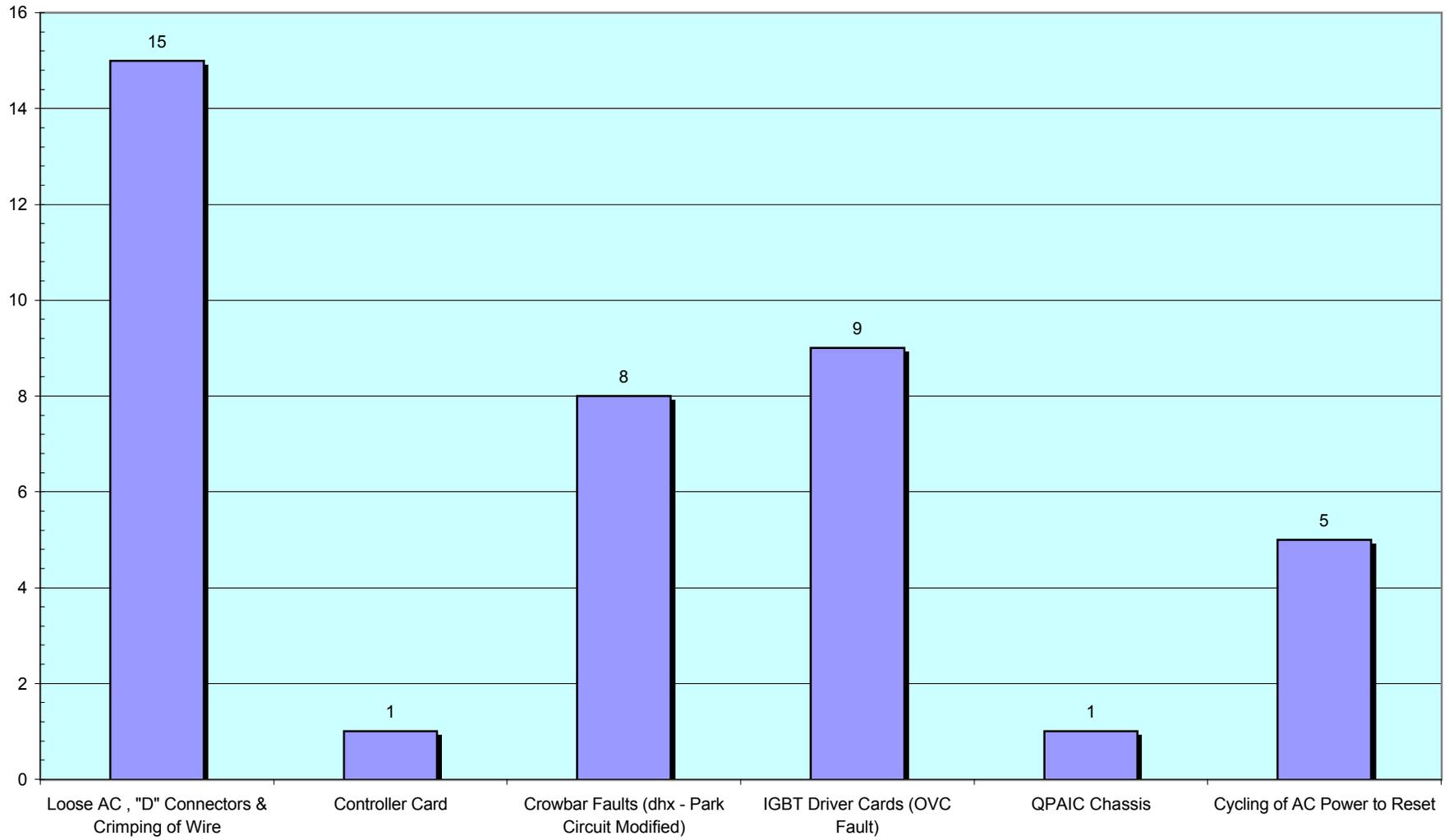
RHIC - Miscellaneous Faults
for the Months of August 2001 - January 2002



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



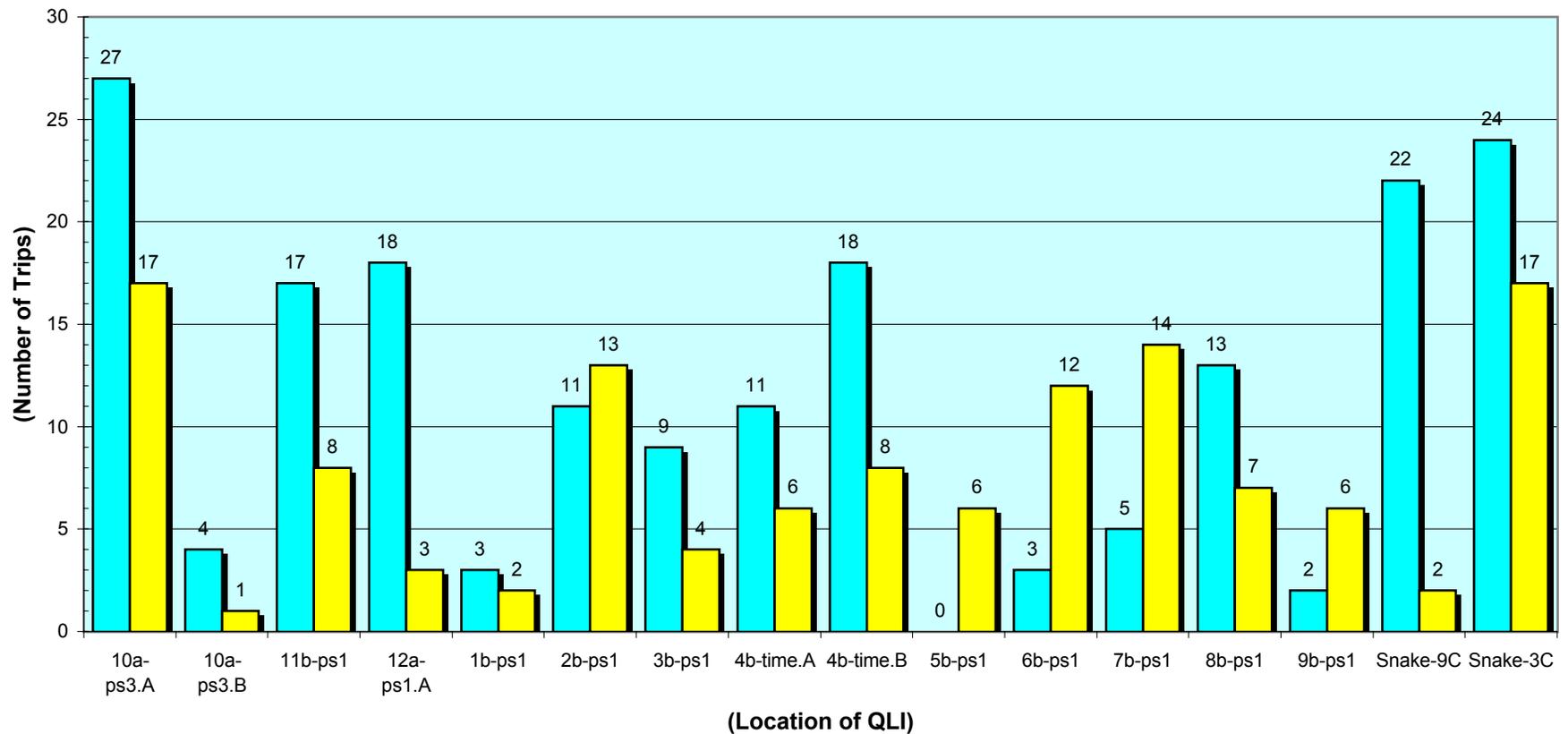
**RHIC - QPA Faults
for the Months of August 2001 - January 2002**



RHIC - Quench Link Interlock Events = 313

Number of Trips for Blue and Yellow Ring

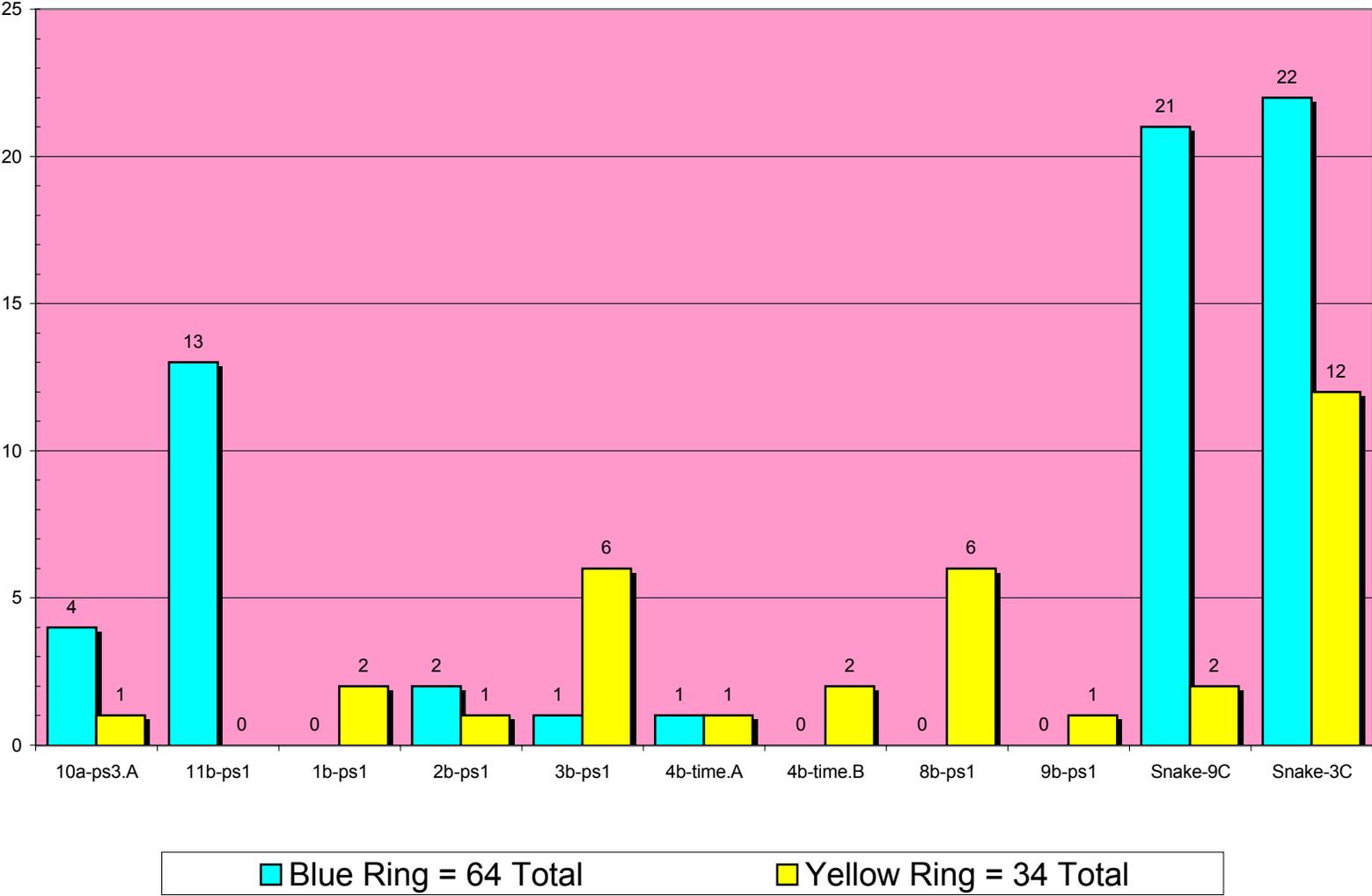
(October 2001 - January 2001)



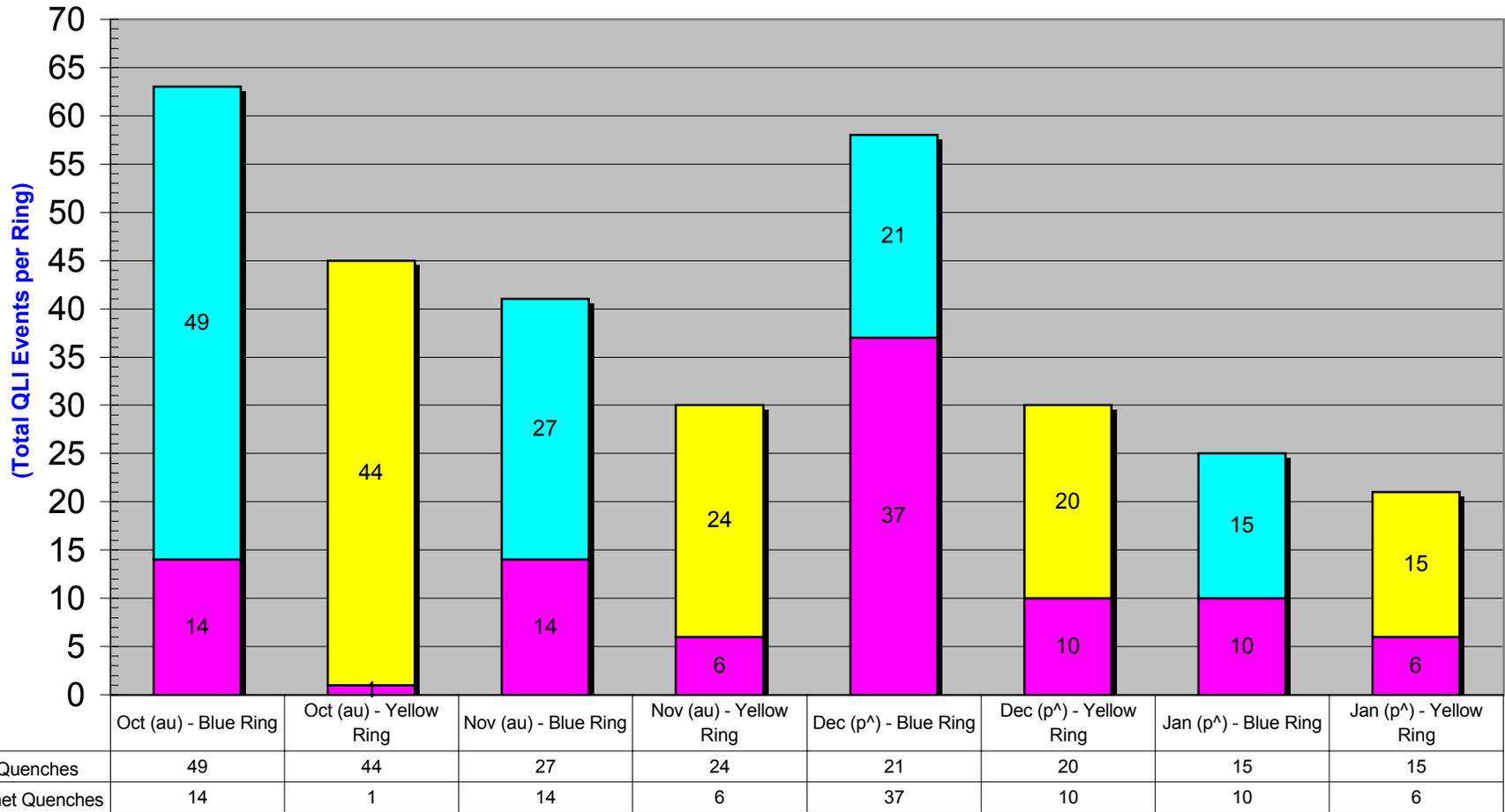
■ Blue Ring = 187 Total ■ Yellow Ring = 126 Total

RHIC Real Magnet Quench Events = 98

for Blue & Yellow Rings (October 2001 - January 2002)



RHIC - Real vs Non-Real Magnet Quenches from October 2001 - January 2002



Glossary of Faults

Faults:	# of Trips	Causes for # of Trips:
3U Control Chassis Replacement	2	Bo11-qd1, possible cause for noisy ramps and after investigating, intermitting connections on the backplane was believed to be the fault. Bo3-snk7-2.3, a possible fault within the 3U chassis causing the supply to trip to the "OFF" state was swapped.
6KASW Quench Switches	8	B10DQPSW (4) PFN Faults, found shorted capacitor and burnt charging resistors, B9DQPSW (2) Scr driver cards failed, Y10DQPSW (1) PLC unit fault, had to be replaced, Y9DQPSW (1) Burnt charging resistor.
Card, Buffer	7	Many found to have shorted capacitors that would load down the regulators on the card, pulling the signals to negative values. (Cap fail location was not found to be consistent on every card).
Card, Control	3	(2) caused by faulty front panel push buttons, (1) caused an AC Phase Fault condition.
Card, Current Regulator	18	Mostly the relays (K1 and K2) failed causing Iref problems. Several tap test in the field showed that these relays were not making full contact and/or would drop out. Other problems consisted of (3) time constant board oscillating (Faulted Cap / bad solder joint). Some cards had no faults and were returned to service.
Card, Digital Isolation	0	None reported.
Card, Fiber Optics	3	Various causes; oscillating on ramps, setpoint differences and power supplies tripping to a standby error condition. Controls Group takes care of the repairs to these cards.
Card, Firing	3	The firing card has been known to loose its synchronization when the supply has been tripped, the fix is to cycle the AC power to re-sync the card. There is a fix and this will be modified during shutdown.
Card, Isolation Amplifier	1	Bo6-qf8 experienced noise on the ramps. As other cards had already been replaced, the Iso Amp Card was the next step.
Card, Low Res	2	Yi2-qs3 low res card would pull the setpoint down to zero. This number may be higher as we don't normally log this in as a power supply fault.
Card, Voltage Regulator	2	Cards pulled due to failing in the field, upon checking at the shop, shorted capacitors were the fault.
Card, ZFCT	2	Bo11-qd1 noise on the ramps, card was swapped as all other cards had been tried. Yo9-qf6 was tripping on error fault, the zfcct card was in fact at fault and exchanged.
CFE/FEC Resets	11	Systems locking up and reboots were required to clear. This count is probably much higher due to the fact that we do not log these faults in on every reset.
Corrector Magnet / Loose Connections	2	Corrector yo9-tv3 tripping to standby error state, the power supply was changed but the problem still persisted. Loose connections at the magnet tree turned out to be the cause and were properly tightened
DX Heater Chassis	1	The b2-dhx heater chassis failed. Fuse replaced did not work, chassis was pulled and found to have a faulty transformer possibly caused by a shorted tantalum capacitor.
Fan Faults	11	(4) due to restriction of air vane travel unable to make switch contacts, (6) switch contacts became dirty, (resistive build up) by cycling switches, contacts became clean, (1) dirty fan filter, changed.
Gamma-T / AC Reset	1	A bad WFG request not properly working, logs show high radiation levels may have caused damage. An ac reset of 9c-ps2, cleared the problem.
Gamma-T / Current Reg Card	1	Current would not reach setpoint, indicating a 2amp offset at the top end. Turned out to be the Iref relay causing the problem.
Gamma-T / MADC Faults	1	Beam loss at transition, Gamma-t cfe-7c-ps1 showed no heartbeat, madc error. Controls group handled this one.
Gamma-T / Magnet Polarity Reversed	1	The string of magnets connected to the yi2-qgt (gamma-t) power supply had a polarity reversal and were corrected.
Gamma-T / Operator Error	6	New to this run, there were (3) rampTimeS set to wrong values, (1) issuing a jump command when the supply was off, (1) turn on to a power supply with a setpoint, causing it to rail, (1) accramp started, no real event.
Gamma-T / Unexplained	7	Power supplies would trip to the off state and or found in the off state. This problem may have been an oversight when supplies were needed and were never turned on.
Gamma-T / wfg Problems	2	(1) yo8-qgt indicated a crowbar and Iref was unable to come down from 100amps, (1) yi3-qgt would not ramp, also due to a fault in the wfg.

Glossary of Faults

Housekeeping Power Supply	4	Bo11-qd1, suspected cause; b8-q89, no ac to the 15v supply; bi5-tq6, -15reg faulted, loading down the FET board; yi10-tq5, Faulty RY401, causing ring security fault not to clear.
Housekeeping Wire Harness	1	Y4-dho, intermitting output fluctuations, current would drop out for a period of time then come back.
K-Lock Connection	10	Service building 1006b brought down the QLI 10 times when the problem turned out to be a bad solder connection on one of the k-lock connectors that goes into the quench detection system.
Loose AC Connections, Dynapower	2	Bo10-qd1 and bo10-qf6 sharing the same rack 208vac, would intermittently trip to the "OFF" state. Tightening of all ac connections, some appeared to be slightly relaxed. Electricians checked the breaker panel but not the buss bar side of the breakers. Problem may come back.
Main Blue Dipole - (Operator Error)	4	(1) Wrong Ramp Factor was used, (1) The AGS Booster MMPS was accidentally left on during ramping, (1) Running at top energy, a down sequence was issued sending the mains right to park, (1) Recovery program didn't run up the blue main.
Main Blue Dipole - (Communication Failure during Down Ramp)	19	These glitches occurred when switching from flattop to ramp currents. Operating the AGS Booster MMPS while ramping may have been part of the problem. However, various software changes eventually fixed the problem.
Main Blue Quad - (Controls)	1	Tripped due to a controls problem in the wfg telling the supply to stop changing early in the ramp, then jumping upwards at the time of the QLI.
Main Blue Quad - (Operator Error)	1	Current taking off at injection, turns out that someone was testing live gamma feature in the decoupling scripts
Main Blue Quad - (Regulator Chassis)	1	There was a trip due to "reg error" on ADT, however the regulation did appear to be operating normally.
Main Blue Quad - (Communication Failure during Down Ramp)	3	These glitches occurred when switching from flattop to ramp currents. Operating the AGS Booster MMPS while ramping may have been part of the problem. However, various software changes eventually fixed the problem.
Main Yellow Dipole - (DCCT Chassis)	3	Three QLI occurred due to a problems with the DCCT Chassis which was eventually replaced.
Main Yellow Dipole - (4b RTDL Reboot)	1	A reset of the 4b RTDL caused the main to QLI.
Main Yellow Dipole - (Current Monitor Chassis)	1	A problem in the current monitor chassis "cur mon" alarm, found that capacitors needed to be added to the circuit.
Main Yellow Dipole - (Operator Error)	1	After the mains were unlocked due to working procedures, the procedure for turning them back on was not followed properly and caused a QLI.
Main Yellow Dipole - (Regulator Chassis)	1	A problem with the regulator chassis caused a QLI on the down ramp.
Main Yellow Dipole - (Communication Failure during Down Ramp)	19	These glitches occurred when switching from flattop to ramp currents. Operating the AGS Booster MMPS while ramping may have been part of the problem. However, various software changes eventually fixed the problem.
Main Yellow Quad - (Communication Failure during Down Ramp)	3	These glitches occurred when switching from flattop to ramp currents. Operating the AGS Booster MMPS while ramping may have been part of the problem. However, various software changes eventually fixed the problem.
Node Chassis Card Replacement	2	The internal 5vdc power supply would fail after running for a while due to heat build up. Possibly underrated for the current load conditions, these supplies were upgrade.
Operator Errors	16	Wrong program files / ramp factors used, wrong commands sent to power supplies, use of diagnostic mode during a recovery program, sending off commands when the supplies are at top energy (alcove 3C snake magnets)
Power Dip / Weather Delays	14	LIPA was responsible for (2) two power dips, weather and weather delays to protect the equipment were (6) six. Glitches that occurred unexplained account for (6) six additional power dips.
PS Replaced, Correctors	71	71 accounted trips, most difficult to repair in the tunnel, whenever there is a suspected power supply problem, the supply is replaced with another unit. (35 units replaced, approximately 5% bench tested having no problems).
PS Replaced, Dynapower	1	Yo9-qd9 tripping on run up, card replacements n/g, pulled unit for repair.
PS Replaced, Gamma-t	0	No reported problems that required the replacement of the entire main power supply unit.

Glossary of Faults

PS Replaced, IR Suncrafts	13	50% account for the main contactor located internally failing. Housekeeping faults and other electronic components make up the rest. All these being internal, the power supply has to be pulled out of service for repairs.
PS Replaced, Snake	0	No reported problems that required the replacement of the entire main power supply unit.
QPA - Controller Card	1	Failed transformer on the card, unable to clear faults.
QPA - Crowbar Faults (dhx Park Circuit)	8	The dhx power supplies would become unstable on turn-on causing a large voltage spike to the maximum, tripping on crowbar fault. A modification to the C30 cap in the park circuit of the current regulator cards fixed the problem.
QPA - IGBT (OVC Fault)	9	Original cards beginning to fail due to components, they were replaced with a newer modified version.
QPA - Loose AC, "D" Connectors & Crimping of Wires	15	B12-dhx-ps caused many QLI, upon intensive investigation, the problem was located in the QPA mounted above, The AC connection to a fuse mounted on the 4 door was intermittent, loose. QPA for bi5-tq4, loses "D" Connector; yo9-tq6 no setpoint or current, upon investigating, problem solved itself, possible bad crimp of the wire.
QPAIC Chassis	1	The driver chips failed, occurred during a power dip.
QPA's, Cycling of AC Power to Reset	5	Actual count may be higher as they are not always reported. It appears that sometimes the qpa's need a manual AC reset due error faults not clearing.
Sextupole / Inductance Tables	7	Current changes made to the sextupole magnets, many would trip. Retuning for the inductance tables solved the problem.
Sextupole Power Supply / Ground Faults / Firing Card Modifications	18	Starting in the 5 O'clock alcove, power supplies would have trouble coming on, then tripping once they were on. Thought to be ground faults, electricians found nothing. Further investigation turned out to be firing card ground currents. Isolating this card from ground cleared the problem so all other sextupole power supplies were also isolated.
Sextupole PS / Operator Error	2	Yi11-sxd tripped during sextupole beam cleaning. Wrong ramp factor for yi7-sxd during a ramp caused a trip.
Sextupole PS / Software reset for alcove 7b	1	Yellow supplies indicating a quench state. The recovery program would halt, therefore a reset to the quench detector solved the problem.
Sextupole PS / Unexplained Cryo Lead Flow, Sector 3	1	Cryo lead flow alarm and upon investigating the problem solved cleared. Possible loose connection?
Snake Magnet Quenches / Beam Induced	23	First time snakes used in the ring, quenches occurred during beam tuning and at times when cryo was not fully recovered and magnets were turned on.
Snake Power Supply / AC Phase Fault	4	unexplained ac failure trips for yi3-snk7-1.4, the mounting screw for the main 60amp breaker was stripped creating an intermittent connection on the "C phase" of the breaker. Electrician moved breaker to a spare location.
Snake Power Supply / Loose AC connections	1	Intermittent trips not at regular intervals causing power loss to the blue snake power supplies in alcove 3C. Turned out to be loose connections (all 20) on the back of the AC power chassis in the rack. (Note: seems that when the unit was installed, the connections were never tightened all the way down)
Snake PS Trips / Unexplained	5	bo3-snk7-2.3 tripping to the off state, replacement of every unit except the power supply itself, fixed the fault. Possible loose connection or in the node card cable harness that was also replaced.
Unexplained Trips	13	12a-ps1.A sometimes would fail during a recovery program. 10a-ps3,A Yellow and 6b-ps1 Yellow would occasionally trip the link, no problems found in analysis they too would reset with no problems. 7b-ps1 blue & yellow fail at the same time, changed the permit module, would still fail, changed the V102 interface card but due to the end of the run, not sure if this fixed the problem.
Valve Box Voltage Tap	1	A voltage tap wire was crimped on the insulation, eventually breaking through causing a short to ground.