

TWG Meeting (5/20/04)

Summary of April 2004 Shutdown Activities – R. Klaffky, AOD

- Upgrades to Injector, Storage Ring, and Beamline Systems
- Maintenance/repair of these systems

Beamline Fault Remediation Plans

Summer Schedule

Some Beamline Plans for the August Shutdown

ACCELERATOR AND BEAMLINER SYSTEMS (cont'd)

Storage Ring Upgrades

- Decker Distortion S26, 27, 28
- Water circuit and control cables installed in preparation for HOM damper installation in S38 RF cavities in August 2004
- Improvement to ACIS UPS systems
- Corrector regulators upgraded
- Mitigation of old BPLD electronics and cables

Storage Ring Maintenance

- Maintenance on 480V Switchgear X8, X9
- Maintenance on transformers and load interrupters X1-1, X1-2, X2-1
- Maintenance on transformers X9-1 and X9-2
- Klystron maintenance
- Exchanged refurbished ion pumps in Sectors 20-24 and baked

ACCELERATOR AND BEAMLINER SYSTEMS (cont'd)

APS Injector Upgrades

- Completion of L1 water skid upgrade (flowmeter installed)
- Phase I Upgrade (6 of 20) Linac BPM FE electronics and DAQs
- New PTB S-band BPM electronics for direct injection

Injector Repair/Maintenance

- PC gun re-installed (Cu cathode instead of magnesium)
- PAR kicker magnet maintenance
- Booster kicker magnet maintenance
- Ion pumps replaced on scraper tank where there had been water leak
- Klystron tank maintenance
- Replace WR 284 water load in L4

ACCELERATOR AND BEAMLINER SYSTEMS (cont'd)

Beamline Upgrades (Front Ends and Insertion Devices included here)

- Installed 21 ID canted undulator front end
- Installed new safety shutters on 23ID and 24ID
- Baked these front ends and installed PSS
- Installed and aligned new 26ID (Nano) and 30 ID(IXS) wall collimators
- Installed utilities for 11BM FE
- Survey extended from SR to experimental floor for 25ID, 25BM, 26ID, 26BM
- DIW monitor improvements – DP monitors replaced with high reliability flowmeters
- Sector 23, 24 beamlines connected to APS DIW system
- Sectors 1-18 PSS electro-mechanical timer relays replaced with solid state devices
- Remote shutter interface installed on 3ID
- Various computer software/hardware improvements (a sampling):
 - APS/CAT software distribution system finalized
 - Samba software installed on PV Gateway computers to allow PCs to access distribution directories as well as Solaris, Mac, and Linux workstations
 - Worked on correcting Viper cybersecurity deficiencies for COMCAT network and computers

- XOR Beamlines:
 - Installed Mailman list management software on XOR server, allowing users to manage their own lists
 - Installed anonymous FTP server to enable XOR beamlines to distribute experiment data to non-APS users
 - Created firewall conduits for XOR web and FTP servers to allow access to them by non-APS users
 - Installed new Linux server for XOR users
 - Upgraded XOR workstations to current Red Hat Linux version and transitioned admin responsibility to IT group
 - Upgraded CMC CAT BM line to synApps 4.6
 - Upgraded 4IDC to synApps 4.6
 - Upgraded CCD image server at Sector 8ID
 - Converted sector 8ID I station to EPICS/synApps

ACCELERATOR AND BEAMLINER SYSTEMS (cont'd)

Beamline Maintenance/Repair

- ID Maintenance

- Sector 3 undulators removed, U27 #2 re-magnetized, U27 #1 and #2 retuned and replaced
- Sector 4 U25 removed and retuned
- S22ID removed for chamber baking and reinstalled
- Chains and sprockets replaced on all STI IDs
- EMW drive chain serviced
- Encoder adjustments and calibration

Other Maintenance/Repair

- Replace VAT chassis, CC gauges, cables and bake front ends in 9BM, 9ID, and 33BM. Interlock signals that request a valve closure combined to create an AND polling logic.
- PSS validation on 17 beamlines (BM and ID)
- Several cryo-pump controllers reworked with changes in timers and the timing connection
- 34 ID wiring error corrected in remote shutter interface chassis

Some Beamline Work for August Shutdown

- Install Sector 30 (IXS) ID Front End
- Install Sector 23 (GM-CA) BM Front End
- Install Sector 26 (Nano) ID Vacuum Chamber
- Install IXS 3.3 cm undulator for shielding verification
- Decker Displacements S14, 29, 30
- XBPM installation S14ID (original was for wiggler)
(P1 and P2)
- Sector 7, 20 connection to APS DIW system

FAULT REPORT

RMD #04109 (03-02-2004)

Beamline DIN # 000355

Subsystem: Beamline 9-ID PSS

Submitted by: R. Dortwegt (03-10-2004)

DESCRIPTION OF FAULT(S)

The flow interlock circuit for the white beam stop in 9-ID-A tripped on high flow on 3-2-04. The water flow rate was adjusted downward on 3-2-04, but because the DP signal was very near its corresponding trip setting, the flow could not be reduced very much. By the next day, the trip had occurred again.

DISCUSSION, RESPONSE TIME AND TIMELINE

The first call concerning this fault was received by the author on 3-2-04 around 18:00 hours. At that time, it was clear that the water flow rate should be adjusted downward as the flow signal was tripping the high set point of 38 inWC. However, the DP operating point was, at the same time, near its low trip set point of 55psid. Lowering the water flow rate significantly to assure the avoidance of flow signal trips would create a low DP trip. The decision was taken to lower the flow slightly at that time to avoid both the high flow and low DP trip setpoints. This was performed by the ASD-ME technician on site at that hour.

The next morning, the author discussed the situation with J. Collins and M. Ramanathan. These parties agreed that a change of DP setpoints would be appropriate based on having a flow vs. DP characterization curve to be obtained with an ultrasonic flow meter. They would not authorize a change of setpoints without this data.

By approximately 13:00 hours on 3-3-04, the PSS circuit had tripped again. The flow-DP data was collected and given to J. Collins who reviewed the data and offered new DP setpoints that corresponded to the flow setpoints that were not altered.

After the data was collected, but prior to changing the setpoints, the beamline was placed back in operation using the suspect DP setpoints while the data was being reviewed. This was done to permit the User to make use of the beamline, understanding that there was the likelihood of further trips.

Data was collected between 14:15-15:00 hours. The beamline was placed back on line at that time. The DP setpoints were changed by N. Friedman of the PSS group around 16:05 hours. Another fault of the circuit occurred at 17:00. At that time the hatch was opened and the water flow rate was reduced by an ASD-ME technician to a more appropriate rate.

Figure indicates flow and DP signals for the month long period from 2-9-04 through 3-9-04. Figures 2A and 2B indicate flow and DP data for the 48 hour period of 3-2 through 3-3-04. Figure 3 indicates the timeline of data collection, DP set point change and flow adjustment on 3-3-04.

REASON FOR THE INCIDENT

Several things contributed to this ongoing fault situation:

1. Mismatch between actual water flow rate and corresponding DP data. It is unclear how the DP setpoints could have been chosen to be so far away from the actual DP for a given flow rate.
2. The actual flow has been drifting upward while the actual DP has been drifting downward (see Figure 1). It is unclear how this occurs unless the component is being eaten away or the instruments are failing. The latter is not indicated because all abrupt flow and DP changes correspond accurately in time.

REMEDIATION (HOW THE PROBLEM WAS SOLVED)

Recharacterization of system flow-DP curve and adjustment of DP setpoints was the method used to address the issue on an immediate basis. Long term corrective action is indicated below.

APPLICABLE PROCEDURES

Not applicable.

SPARES

Not applicable.

SYSTEM MONITORING

Improved system monitoring is indicated. See corrective action below.

CORRECTIVE ACTION

Several corrective actions are planned or will be taken to prevent this problem in future:

- 1) During the May, 2004 shutdown, all PSS beamline flow instruments that employ DP sensors will be replaced with “flow” sensors. These PSS systems are all provided with two electronic instruments to verify adequate water flow. Up until now, when beamline components were furnished with “mesh” (a means of enhancing heat transfer rate) one flow instrument monitored flow rate while the other instrument monitored DP across the component itself. The occurrence of repeated DP trips has

caused a re-evaluation of the usefulness of DP trips. The decision to change DP sensors to flow sensors was reached by mutual agreement with M. Ramanathan.

- 2) It has also been agreed that all PSS flow trips will be on low flow only. There will be no high flow trips. High limits will be put in place as warnings only.
- 3) In the near future, all PV's for PSS water flows will be monitored on EPICS with pre-alarm values that will alert MCR personnel of a worsening water flow condition prior to a trip.
- 4) Already in place is a 3-year program to upgrade flow monitoring equipment in the PSS system with more reliable components. Currently, components are located in beamline hutches and are subject to failure by exposure to x-rays. Upgraded instrumentation is mounted outside the radiation environment. Sector 9-ID will be upgraded in September, 2004. This program is currently 62% complete overall and is expected to be complete in September 2005.

Safety Interlock Group Beamline Downtime
2004-1

000329	1/29/04	08:30	31-ID	Watchdog relay failure; shutter could not be opened.	4:20	Re-wiring of relay by SI group.
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Conversion of electro-mechanical to solid-state relays is in progress. These are being changed out as beamline validations are due. All the remaining relays are swapped out with new every shutdown.

000332	1/29/04	17:51	31-ID	Beamline was taken offline to complete a portion of PSS Validation.	0:38	Validation was completed.
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Required after replacement of WDT

000333	1/30/04	11:00	12-BM	Watchdog relay failure	0:30	Replacement of relay
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Conversion of electro-mechanical to solid-state relays is in progress. These are being changed out as beamline validations are due. All the remaining relays are swapped out with new every shutdown.

000334	1/31/04	20:33	14-ID	LOVE controller set-point incorrect; slight water pressure fluctuation tripped high alarm set-point	2:47	High alarm set-point was changed for consistency.
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All LOVE controllers are being set to monitor flow only and the high pressure trip eliminated. As a side note, future DIW systems will be monitored using a PLC rather than LOVE controllers.

000338	2/3/04	10:34	13-BM	Door closed limit switch was not engaging properly; shutter could not be opened	0:54	SI technician adjusted limit switch.
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Will investigate adding re-calibration of LS to validation procedures

000353	2/29/04	13:36	09-BM	FE-EPS trip on CC2	0:09	FC followed Standing Order reset procedure
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This is a recurring series of CC2 trips occurring at 9BM. As far as can be determined, the root cause is a malfunctioning Cold Cathode Gauge (CC2), which correlates somewhat with the data presented (repeated closure of the Slow Valve and Front End Valve (SV and FEV) but not the Beamline Isolation Valve (BIV), which should also have closed).

Since the root cause is a random glitch event, the chosen method of repair is to replace the gauge, cable and analyzer in question, and extensively test the system during shutdown. Additionally, This sector was chosen as one of three to test voting logic for CC1 and CC2, which is designed to eliminate this sort of problem.

000358	3/8/04	18:00	08- ID	Loose wire inhibited beamline participation in machine studies	5:00	SI was able to correct the problem on 3/9
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Technicians were verifying documentation and loosened a wire as part of the investigation. Future work will be restricted to visual inspections only

000359	3/10/04	10:13	09- BM	Damaged wire caused EPS trip, closure of SS2 and PS1	2:57	SI group repaired wire
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Was caused by PSS Survey work in preparation for a system upgrade. While removing wire ties with a pair of diagonal cutters, the wire transmitting the PS1 Open Request signal from FE-EPS to PSS was accidentally severed. Future work will be restricted to visual inspections only

000364	3/14/04	16:15	33- BM	Pneumatic door malfunction	0:20	Tecknit performed door maintenance; SI is scheduled to adjust mechanisms during studies
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This is a reoccurring problem that is out of our field of expertise. This should be referred to the floor coordinators

000366	3/16/04	20:15	22- BM	Serious fault caused by I/O block shutdown	0:27	SI personnel power-cycled the I/O block
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I/O block was replaced and attributed to normal wear.

000368	3/18/04	13:15	08- BM	PSS watchdog relay failure	2:07	Replacement of relay
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Conversion of electro-mechanical to solid-state relays is in progress. These are being changed out as beamline validations are due. All the remaining relays are swapped out with new every shutdown.

000370	3/19/04	18:08	09- BM	CC2 trip closed several front end valves	0:16	FC documented fault and reset FEPS
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This is a recurring series of CC2 trips occurring at 9BM. As far as can be determined, the root cause is a malfunctioning Cold Cathode Gauge (CC2), which correlates somewhat

with the data presented (repeated closure of the Slow Valve and Front End Valve (SV and FEV) but not the Beamline Isolation Valve (BIV), which should also have closed). Since the root cause is a random glitch event, the chosen method of repair is to replace the gauge, cable and analyzer in question, and extensively test the system during shutdown. Additionally, This sector was chosen as one of three to test voting logic for CC1 and CC2, which is designed to eliminate this sort of problem.

000375	3/28/04	22:03	34-ID	Recurring serious PSS faults	14:59	Investigation by SI, VAC, and ME groups; SI personnel changed watchdog relay
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Conversion of electro-mechanical to solid-state relays is in progress. These are being changed out as beamline validations are due. All the remaining relays are swapped out with new every shutdown.

000382	4/7/04	08:00	09-BM	PSS panel did not show FEEPS permit	4:27	PSS relay was replaced
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PSS relay was replaced and attributed to normal wear.

000384	4/9/04	14:54	22-BM	PSS serious faults	2:16	Power-cycling and grounding of 15U panel
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Still under investigation

000385	4/10/04	10:22	18-ID	PSS serious faults (shutter-related)	2:43	Watchdog relays were replaced
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Conversion of electro-mechanical to solid-state relays is in progress. These are being changed out as beamline validations are due. All the remaining relays are swapped out with new every shutdown.

000392	4/16/04	00:16	20-ID	PSS faults on P5-B shutter	0:35	Call to PSS on-call and Beamline Personnel for permission to reset
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This was a “no switch” fault. These are usually attributed to the vacuum group caused by blow-by. This was not a PSS failure. This was the PSS reacting to an event.

000341	2/7/04	04:15	09-ID	CC2 tripped, closing PS1 and PS2.	0:30 0:15	Call to FEEPS personnel to document and reset.
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Was a random CC2 event of unknown cause. The suspected root cause was analyzer malfunction, similar to the repeated events occurring at 9BM. Like 9BM, since the root cause is a random glitch event, the chosen method of repair is to replace the gauge, cable and analyzer in question, and extensively test the system during

shutdown. This sector was also chosen as one of three to test voting logic for CC1 and CC2, which is designed to eliminate this sort of problem.

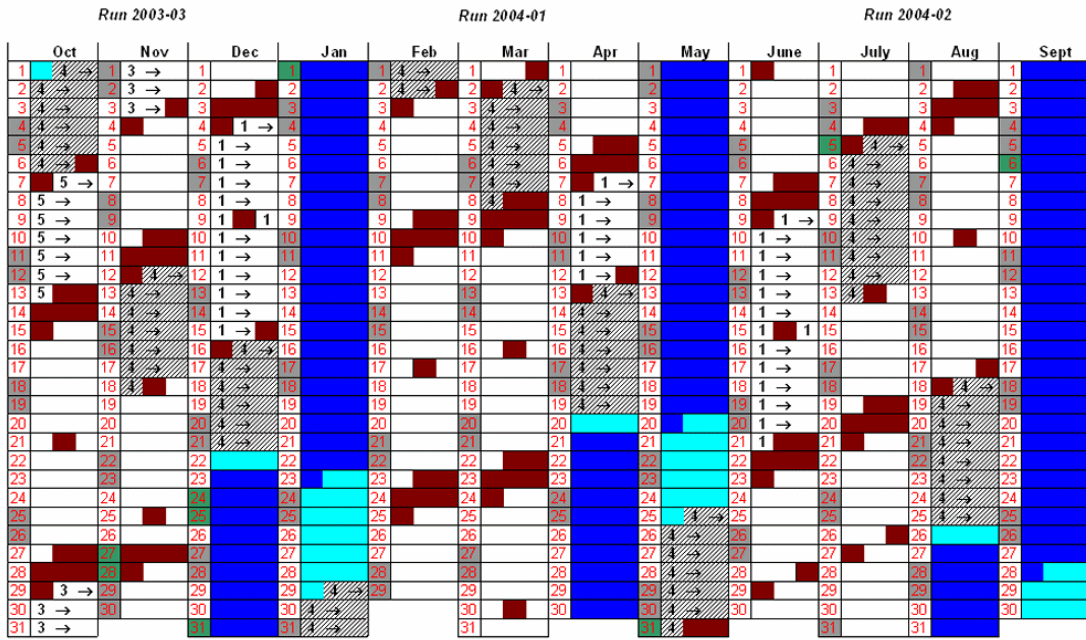
000368	3/17/04	19:09	08- BM	Serious PSS fault occurred; no one was present until the next morning. Fault was reset and beamline personnel notified. Subsequent BLEPS fault occurred because beamline personnel unplugged machine status module.	2:07 20:13	Beamline personnel plugged in machine status module
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This was a “no switch” fault. These are usually attributed to the vacuum group caused by blow-by. This was not a PSS failure. This was the PSS reacting to an event.

000379	4/2/04	02:12	09- BM	CC2 trip closing several FE valves	0:15 2:03	Trip was reset and documented; FC contacted beamline personnel
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This is a recurring series of CC2 trips occurring at 9BM. As far as can be determined, the root cause is a malfunctioning Cold Cathode Gauge (CC2), which correlates somewhat with the data presented (repeated closure of the Slow Valve and Front End Valve (SV and FEV) but not the Beamline Isolation Valve (BIV), which should also have closed). Since the root cause is a random glitch event, the chosen method of repair is to replace the gauge, cable and analyzer in question, and extensively test the system during shutdown. Additionally, this sector was chosen as one of three to test voting logic for CC1 and CC2, which is designed to eliminate this sort of problem.

APS FY2004 Long Range Operations Schedule (October 2003 - September 2004)



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| <ul style="list-style-type: none"> Top-up User Operation in low emittance mode Non top-up User Operation Fill pattern is 24 singlets unless otherwise indicated | <p>SOM Periods</p> <ul style="list-style-type: none"> 1 Hybrid Fill - (singlet) 2 Hybrid Fill - (triplet) 3 110 mA - Low E. singlets 4 324 Singlets - Low E. Fill 5 23 Singlets - Low E. | <ul style="list-style-type: none"> Machine Studies Maintenance Shifts set aside for Studies/ Machine Intervention as Needed Weekends Lab Holidays |
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SHUTDOWN CONSTRUCTION PROJECTS (non-accelerator)

- Preparations completed for future CNM hot water supply and return tie-in to APS system to prevent disruption to APS
- (Tees cut into existing HW lines at column 145 and valves installed)

- BSL3 – BIOCARS work
 - Labyrinth work for 3 BSL3 hutches
 - New exhaust ducts for these hutches
 - Installation of new exhaust HEPA filter, fan, and silencer
 - Installation of new fresh air supply to five air handling units
 - HVAC controls work