

InterCAT Technical Working Group Meeting

August 19, 1999

Agenda Review and TWG Activity Summary: (Steve Heald)

Steve reviewed the meeting agenda and noted that he was substituting for Paul Zschack.

Facility Reports

Facility Update/News: (Bob Ferry)

Bob reviewed information about two recent power outages. The first outage occurred when a fire started in an APS' feeder station as the result of an arc over (causing a significant outage). The second power loss happened when, during maintenance work on a transformer, safety straps were not removed before the unit was re-energized. This resulted in a ground fault which caused a three-hour loss of electricity. Repair and maintenance work is continuing and the APS should return to its standard electrical supply configuration (two working transformers) soon.

Bob reported that availability has been running at approximately 91% with a mean time to beam failure of 25 hours. He indicated that the delay in providing beam after today's morning fill was due to an unanticipated IOC reboot.

Bob also updated the group on the status of the liquid nitrogen system. Module A is filled and has been maintaining its fill level well. Bob told the group that he and his staff are learning the details of the system and are conducting some tests on the unit. One failure of a subcooler valve was found; the vendor is repairing the problem. Module B is fully constructed and in place (not filled). Module C is built and will be shipped to the APS around September 1. Module C will take about two weeks to install. Bob indicated that the entire system is expected to be "live" around mid-October to November 1.

A special fill pattern will be used starting at 4:00 p.m. on Tuesday, September 21. The pattern will be as follows:

- | | |
|---------|--|
| Group 1 | 6 consecutive bunches
15 mA |
| Group 2 | 8 subgroups with 7 consecutive filled bunches in each subgroup
spacing between subgroups = 48.3 nsec
85 mA |

The gaps between the groups will be 1.58 μ sec. Average lifetime should be about 30 hours. A four-hour studies period will be available for users to preview the special pattern between 8:00 a.m. and 12 noon on the 21st. (Handouts describing the special fill pattern were made available.)

Some questions about venting liquid nitrogen were raised. Bob indicated that, to some extent, this will be a "learn-as-you-go" process. Venting will be allowed on the floor, although there may be some noise to deal with. Some general discussion was held on the topics of dewar pressure and fill times and CAT linkages to the main liquid nitrogen system. Bob noted that, so far, each CAT he has spoken with is planning a different approach for linking to the system.

External corrosion causing W-slit water leaks: (Deming Shu, Jeff Collins, and Dave Ryding)

Deming reminded the group about recent findings that have shown L5-80- and L5-90-style slits undergo water channel corrosion when direct contact between tungsten (W) and water occurs. The

L5-90 slit has been redesigned (Deming showed a diagram) and a new design for the L5-80 slit is being developed.

Jeff told the group that the problem was first discovered in sector 3. The water channels on the slits were found to have grown by 50/1000 ths of an inch. Vendors had little experience with or knowledge of this phenomenon. Non-coated machinable tungsten was tested and it was found that the rate of erosion steadily increased as the amount of surface area increased. Coating the machinable tungsten was tested, but found to not be a long-term solution. Jeff showed the group data collected from a water de-oxygenation system; water quality has been shown to improve as oxygen is removed. Jeff told the group the Central Shops can retrofit water systems for the CATs (estimated cost \$4.8K). Anyone interested in more information about de-oxygenation systems can contact Al Schneider, Central Shops, ext. 2-7082.

A question was asked about whether or not this problem would affect the shutter system. Jeff answered "no," the problem only results from direct water contact. The subject of copper corrosion was also raised; rates of copper corrosion will also decrease with decreased oxygen content in the water.

Dave opened his portion of the talk by explaining what machinable tungsten is (tungsten "balls" embedded in a nickel/iron matrix). He then showed photographs of a galvanic corrosion pit found penetrating from the outside in (found at 2-ID). The pit resulted from a water leak; water got between an aluminum plate and machinable tungsten. The damage shown in the photograph occurred in less than six months (a very short period of time). Even the aluminum showed some pitting. Dave noted that the use of deionized and deoxygenated water would slow the corrosion process considerably. He showed a micrograph of oxygen cells found in machined tungsten and talked about their role in pit formation since they can create localized accelerated corrosion. Dave stated that the best option is to have no exposure to water. For flowing deionized water, the best option is to leave the water flowing at all times. If the water flow must be shut off, any at-risk parts should be rinsed and dried with alcohol.

CAT Reports

Fast x-ray measurements on diesel fuel spray: (Jin Wang)

Jin told the group that this work was part of a continuing collaboration with the Energy Systems group at Argonne. He showed a diagram of their experimental set up (with a simple single-hole injector). Intensity measurements were made once every 160 ns. The duration of each injection was 300 μ s; Jin discussed the awkward time scale of the experiment (too long for single pulse, too short for time averaging). He used an APD for single photon counting mode and showed data analysis from the APD output. Due to the large number of data points, an oscilloscope was used to collect the data. The integration of the APD output did require some background correction.

Jin reported that they also looked at a comparison of sextet and singlet APD pulse heights and at the numbers of photons at 6, 9, and 12 keV. The 350 meV peak height was the saturation point (it was the same for the measurements at 6, 9, and 12 keV). Jin also showed and discussed results on measurements on the injection axis at 1, 5, and 9 mm from the nozzle. He indicated that Steve Ross is developing a gating system for these experiments. The group discussed related experiments and measurement techniques.

Beamline Diagnostics Subgroup report: (Jonathan Lang)

Jonathan reported that the purpose of the subgroup is to identify commonly used beamline diagnostic tools. At the July 27th meeting of the subgroup, two major categories of tools were identified: one-time-use (invasive) tools used to test optics performance and for troubleshooting, and in-line (passive) tools such as bpms and quantitative output devices. The subgroup will assemble lists of tools and techniques used for measuring beamline performance. Input for these

lists will be collected via a questionnaire and results will be shared with the TWG (possibly via the Web).

The questionnaire will ask for short descriptions of techniques and/or tools, references for papers or Web addresses, names of parts suppliers, etc. Jonathan indicated that he hopes at least one person from each CAT will complete the survey. He concluded his discussion by identifying current subgroup members.

Detector Subgroup report: (Tom Irving)

Tom stated that the goals of the Detector Subgroup are to share information about detector systems with the TWG and to possibly pave a way for sharing resources. The subgroup plans to initiate a dialog and make recommendations to the APS on detector-related issues. Tom noted that CATs cannot typically acquire all needed detectors and hot spares for their beamlines. The APS could possibly offer support to the CATs in a variety of ways: offer a "pool" of detectors for CAT use, take a role in evaluating detector technologies and interface issues, negotiate rental/lease agreements with vendors, and possibly re-establish a detector development program. Tom showed the group a list of potential candidates for a detector pool.

The next step for the subgroup is to prepare a detector survey to gather meaningful, detailed information about detectors in use at the APS, possible detectors for a pool, new technologies that need to be developed, etc. It was noted that if any anecdotal comparisons of instrument parameters or performance are posted on the Web, they will have to be handled properly. Tom encouraged the TWG to solicit presentations from TWG members about detectors. The next subgroup meeting will be scheduled in the fall; anyone interested in participating should e-mail Tom Irving at irving@biocat1.iit.edu.

Discussion & Other Business

Power recovery issues (coolers, computers, servos, vacuum, etc.): The floor was opened for comments about the impacts of and lessons learned from the recent power outages. The following is a summary of those comments:

- After the second outage, a liquid nitrogen relief valve froze in the open position, resulting in a continuous venting of nitrogen until the valve was unfrozen.
- Found that an operating system began running a log file; it is suspected that this began as the result of a power loss. The log file continued to run until it accumulated a massive amount of stored memory and shut down a beamline.
- Ion pumps should have battery backup or an emergency generator.
- Found that CAT computers came back up faster than the name server after a power loss. Because of this, all computers had to be rebooted.
- Errors were found in the floor coordinator phone lists (e.g., people called twice, incorrect people called). (These problems are currently being addressed by EFOG staff.)
- The Cardkey®-controlled doors locked as a result of the power outage. It is recognized that there must be a balance between security and access, but this made it difficult to move in and out of the building.
- The safety protocols for the hutch doors make them difficult to work with during power losses. If a door is disabled, there is a possibility that it can slam shut when the power is restored. The APS is currently working on a "soft start" program upgrade to eliminate the potential for a door

to slam closed. There was also concern about gaining access to closed hutches when the power is out.

Next Meeting

The meeting will be held Thursday, September 16, 1999, in conference room A1100.