InterCAT Technical Working Group Meeting
May 20, 1999

Agenda Review and TWG Activity Summary: (Paul Zschack)
Zschack reviewed the agenda and the current activities of the TWG subgroups. The Timing and Accelerator Parameters Subgroup will be distributing its report over the listserver. No meetings are planned for the near future; anyone interested in joining the group should contact Jon Tischler. The Top-off Subgroup will organize and schedule its next meeting according to facility progress with top-off operations. Jonathan Lang has volunteered to head the Beamline Diagnostics Subgroup. The Detector Subgroup anticipates scheduling a meeting over the summer (contact Tom Irving if interested in participating). Zschack announced that he will be heading up a new subgroup, the Beam Stability Subgroup. The first meeting of the new subgroup will be held June 3, 1999, at 3:00 p.m. in the building 438 conference room.

Facility Updates

APS Facility Update/News: (Steve Davey)
Davey reported that Oxford contractually owes four more cryo-cooler service visits and asked the group to select either July (during shutdown) or October for the next service visit. The group opted to wait until October for the next maintenance visit.

A new APS seminar series has begun. The next seminar will be June 2, 1999, by Arthur Freeman. Davey distributed instructions explaining how to sign up for the listserver that will announce the seminars. Interested parties can send an e-mail "ADD user-seminars" to listserv@aps.anl.gov to be included in the electronic distribution.

Liquid Nitrogen Distribution Update: (Paul Zschack for Bob Ferry)
Zschack reported the LN2 system is in fabrication. It is anticipated that it will be installed on the experimental hall floor sometime between June and September. Zschack encouraged all CAT members to begin thinking about what will be needed to "tie in" their stations to the centralized system. Bob Ferry will be asked to provide an update at the next TWG meeting.

Top-off Operation Update: (Tony Rauchas)
Tony reported that the May 19 meeting on top-off operation was very positive and that no safety issues were identified. The only remaining step is to gather needed signatures. The June 3 run will begin with fill-on-fill (twice daily at 08:00 and 20:00) and shutters open. Fills will be done with shutters closed only if beam is lost (due to safety considerations). It was decided at the meeting that singlets mode operation will also begin on June 3 (rather than delaying implementing singlets mode for one week). This fill pattern will become the standard mode. The special operating mode will be redefined at a later date to be an asymmetric fill.

Tuning signals will include the standard 30-msec injection gate and an additional PV that will indicate total injection time (a "global blank"). Rauchas reviewed some details of the signals and indicated that the signals would be operational during the start-up period to facilitate user testing. Audible announcements will continue, and Rauchas told the group that the APS is investigating adding audible announcements over the television system.

Reports

Beam Stability Issues: (Tony Rauchas)
Rauchas reported that the particle beam position is measured by a system of 360 rf beam position monitors (rf bpms). Additionally, each ID vacuum chamber has two more rf bpms–one horizontal an done vertical. The original rf bpm systems had good short-term stability, but displayed significant current and fill-pattern dependency, and did not have good long-term stability. A new system is being implemented for the ID vacuum chamber rf bpms that will greatly improve long-term stability.

For orbit control, two systems are currently in use to maintain beam orbit. The global feedback system uses most of the rf bpms to try and minimize "average" orbit error by making corrections every few seconds. The real-time feedback system uses a selected subset of rf bpms to make fast corrections (bandwidth is limited to ~ 70 Hz). Currently, local feedback at any particular ID can't be implemented due to recently identified variables (e.g., local temperature variations inside the storage ring tunnel that cause 5 - 10 μm changes in vacuum chamber position). Global feedback averages out the effects of such variables.

Rauchas also reviewed bpm performance. The rf bpm system was designed to maintain jitter/drift to within 10% of the emittance (at 10% coupling). Rauchas showed recent measurements of beam motion. He also briefly discussed some recent beam-position-related problems that have become evident at certain beamlines. Two effects, ID-gap-related intensity fluctuations and random intensity fluctuations, are still under investigation. In the process of trying to determine the cause(s) for the fluctuations, two potential issues have been discovered. X-ray bpm blades are apparently not parallel to the beam, creating a problem with calibration. This could cause the photon beam to clip apertures during steering resulting in intensity change with ID gap. Secondly, an intermittently faulty rf bpm was isolated at 17-ID during a recent studies period.

Long-range plans encompass continued improvements to the rf bpm systems and eventual incorporation of x-ray bpms in BM beamlines in the vertical orbit control position feedback loops. There is currently an R&D effort underway to develop methods to eliminate stray radiation from the ID x-ray bpms that has been quite successful so far.

Beamline Diagnostic Monitor: (Randy Alkire)
Alkire reviewed a layout of the SBC-CAT ID beamline and its primary components. The beamline diagnostic monitor is in the D hutch, about six meters away from the monochromator, downstream from the Be window. The monitor is a position-sensitive PIN diode array with a 0.5-μm metal foil that sits in the beam. The whole array is housed in the timing shutter device, which is about 44 mm in diameter. The design is compact (and vacuum-compatible) but offers a large opening (10-mm horizontal opening, 8-mm vertical opening). The array sits on the x-y calibration stage.

Choice of metal for the foil is based on desired energy range (foils are commercially available and are used mounted on kapton). Alkire reviewed the absorption/emission energies for various metals. For a 5-10 keV energy range, Ti or Cr would be good foil selections. The monitor measures the center of mass of the beam and can measure position to within 1-2 μm. The foil has low absorption and is insensitive to radiation damage. He indicated that the foil must be perfectly flat and free of wrinkles. Five foils can be purchased for approximately $400-$500.

The PIN diodes (upstream of the foil) have a wide dynamic range. Alkire showed a vertical calibration curve at 8 keV; the curve was not quite linear due to the fact that there are two square diodes in a radial field (as the point source is assumed to be). Alkire also discussed other tuning and horizontal calibration curves. Diodes were obtained from UDT and cost approximately $100 each.

Alkire then presented actual results, showing straight calibration numbers at both 8 keV and 12 keV. He discussed various sources of error (e.g., wrinkles in the Ti foil introduced horizontal calibration error). He also compared results from water- and LN2-cooled monochromator crystals. A variety of experimental results were presented and discussed, including tests run during pulsing magnet tests (no top-off) and tests during top-off runs.

New Standard Component Designs: (Deming Shu)
Shu showed diagrams and discussed specifications of a water-cooled polished Be window (from Brush Wellman, 500 micron) designed for use with 100 mA with undulator A. The mirror has also been tested using double undulators at an 11-mm gap. The mirror is available for $5.94K.

A pink beam L2-90 slit is currently in use on 2-ID-A&E. Shu described the set-up and showed diagrams.

Shu also gave a brief introduction a P4 design on the 32-ID beamline. The entire table can be moved to allow white beam to pass through. A meeting is being held to evaluate the safety aspects of the design; the table should be built within the next few months. Anyone interested in pricing information on any of these new components should contact Deming Shu (shud@aps.anl.gov).

News and Other Business

UNI-CAT Cryo-cooler Failure: (Paul Zschack)
Zschack reviewed the circumstances that lead up to the failure of the UNI-CAT cryo cooler unit. Prior to the failure (during normal operating conditions), the high-pressure loop buffer had to be refilled every one to three weeks. The loop pressure never required any pressure adjustments. There was an apparent event-driven leak in the high-pressure loop. During the leak check and repair process, a leaky Swagelok fitting was found. After repair, pressure in the loop built very quickly (within 10-30 minutes) and burst the relief disk. The vacuum jacket was found to have gone soft, evidently generating enough heat to cause loop pressure to rise dramatically. The dewar vacuum jacket was then pumped out and normal operation was resumed. Apparently, the combined heat leak and LN2 leak were in balance prior to the failure, and when the Swagelok fitting was repaired, the heat leak went out of balance. Zschack expressed his gratitude to XFD for the loan of a spare cooler. He advised the group that if this situation arises at another CAT, they should be aware that interfacing a spare cooler to their system can be time-consuming (it took UNI-CAT two days to hook up the spare cooler).

Next Meeting

The meeting will be held Thursday, June 17, 1999, in conference room A1100.