InterCAT Technical Working Group Meeting
July 15, 1999

Agenda Review and TWG Activity Summary: (Paul Zschack)
Paul reviewed the meeting agenda and noted last-minute changes in speakers. Paul mentioned that he has spoken to Quality Cryogenics (the company installing the LN2 delivery system) and noted that, so far, only two CATs have inquired about linking their hutches to the centralized system. Floor Coordinator Bill Wesolowski can help anyone interested in contacting Quality Cryogenics.

The Beam Stability Subgroup met earlier this week; anyone interested in joining that subgroup should contact Paul Zschack (UNI-CAT). A Top-off Subgroup meeting is planned for next week; contact John Quintana (DND-CAT) for further information. The Diagnostics Subgroup (led by Jonathan Lang, SRI-CAT) will meet Tuesday, July 27th at 4:00 p.m. in the LOM 431 conference room. Also scheduled for July 27th, the Detector Subgroup (led by Tom Irving, Bio-CAT) will meet at 10:00 a.m. in the LOM 435 conference room.

Facility Reports

Facility Update/News: (Tony Rauchas)
Tony reported that the APS is investigating the short lifetime of the ring. He indicated that if the lifetime cannot be increased, operation with singlets will be discontinued. Tony indicated that a possible option would be to return to triplets operation using one fill per day, still using fill on fill with shutters open. The decision of singlets versus triplets will be made prior to the start of user operations next week.

Radiation observations at the APS: (P.K. Job)
P.K. reported to the group about Bremsstrahlung measurements on ID beamlines at both the APS and ESRF. He explained the problem of Bremsstrahlung radiation using a diagram and defined its properties. Bremsstrahlung can produce an electromagnetic "shower'" effect when it interacts with beamline components. P.K. told the group that a couple of years ago, he proposed a measurement technique and designed both a detector and a data collection system to measure total absorption calorimetry. P.K. explained that each "event" must be collected and summed to see a complete spectrum. The spectrum can then be integrated to determine total Bremsstrahlung radiation. P.K. showed data comparing Bremsstrahlung measurements made on six different beamlines at the APS and ESRF and described various aspects of the different beamlines. He found that the measured Bremsstrahlung radiation was different for all six beamlines (in some cases by as much as seven or eight times difference) and that these radiation levels cannot be predicted based on only one or two parameters (e.g., pressure, current, etc.). P.K. compared a variety of test results and discussed a wide range of possibilities for the beamline to beamline differences.

CAT Reports

SAXS at BESSRC-CAT: (Soenke Seifert)
Soenke opened his discussion by describing various optical components, detectors, and other beamline instrumentation used in sector 12 to conduct ASAXS experiments. He described in detail the 2-D proportional wire detector, 15 cm^2 nine segment mosaic gold CCD camera, double-crystal Si(111) monochromator, and the $Pt/Pd/SiO_2$ flat focusing mirror. The beam stop has a modified photodiode inside.

Data acquisition at 12-ID includes 2-D data averaging and normalization on a Sun system. Data analysis is handled via IGOR Pro. Soenke indicated that other improvements to these systems are planned. He showed the group results obtained on a 209 nm polystyrene sphere in August 1998. A wide Q range of almost up to two orders of magnitude is possible using a small beam stop and a large-area CCD camera. Future plans include using pink beam and experiments monitoring the beam stop at maximum camera length and 2 Å wavelength.

SAXS at IMM-CAT: (Larry Lurio)
Larry reviewed the 8-ID beamline set up, including 8-ID-A enclosure and the 8-ID-E experimental enclosure. The white beam first optics enclosure uses two L5-80 slits and a horizontally deflecting mirror to define the beam size to ~300 microns and to reduce the heat load to less than one watt of power. Larry described various components including the incident beam monitor, the optional single-bounce Ge monochromator, and the shutter attenuator. He said that the real technology, however, lies in the two sets of high-precision in-vacuum slits used to define and trim the beam.

IMM-CAT has experimented with many different sample cells and has found that capillaries are very useful, albeit somewhat problematic to use. Larry briefly reviewed differences in beam stops between IMM-CAT and BESSRC-CAT. He described the beam stop design at 8-ID, including the pin diode, and explained the advantages. The detector is a direct detection CCD camera. For software, 8-ID is currently using a Princeton Instruments library routine on a Sun system, but will likely move to a Linux-based system. Free-ware Yorick routines are also used for display and data reduction. Larry gave some generic specifications for other instrumentation and briefly described the compact, in-vacuum slits. The slits are made from machinable tungsten, which was polished. He explained the set up for the slits and showed a photo from within the hutch. He showed the group results obtained on a latex sphere. The science being done at IMM-CAT includes coherent SAXS studies of dynamics, time-resolved studies of protein folding (using pink beam), and standard measurements of colloids, magnetic colloids, polymer melts, etc.

SAXS at Bio-CAT: (Tom Irving)
Tom (Associate Director of Bio-CAT) introduced himself to the group and explained that Bio-CAT's diverse scientific interests have impacted the design of the beamline. He briefly described the scientific program, indicating that Bio-CAT focuses on partially ordered biological materials. He showed a schematic of the beamline, on which the focusing optics are far downstream, which is good for looking at small samples. The undulator A line has a cryogenically cooled monochromator with sagittal focusing second crystals; there is enormous flexibility in setting the beam size. The vertical focusing mirror is a ULE downward deflecting mirror (Pt, Pd stripes) with either cylindrical or elliptical bending. Tom showed a vertical profile of the focused beam and a slide of the beamline components. The detector for SAXS and SAXRD is a Fuji BAS 2500 offline scanner and Tom reviewed its advantages and disadvantages. The single-element CCD detector (1 k x 1 k), designed by W. Phillips, M. Stanton, and A. Stewart, has been in operation since March 1998. Tom discussed various applications of the detector, which has a 60 mm^2 active area.

Tom described research on various muscle tissues, including fruit fly flight muscle tissue (showed a diffraction pattern). He described in detail the set up for the flight muscle experiment. He also showed a hair diffraction pattern from the work done by V. James, emphasizing that very high resolution is critical for the hair experiments.

Future plans include a new CCD detector with a 48 mm^2 active area that will have higher gain, very flexible readout, and binning modes for time-resolved studies. Solution scattering commissioning experiments are planned for the fall. Tom also discussed a multi-element detector, a fast time slicing plastic scintillator array. Right now it exists as a 16-channel prototype. Tom discussed its projected uses and advantages.

Next Meeting
The meeting will be held Thursday, August 19, 1999, in conference room A1100.