InterCAT Technical Working Group Meeting
September 21, 2000

Agenda Review and TWG Activity Summary: (Steve Heald)
Steve called the meeting to order and reviewed the agenda.

Facility Reports

Facility Update/News: (Jeff Collins)
Jeff recapped a presentation given last year about problems with corrosion of machinable tungsten (5% Ni/Fe, 95% W) in contact with water. Recently in sector 6, a section of machinable tungsten (henceforth MT) corroded/eroded into vacuum. The problem has been reviewed with the two main manufacturers who were unaware of MT's tendency to corrode ; in typical industrial applications it is not in contact with water. The corrosion/erosion problems occur when Fe reacts with O_2 in water and the MT matrix begins to break down.

Coating MT with Ni has been tested as a means of preventing corrosion. The efficacy of this method is tested by monitoring weight loss. The Ni coating was found to offer slight protection; however, once water breached the coating, the corrosion process began. Another solution is to remove all O_2 from water in contact with MT using a scavenger bed. This has proven to be effective. Anyone interested should contact Al Schneider in Central Shops at 2-7082.

Workshop on Detectors for Synchrotron Research: (Denny Mills)
Denny reported that this invitation-only workshop will be held in Washington D.C. October 30–31, 2000. Various facilities have joined together to sponsor the event; Denny presented a preliminary agenda for the meeting. Several APS and user attendees have been identified. Working group topics of great interest to the community have been identified, including the following:
i. high-speed readout area detectors
ii. area detectors with energy resolution
iii. calibration standards (benchmark standards) to improve detector comparison
iv. high-energy x-ray/quantum efficiency issues

Anyone interested in obtaining a copy of the agenda, suggesting a working group topic, or interested in possibly attending the meeting should contact Denny.

Update on Metrology Lab and Mirror Measurements: (Lahsen Assoufid)
Lahsen updated the group about recent improvements and additions to the metrology lab. A new vestibule has been added to the entrance of the lab and the clean level classification of the room has been increased to Class 10. Improvements have been made in air flow and temperature control. Lahsen reviewed the currently available equipment and its capabilities, including the new atomic force microscope (AFM). He gave example data from the evaluation of an APS mirror and compared the results obtained from the different instruments.

The metrology lab has handled more than 160 requests from the APS, CATs, and non-APS organizations in the last two years. Lahsen reviewed typical features of APS mirrors (sizes, coatings, substrate materials, etc.) and the common sources of APS mirrors, including two new vendors, Reosc and Canon.

In March 2000, the first International Workshop on Metrology for X-ray and Neutron Optics was held at Argonne National Laboratory. The meeting was attended by more than 60 people. Lahsen reviewed the conclusions and recommendations that resulted form the workshop. A summary book of viewgraphs from the workshop is available both from the APS library and from Lahsen by request.

Future plans for the metrology lab include further improving the temperature control and the clean room classification level as well as further developing capabilities of the AFM, etc.

CAT Reports

XAFS Detectors Part 2: (Grant Bunker and Jeremy Kropf)

Grant reviewed the contributions that lead to the development of the bent Laue analyzer for fluorescence XAFS. The predominant noise source in dilute XAFS experiments is background scattering; the effective counts get swamped by the background-to-signal ratio. Grant reviewed the history of the problem and the attempts to mediate it. One potential solution is to eliminate the background photons before the reach they detector and to use current mode detection to eliminate repetition rate limitations. In 1997, a novel asymmetric bent Laue optic that was originally developed for medical imaging was proposed. Grant showed a schematic of the diffraction of x-rays by a bent crystal. By slightly bending a crystal and choosing an asymmetric angle, a perfect crystal can be made to act like a mosaic crystal and have a wider angle of acceptance. The goal is to maximize the solid angle and the Bragg condition must be met over the whole crystal. Grant discussed why a log spiral is desirable and how a crystal bent to these conditions works. He reviewed the use and purpose of Soller slits. He then presented some data from a MR-CAT experiment.

Grant concluded his talk by noting that multilayer analyzers and bent Laue detector are very complimentary for a wide range of energies. A single-element version of this detector is now practical. Future work will include extension to lower energies with thinner crystals and also a multielement version.

Jeremy discussed a particular application of XAFS detectors. With actinides, there are many interfering fluorescence lines. A bent Laue analyzer is used to separate the beams. Slits are not easily used in these experiments and solid-state detectors do not work well. Jeremy presented and discussed results from various experiments. Lead shielding and beam focusing are used to get rid of background. Jeremy noted that with plutonium/neptunium samples, you can actually measure the XAFS from U over a large energy range (eliminating the Np L3 edge). One can even start to measure small peaks as the background levels are reduced.

Next Meeting

The meeting will be held Thursday, October 19, 2000, in conference room A1100.