

TOPAZ/MaNDi IDT Meeting

UT Conference Center, Knoxville, TN

Friday, May 30, 2008

The meeting was sponsored by the user outreach and coordination office of the Neutron Sciences Directorate and by conference planning at ORNL.

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The meeting was called to order at 1:10 PM by Robert Bau. Bau welcomed the guests to Knoxville and thanked them for attending the meeting. The attendees introduced themselves. Leighton Coates was to lead off, giving his overview of MaNDi, followed by Christina Hoffmann with her overview of TOPAZ. Following a break, in a late addition to the agenda, Nobuo Niimura was to present a report on late breaking news from J-PARC, Tokai, where first beam on target was achieved on May 30, 2008, at 2:25 PM local time.

The final agenda is attached, together with a list of attendees. IDT members attending the meeting were joined by John Cleaves (SING-II Project Manager), Scott Keener (Lead Engineer, MaNDi), and Al Ekkebus (User Coordinator).

MaNDi Update - Leighton Coates

Coates reported that the sample position for MaNDi (SNS Beamline 11B) had been moved out to 30 m from its original location at 24 m. At 30 m, MaNDi has 1.7 m lateral separation from POWGEN3 (Beamline 11A). In addition to providing this degree of lateral separation, moving out to 30 m will provide MaNDi with a quieter environment improving signal to noise. $\Delta\lambda$ is thereby reduced from 2.69 Å to 2.16 Å. 30 m effectively is the practical limit, since moving the MaNDi sample position out beyond this distance would cause problems with Target Building crane access.

Coates reviewed the MaNDi beamline layout including three bandwidth choppers, bent supermirror guide, secondary shutter, focusing optics, beam monitor, sample environment, and detector array. He reported that work is proceeding on the detailed detector configuration, with $l_2 = 0.5$ m at present. POWGEN3 and MaNDi will share a common shielding wall 12" thick. Access to MaNDi will be via the mezzanine. Stairs to reach the Target Building floor level will be provided at TOPAZ. MaNDi and TOPAZ will share a common enclosed sample preparation room at floor level. An intermediate floor level will provide additional space shared between the two beamlines. Coates reported that the floor plans are laid out and that the MaNDi and TOPAZ teams are requesting approval for them from the SNS Space Allocation Committee.

The MaNDi guide design, described in Schultz, A.J., et al., *J. Appl. Crystallogr.* **2005**, 38, 964, has now been optimized for $l_1 = 30$ m. The $m = 3$ guide focuses the 15×44 mm² beam to 7×7 mm². A flux gain of 19% across $\Delta\lambda$ has been achieved. The divergence is tuneable and remains consistent across all accessible wavelengths. Using interchangeable guide sections, the divergence can be set to 0.23, 0.38, 0.56, or 0.80°. Chopper positions have been slightly modified to clear any interference with POWGEN3 and are now set at 7.2, 8.27, and 10.5 m.

Coates discussed the possibility of providing for low-temperature data collection at MaNDi. The instrument will be capable of collecting data on crystals that are small enough to be suitable candidates for freezing. Interest in low-temperature data collection has, however, to date been limited at other facilities. Coates reported that Matthew Blakeley of ILL, Grenoble, anticipates 3-4 low-temperature experiments in the current year at LADI. Leif Hanson commented that freezing a crystal often results in

an increase in mosaic spread. Ice formation in the cold stream may also be a concern, especially in the high humidity environment of east Tennessee.

MaNDi will initially deploy 30 SNS Anger detectors (150 x 150 mm², 3 x 3 segmented PMT array, GS20 ⁶Li glass scintillator). The instrument will be wired for the full array of 48 detectors that can be supported by the DAT (detector array tank).

Coates closed his overview with a review of the \$14.65M budget for MaNDi. The instrument design is progressing well. A preliminary design review is scheduled for early this summer, with CD2 anticipated in December 2008. At the present stage issues for further discussion include priorities for the low-temperature data collection option, vs. the procurement of additional detectors, and cost concerns that may arise based on experience with TOPAZ.

Coates indicated that Melissa Harvey, Engineer, has joined the MaNDi team. He also acknowledged the contributions of Alexandru Stoica, Jason Hodges, Bryan Chakoumakos, Christina Hoffmann, and Larry Davis.

Nobuo Niimura inquired about the possibility of rejecting every other neutron pulse, which would make it possible to double the accessible $\Delta\lambda$. In this event Coates indicated the philosophy at MaNDi would rather be to use every pulse, rephase the choppers, and repeat the measurement.

TOPAZ Update - Christina Hoffmann

Hoffmann provided the group with an update of progress on TOPAZ concentrating on the past six months. Work is being carried out with the TOPAZ team (Matt Frost – Scientific Associate, Jack Thomison – Lead Engineer, Larry Davis – Designer, and Mark Overbay – Engineer).

Hoffmann gave a rundown of progress with design, procurement, installation, and testing of beamline components in preparation for TOPAZ commissioning in spring 2009. Work discussed included the following:

- Finalize overall design - sample environment and loading, beamline control room and intermediate floor level, ground-floor enclosed sample preparation room
- Procurement and fabrication – jaws and slits, band-width choppers, neutron guides, focussing optics, optics table, sample environment, DAT, detectors, get-lost tube
- Interfaces and integration – survey and alignment, common shared walls with beamlines 11B (MaNDi) and 13 (fundamental physics)
- Installation – instrument enclosure, guide section assembly

Hoffmann reported that detector modules are being assembled in house. Detectors for TOPAZ and MaNDi will be based on the SNS common design that is shared with SNAP (beamline 3).

Altogether, the TOPAZ design at its present stage includes 724 drawings, 1702 parts, and 434 assemblies. Hoffmann reviewed details of the expanded optics table with its 2 x 3 array and a third level on top for future installation of a ^3He beam polarization system, the instrument enclosure with its removable roof section for loading equipment, and the DAT with an independently supported detector panel positioned at 90° that would remain in place when the remainder of the DAT is lowered out of the way to deploy a high-field magnet.

TOPAZ is collaborating on development of a CCPS (compact crystal positioning system) with Square One Systems, Inc. (Jackson Hole, Wyoming). The CCPS uses motors from Attacube, Inc., that are rated to operate in vacuum and down to $T = 4$ K. Hoffmann showed a movie from Square One illustrating operation of the CCPS interfaced to its automated sample changer. The sample changer incorporates a linear cassette holding 20 samples that can be maintained at cryogenic temperatures. An alternative CCPS design, developed for TOPAZ by Mark Overbay, will support heavy equipment such as a pressure cell. A prototype of this alternative CCPS was available for attendees to inspect at the meeting. A patent application is pending.

Hoffmann indicated that TOPAZ design efforts in the coming months will include incident beam collimators and fine-focus optics as well as continued work on the CCPS.

Jason Hodges asked about the integration of electronics in detector modules. The current design for TOPAZ has 70 cm deep modules with boards integrated into the back of each detector. By contrast, SNAP detectors are only 40 cm deep, but they require a complicated cabling scheme.

Branton Campbell inquired about software. The strategy will be to use the ISAW package developed at IPNS. The initial development is for SNAP. Arthur Schultz reported that he is involved in this effort along with Peter Peterson, Steve Miller, and Dennis and Ruth Mikkelson.

J-PARC Developments – Nobuo Niimura

Nobuo Niimura announced late breaking news from J-PARC. Niimura showed figures received overnight from Japan and depicting first beam on target observed at J-PARC's NOBORU instrument for neutron source characterization. Neutron production from this initial run compares well with predictions. On behalf of the J-PARC team, Niimura accepted congratulations from the attendees for the team's outstanding accomplishment.

Shared User Space – Christina Hoffmann

Christina Hoffmann reviewed the plans for user space to be shared between MaNDi and TOPAZ.

On the Target Building floor level, the plan features a room with enclosed laboratory space to be shared by the two beamlines. Laboratory space for sample characterization is also planned for the third floor of

the CLO (SNS Central Laboratory and Office Building). However this may be delayed several years, as was confirmed by Bryan Chakoumakos. The laboratory space at the beamlines will have full utilities, including two 220/240 V lines, and an external manifold to supply laboratory gases (the latter is the responsibility of POWGEN3). Two refrigerators should be provided, one for each beamline, for storing samples.

The attendees felt strongly that 6' of laboratory bench space, as appeared to be provided in the preliminary plans, would not be sufficient in view of the need for each beamline to have glove boxes (at least one of which needs to be refrigerated), microscopes, etc. Leif Hanson commented that a deionized water unit will likely be required. Also highly desirable would be a centrifuge and a microbalance.

The intermediate floor level will provide shared space for storage and maintenance for the two beamlines, while the upper (Target Building mezzanine) level will house both TOPAZ and MaNDi control cabins.

Attendees inquired whether the beamlines can expect to be able to access laboratory facilities at the CNMS (Center for Nanophase Materials Science). Could a biohazard laboratory, which might be needed by MaNDi in the future, be housed at CNMS? It was agreed that the need for this should be assessed sometime in the future.

Coates reported that he is exploring the possibility of acquiring an x-ray diffractometer to be located at the beamlines. The estimated cost for a dual sealed tube Oxford Diffraction, Inc., unit with low-temperature capability is \$400K (base cost).

Hoffmann reported briefly on an automated sample alignment system with dark vision (with the sample back-lit) that is being developed at Square One Systems. TOPAZ will have a video camera focused on the sample at the loading position, and the goal is to use this to remotely center the sample under feedback control.

Wrap-Up

On behalf of the TOPAZ and MaNDi instrument teams, Coates and Hoffmann thanked the attendees for attending and for their valuable comments.

Future joint IDT meetings will likely be planned around conferences, much as the present meeting was scheduled in conjunction with the annual ACA (American Crystallographic Association) meeting. Possibilities for future IDT meetings include the October SHUG (SNS and HFIR User Group) meeting, at ORNL, and the ICNS (International Conference on Neutron Scattering) meeting in Knoxville scheduled for May 3-7, 2009.

Agenda

- 1:10 - 1:15 Welcome (Robert Bau)
- 1:15 - 2:00 MaNDi Update (Leighton Coates)
- 2:00 - 2:45 TOPAZ Update (Christina Hoffmann)
- 2:45 - 3:15 Break
- 3:15 – 3:25 Report on J-PARC First Beam on Target (Nobuo Niimura)
- 3:25 - 3:40 Presentation of MaNDi/TOPAZ Shared User Space (Christina Hoffmann)
- 3:40 - 4:40 Discussion on Synergy of MaNDi/TOPAZ Shared User Space (Group)
- 4:40 – 4:45 Wrap Up and Closing Comments

Attendees

| Name | Affiliation | E-Mail Address | IDT |
|--------------------|------------------|--|-------------|
| Robert Bau | USC | bau@usc.edu | TOPAZ |
| Branton Campbell | BYU | branton@byu.edu | TOPAZ |
| Bryan Chakoumakos | ORNL | kou@ornl.gov | TOPAZ |
| John Cleaves | ORNL | cleavesje@ornl.gov | MaNDi |
| Leighton Coates | ORNL | coatesl@ornl.gov | MaNDi |
| Al Ekkebus | ORNL | ekkebusae@ornl.gov | Users |
| Anna Gardberg | ORISE | gardbergas@ornl.gov | MaNDi |
| Leif Hanson | U Toledo | Leif.hanson@gmail.com | MaNDi |
| Bryan Hingerty | ORNL | beh@ornl.gov | TOPAZ |
| Jason Hodges | ORNL | hodgesj@ornl.gov | POWGEN |
| Christina Hoffmann | ORNL | hoffmanncm@ornl.gov | TOPAZ |
| Scott Keener | ORNL | keenerws@ornl.gov | MaNDi |
| Thomas Koetzle | BNL | tkoetzle@aol.com | TOPAZ |
| Nobuo Niimura | Ibaraki U/J-PARC | niimura@mx.ibaraki.ac.jp | iBIX |
| Arthur Schultz | ANL | ajschultz2@gmail.com | TOPAZ/MaNDi |
| P. Thiyagarajan | ANL | Thiyaga@anl.gov | MaNDi |
| Steve Tomanicek | U Toledo | tomaniceksj@ornl.gov | MaNDi |