BL12B2

Asia and Pacific Council for Science and Technology（APCST BM）

1．Abstract

The APCST contract beamline BL12B2 has been formally opened for user proposals since September 2001. The first phase of end station construction, including an EXAFS station, a powder X-ray diffraction (PXD) image plate stage, a conventional 6-circle diffractometer and a protein crystallography (PX) end station have been completed by spring of 2002. Modification to beamline optical components has been undertaken to improve beamline focusing capability. In statistics, 49 experiments have been done at BL12B2 since September 2001.

2．Beamline and end station status

In the past year, the BL12B2 has reached to the stage of smooth operation, in which the high quality X-rays have been delivered to various end stations for diverse experiments. As reflected from the multi-discipline characteristics of BL12B2, several new end stations were built and presently completed. These new end stations include a curved image plate stage for PXD, a new EXAFS stage equipped with single element Ge (Li) detector and cryostat for low temperature measurement and a protein crystallography station. After one year operation, the BL12B2 is presently able to efficiently switch among various end stations. Usually the time for end station switching is less than one day in between EXAFS and X-ray scattering, and two days in between protein crystallography and the others. *Figure 1* shows the end stations presently available.

To meet the focusing demands from protein crystallography users, the beamline optics has been undertaken several upgrades in February 2002. The main task was the replacement of the flat focusing mirror(FM)to a new toroidal one. Meanwhile, the rib-type saggittally bent second crystal of double crystal monochromator (DCM) was replaced to a flat one. The beamline focusing was then solely accomplished by the new focusing mirror and the focused beam spot was measured less than 250 μm(V)x 250 μm(H)at the sample position of PX station. Combined with utilization of the Si (111) crystals for DCM, the total flux at PX sample position was measured $4x10^{10}$/sec at 10 keV with a 300 μm collimator, about 12 times higher than before. This photon flux level makes the measurements for those protein crystals of 100 microns size practical. In addition, the beamline stability has been largely improved last year. Several instability sources have been dug out and fixed. Most of the time the intensity instability is less than $5x10^{-4}$.

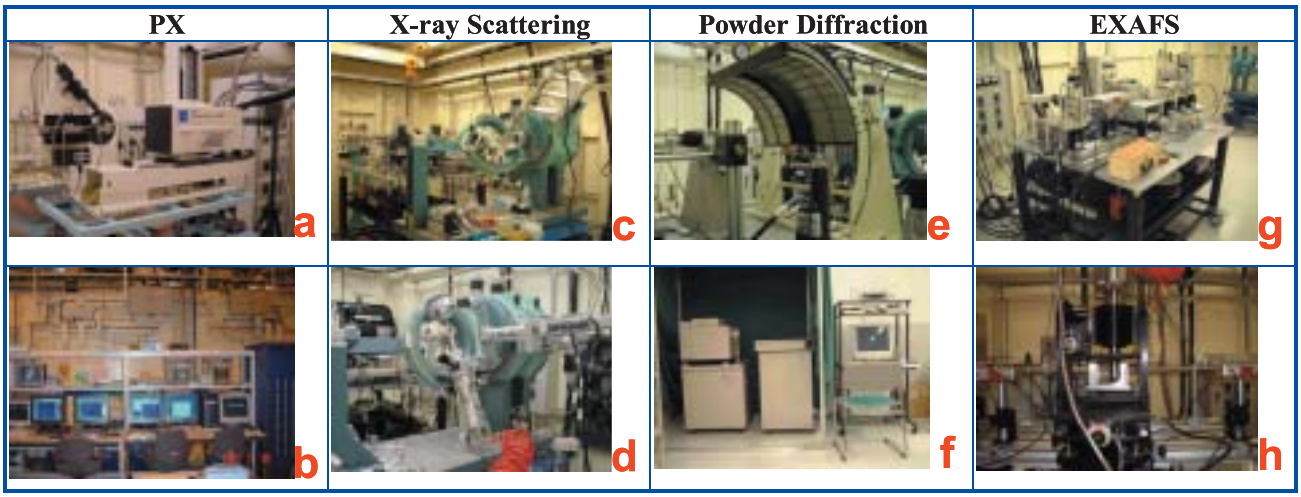

Figure 1 The end stations available at BL12B2. (a) The ADSC Quantum 4R CCD detector for PX. (b) The SGI-SAN architecture computer system for PX. (c) The Huber conventional 6-C diffractometer for XRS. (d) 6-C diffractometer equipped with a cryostat for low temperature measurement. (e) Curved image plate stage for PXD (f) Mac Science image plate reader (DIPR 420). (g) The transmission type EXAFS stage (h) EXAFS stage equipped with Lytle detector and cryostat.

It is worth of describing the protein crystallography end station in a little detail. The protein crystallography station is a collaborative project between JASRI and APCST. It is equipped with an ADSC Quantum 4R CCD detector and the high-speed data network system. The CCD detector assembly as well as the computers and software were installed since August 2001. Presently, the end station commissioning has been completed. Several protein structures have been solved from the station, and some of them were adopting MAD technique. A supporting team was formed under the mission of providing users necessary details and advises. Information for doing protein crystallography at BL12B2 can be found by logging up to web page http://biosrrc.srrc.gov.tw.

Because of the intensive data collection and reduction of the protein crystallography, a shared high-speed data network system will by all means enhance the data acquisition throughput. This task is accomplished at BL12B2 by a computing system consisting of three dual CPUs Octane2 workstations and one terabytes storage disk array, running Clustered Storage Area Network (SAN) File System (CXFS) from SGI. The SAN offers the benefits of consolidated storage and a high-speed data network, while the CXFS enables true data sharing by allowing all SAN-attached system direct access to the same file system. The clustered file system provides data access speeds well beyond what is achievable through traditional methods such as NFS and FTP, solving data sharing bottlenecks for a broad range of environments. *Figure 2* depicts the schematic drawing of the computer architecture at BL12B2.

3. User activities

There are three times a year for BL12B2 proposal submission, due in January, May and September. A Proposal Evaluation Committee (PEC) is formed to review all the BL12B2 user proposals, except the 20% JASRI beamtime. This review procedure is coincident with the one activating in Taiwan Light Source (TLS). After ranking by PEC, a successful proposal is thereafter allocated beamtime according to SPring-8 operational schedule. The Use Plan and the user proposals (B1 Form) are then submitted to SPring-8 User Office. The users are requested to reply their experimental report (B14 Forms) within 60 days after experiments to report their experimental accomplishments and declare travel expense. To simplify the procedure, all the BL12B2 users' B10 Forms (for facility access and guest house reservation), B5 Forms (radiation orientation) and B14 Forms were submitted to SPring-8 User Office through the channel of Taiwan Beamline Office. After one year practice, mostly this review-allocation-experiment procedure functioned well enough, despite sometimes an explanation of delayed submission was needed.

Statistically, since September 2001, 49 experiments were carried out at BL12B2. In category, 35% user beamtime was allocated to EXAFS, 30% to X-ray scattering, 2% to X-ray powder diffraction, and 33% to protein crystallography. Grouped into research fields, the physics was allocated 21% user beamtime and the chemistry, the materials science, the biology and the geo-physics were allocated 24%, 18%, 33% and 4%, respectively. Although not intentionally arranged in advance, 13 experiments were related to nano-technological researches. Due to the completion of the PX station, a stiff increase of PX user beamtime is anticipated in the coming year.

（M.-T. Tang, C.-H. Du, C.-W. Wang, Y.-C. Jean, , Y.-S. Huang, C-. J. . Chen, F. Chao, H.-S. Sheu, J.-F. Lee, K.-S. Liang and C.-T. Chen, APCST/SRRC, Taiwan）

Acknowledgements

We would express our deep thanks to SPring-8 for the constant supports to Taiwan Beamlines Project. Special thank is given to Dr. Hideaki Moriyama for his robust efforts to the PX station construction.

M.T.Tang

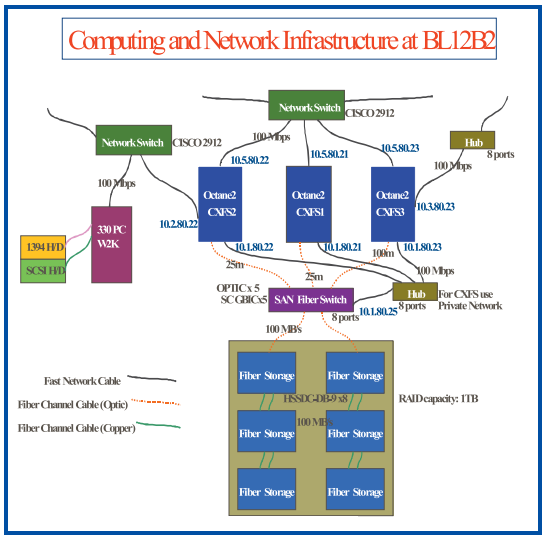

Figure 2 The CXFS computer architecture for BL12B2 PX end station. Refer to text for details.