Developments of New Beamlines

The construction of new beamlines for the next few years will shift from VUV/Soft X-ray spectral region to hard X-ray region, because: (1) the requests for VUV/Soft X-ray facilities from domestic users have been mostly met, (2) the techniques of producing hard X-ray from a medium-energy storage ring has matured, and (3) the demands for the experimental facilities for the X-ray related researches are growing rapidly in recent years. Therefore, three superconducting wavelength shifter (SWLS) X-ray beamlines, three high-throughput biological crystallography beamlines and one VUV/Soft X-ray EPU-AGM beamline have been planned and will be constructed in the next few years, as described below.

Superconducting Wavelength Shifter X-ray Beamlines

With the installation of the SWLS, SRRC has planned to construct three SWLS X-ray beamlines BL01A, BL01B and BL01C, as shown in Fig. 1. These beamlines are designed to share the total radiation generated from a SWLS insertion device source, which is under commission. Beamline BL01A will be a white light beamline for X-ray image experiments. Beamline BL01B will deliver photon beam with energies ranging from 5 keV to 20 keV, a flux of > 2×10^{12} photons/sec and an average energy resolving power of 1000 for scattering experiments. Beamline BL01C will deliver photon beam with energies from 6 keV to 33 keV, a flux of > 7×10^{10} photons/sec and an average energy resolving power of 5000 for EXAFS, powder diffraction and other appropriate experiments.

The conceptual designs of these beamlines have been completed. These beamlines are under construction. Beamline BL01B will be ready for commission by the end of 2002, and BL01C will be ready for commission before the summer of 2003.

The High-throughput Biological Crystallography Beamlines

One of SRRC's key research efforts in the future will be on biological crystallography as part of the national genomics project. For this purpose three high-throughput biological crystallography beamlines, BL13A, BL13B, and BL13C, as shown in Fig. 2, will be constructed. These beamlines are designed to share the total radiation generated from a superconducting multipole wiggler, which will be installed in 2003. Beamlines BL13A and

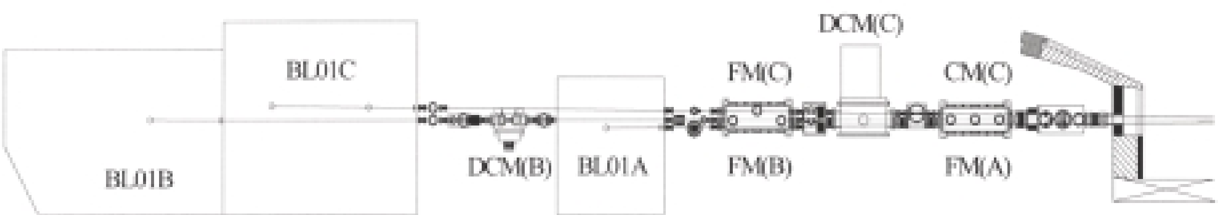

Fig. 1: The layout of the beamlines BL01A, BL01B and BL01C for the SWLS source.

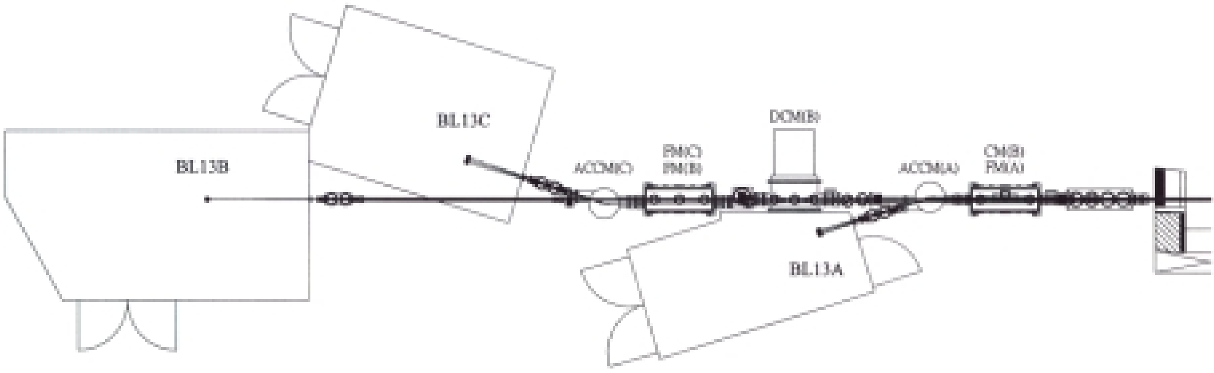

Fig. 2: The layout of the biological crystallography beamlines BL13A, BL13B and BL13C.

BL13C are nearly identical and will deliver photon beams with energies from 12 keV to 14 keV through one 0.1 mm pinhole located before sample, with a flux of $>10^{11}$ photons/sec for standard monochromatic crystallography such as crystal screening, drug design, and high-resolution structure study. The central beamline BL13B will deliver photon energies from 6.5 keV to 19 keV through one 0.1 mm pinhole located before sample, with a flux of $>10^{11}$ photons/sec for performing multi-wavelength anomalous diffraction (MAD), single-wavelength anomalous diffraction (SAD), and other related experiments.

The conceptual designs of these beamlines were completed in April 2002, and later reviewed by experts from around the world. Beamlines BL13B and BL13C and their end-stations are currently under construction and will be ready for commission by the fall of 2003, and beamline BL13A will be constructed in 2004.

The EPU-AGM Beamline

Another development is the design of an Active Grating Monochromator (AGM) beamline at the EPU undulator called the EPU-AGM beamline, as shown in Fig. 3. During energy scanning, this special design can keep the image plane at the sample with constant image distance and low aberration. This beamline is designed to deliver an intense photon beam, generated by an elliptically polarized undulator, with energies ranging from 350 to 1200 eV and an average flux of $>10^{13}$ photons/sec/0.1%bw/200mA.

For performing photon-in and photon-out experiments, such as soft X-ray magnetic scattering or soft X-ray fluorescence spectroscopy,

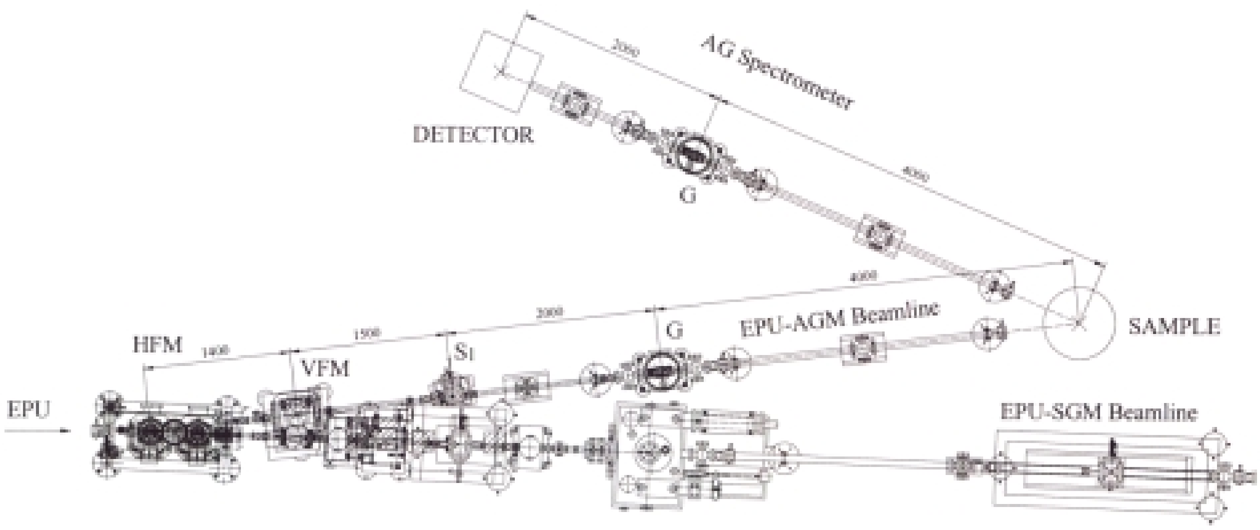

Fig. 3: The layout of EPU-AGM beamline and AG spectrometer.

the signal-collection efficiency is very low using conventional fluorescence spectrometer. To address this problem, we designed an Active Grating Spectrometer (AGS) employing an identical active grating as that used in the AGM beamline. With this novel AGM/AGS configuration, the signal-collection efficiency is higher than that of any conventional fluorescence spectrometer by more than one order of magnitude.

The EPU-AGM beamline and the AG Spectrometer are currently under construction. It will be ready for commission by spring 2003.

For further details:

SWLS BLs:

Y. F. Song, C. H. Chang, P. C. Tseng, K. L. Tsang

Reference:

Y. F. Song, *et al.*, SRRC internal report, SRRC/RBM/IM/02-05 (2002).

Biological Crystallography BLs:

P. C. Tseng, Y. C. Jean, C. H. Chang, K. L. Tsang

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P. C. Tseng, *et al.*, SRRC internal report, SRRC/RBM/IM/02-04 (2002).

EPU-AGM BL:

H. S. Fung, L. J. Huang, C. H. Chang, S. C. Chung

Reference:

H. S. Fung, *et al.*, SRRC internal report, SRRC/RBM/IM/02-02 (2002).