# New Microbeam Beamline Dedicated to Protein Microcrystallography

Protein crystallography is one of the powerful tools for determining protein structure using crystal and X-ray. Proteins substantially important in biological research, such as membrane proteins and protein complexes, are often difficult to grow as single crystals with a size larger than 10 microns. Structure determination using such microcrystals was not achievable with the existing SR beamline because the diffraction signals from microcrystals are quite weak. At SPring-8, a new beamline **BL32XU** is under construction for the Targeted Proteins Research Program promoted by MEXT of Japan. The beamline is designed to provide a stabilized and brilliant microbeam to collect high-quality data from microcrystals by enhancing the diffraction signal from a crystal, and also by reducing background scattering (Fig. 1).

The source of the beamline is a hybrid in-vacuum undulator whose periodic length is 2.6 cm with the number of periods of 173. A liquid-nitrogen-cooled double-crystal monochromator equipped with Si(111) crystals covers the required energy range of 8 – 20 keV. The high precision monochromator has been specially designed on the basis of the SPring-8 standard one. The monochromatized beam is focused with K-B mirrors with a large reduction ratio of about 26 for the vertical direction, and 40 for the horizontal direction. The focusing mirror surfaces are fabricated with atomic level accuracy by Elastic Emission Machinery (EEM) technique.

We have observed the first beam on October 3, 2009, and have been conducting beamline commissioning. At the end of November 2009, we achieved a focused beam with a size of 0.9 × 0.9 $\mu m^2$ with photon flux of 6 × $10^{10}$ photons/s. Using the focused beam, diffraction data from some small protein crystals were successfully collected (Fig. 2).

Beamline BL32XU will overcome difficulties in data collection from protein microcrystals and open a new door for protein crystallography.

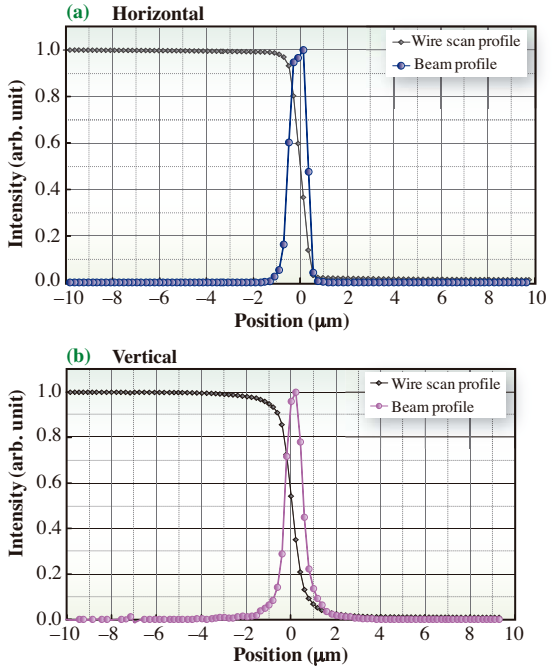


Fig. 2. **(a)** Horizontal and **(b)** vertical beam profiles with each raw wire scan profile. In both directions, FWHM of the focused beam corresponds to 0.9 μm.

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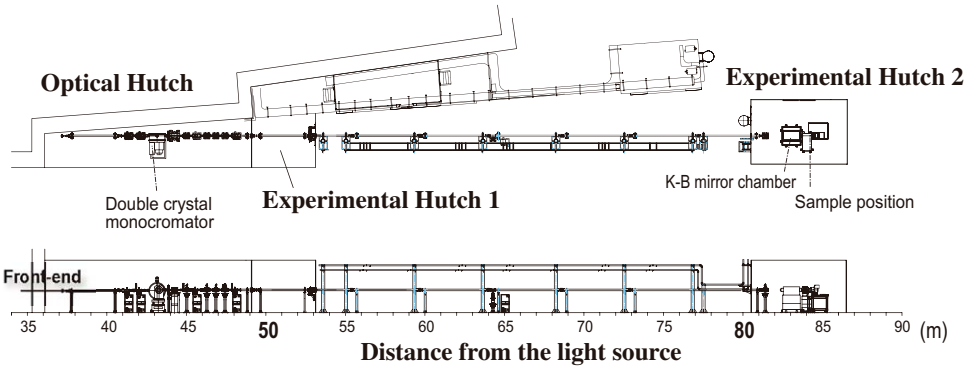


Fig. 1. Engineering drawing of beamline BL32XU.