

## Current status of small-angle scattering experiments at BL-45

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BL45 is the first branch beamline that uses a diamond monochromator. We succeeded in bringing out the monochromatic beam at the beginning of July 1997. We were able to introduce 12keV X-rays to a small-angle scattering (SAXS) experimental hutch at the end of November 1997. Since then three proposals for experiments have been made in SAXS; solution X-ray scattering, muscle diffraction, and membrane diffraction.

The use of two mirrors enabled us to obtain a small focus (about 0.3 mm vertically, 0.5 mm horizontally) with very small parasitic scattering.

The camera length could be changed between 50 and 220 cm. The relationship between the observed S-range and camera length is shown in the table below (S equals to  $2\sin\theta/\lambda$ ,  $2\theta$  is the scattering angle).

Camera length	S range (typically) $\text{\AA}^{-1}$
220 cm	$0.0007 < S < 0.033$
180 cm	$0.00084 < S < 0.04$
90cm	$0.0017 < S < 0.08$
50 cm	$0.003 < S < 0.15$

Basically, the size of the beam stop determines the minimum S value.

The life-time of the X-rays was so long that the change of ion chamber current in the

experimental hutch was within 1% in one hour for operation in the full-fill mode.

An X-ray image intensifier (Hamamatsu Photonics, V5445P) with a cooled CCD camera (C4880-82) was used as a detector. The performance of this detector was checked by using three types of protein solutions: lysozyme (15 kDa), Gro-EL (800 kDa), and pyruvate dehydrogenase complex (9.6 MDa). The dark current noise of the detector was stable enough to subtract the background for the solution scattering system. The typical data collection time was 1 second. The radius of gyration ( $R_g$ ) of each of the proteins was 15.4  $\text{\AA}$ , 68 $\text{\AA}$ , and 212 $\text{\AA}$  for lysozyme, Gro-EL and pyruvate dehydrogenase complex, respectively. These values were identical to those obtained by experiments at the Photon Factory.

Even without image distortion correction or shading correction, this detector can be applied to solution scattering for the determination of  $R_g$ 's in small-angle regions, although the choice of camera length and the reduction of parasitic scattering greatly affect the decay of profiles in wide scattering regions.