BL19B2: Three-Dimensional X-ray Topography

BL19B2 (Fig.1) is a medium-length hard X-ray bending magnet beamline designed for engineering science researches. Target of this beamline is to promote the use of the synchrotron radiation in the industrial users. The main techniques on this beamline are X-ray absorption, diffraction, scattering, and imaging. The beamline has three experimental hutches. The first experimental hutch is located at 51 m from the source and has sizes of 4 m (along beam) × 3 m (W) × 3.3 m (H). The second and the third experimental hutches are located at 77 m and 111 m from the source and have sizes of 5 m (along beam) × 4 m (W) × 3.3 m (H) and 8 m (along beam) × 4 m (W) × 3.3 m (H), respectively. X-ray imaging systems and, a multi-axis diffractometer and a powder diffractometer are prepared in the first and the second experimental hutches. Two dimensional detectors for ultra-small angle X-ray scattering are prepared in the third experimental hutche. X-ray topography experiments are performed using the multi-axis diffractometer at the second experimental hutch.

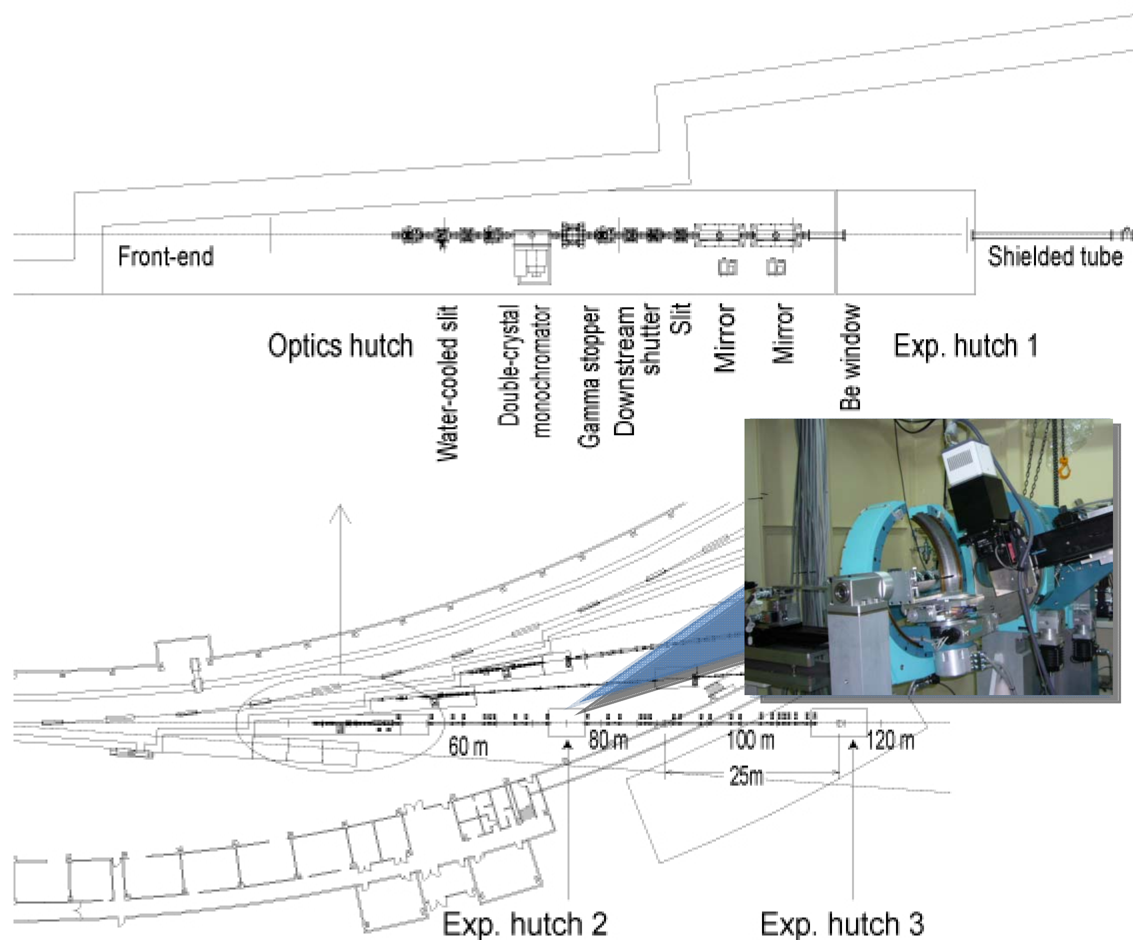

Fig.1 Schematic layout of BL19B2

X-ray topography is a nondestructive imaging technique by means of X-ray diffraction. Crystal defects in single crystal are characterized by this technique. X-ray topography is a very powerful tool for the evaluation of crystals, for technological applications and for characterizing crystal and thin-film growth and processing. Most of conventional X-ray topographic techniques show two-dimensional projection images.

Step-scanning section topography combining with image processing is one of the technique of three dimensional topographic observation. This technique has been developed at SPring-8. Figure 2 shows a schematic of the step-scanning section topography. The sheet-like incident beam provides an image of a section through the sample crystal. The final three dimensional image of the sample crystal consists of a series of section topographs obtained by sample scanning.

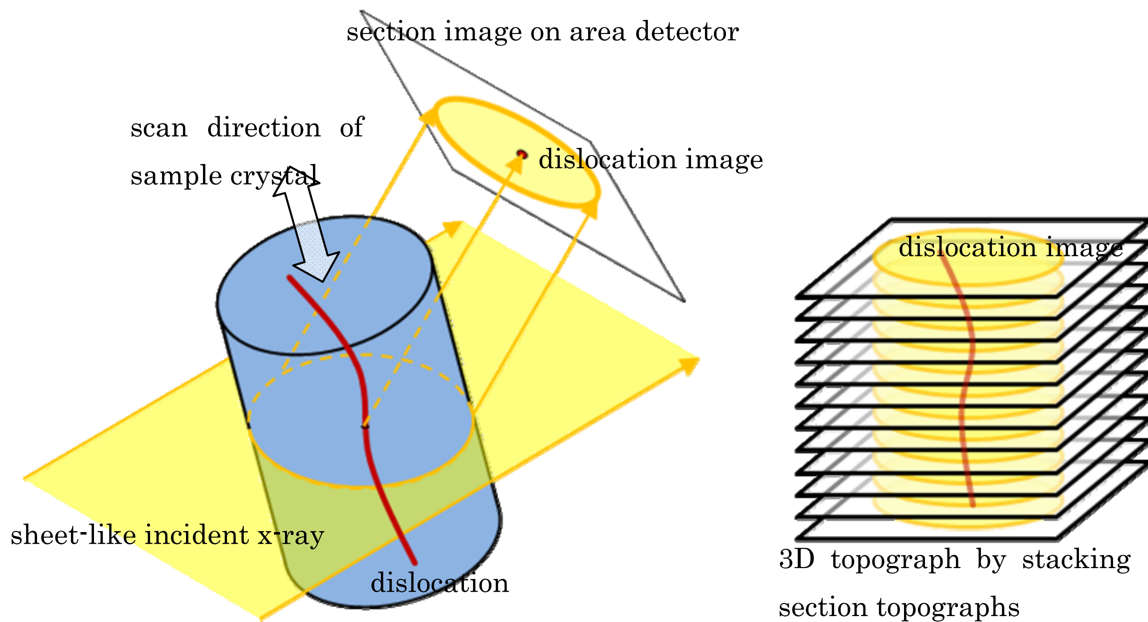

Fig.2 Schematic of the step-scanning section topography.

Plan of practice

1. Introduction of beamline 19B2 (quick tour).
2. Brief review on X-ray topography.
3. Alignment of diffractometer.
4. Measurement of dislocation distribution in CZ-Si crystal.