

Medical and Imaging Beamline I at SPring-8

Kentaro UESUGI, Keiji UMETANI, Naoto YAGI and Yoshio SUZUKI

SPring-8 / JASRI

BL20B2 (Medical and Imaging Beamline I) was constructed in 1998 and has been opened for public use since 1999. The purpose of this beamline was development of hard X-ray imaging technique and medical imaging in the energy range of 5 – 100 keV.

The beamline consists of a bending-magnet light-source, a fixed-exit double crystal monochromator and three experimental hutches. The distance from the light source to the end station is 215m. The divergence of the X-ray is 1.5mrad in horizontal direction. Therefore, the width of the X-ray beam is larger than 300mm at the end station, which enables us to do large field imaging. However vertical width of the X-ray beam is determined by natural divergence of synchrotron radiation is about 20mm.

There are several detectors for X-ray imaging at the beamline. For high spatial resolution imaging, CCD-based visible light conversion type detectors are used. They have a spatial resolution of 10 μ m-50 μ m depending on the optics in the detector. A CMOS-based detector called flat panel detector is used for large field imaging, because the field of view is 112mm \times 117mm, although, the beam size is less than 20mm in vertical direction.

For biological samples some imaging techniques are available to users, such as micro-angiography, micro-tomography and refraction enhanced imaging.

The micro-tomography system has a spatial resolution of about 13 μ m in three-dimension. The high resolution system is used for not only biological samples but also geological materials because the micro-tomographic system with monochromatic X-ray makes it possible to measure linear absorption coefficient quantitatively.

The lower spatial resolution but faster tomographic system is used for soft materials such as non-fixed dead animals. The spatial resolution is poorer than 20 μ m but the scanning time is less than 30 minutes.



Figure. Three-dimensional image of bones of body of rabbit's pup taken with high speed CT scan (25keV, 5minutes). Width of the image is about 25mm.

At the conference, the details of the beamline, equipments and experimental results will be presented.