

JAERI Beamlines

Teikichi A. SASAKI

Spectroscopic studies of the 5f (actinide) series of elements and their compounds are interesting from a physical and chemical point of view. Because the 5f electrons are more spatially extended than the 4f electrons, a large number of the ionization state occur. The various energies determining the ground state of an actinide ion, such as spin-orbit coupling, crystal field energy, and exchange energy, may frequently be of the same order of magnitude. The common explanations that are useful in discussing d transition compounds or 4f compounds are often not applicable to actinides. This provides a richness and a complexity to actinide compounds. A beamline (BL-27) was constructed from a bending magnet at the Photon Factory (PF) in KEK to study X-ray photoelectron spectroscopy (XPS), X-ray diffraction and absorption of radioactive materials and radiation biology, in collaboration with PF. The beamline BL-27 is divided into two branchlines, BL-27A being a soft X-ray (1.8-6 keV) beamline and BL-27B an X-ray (4-20keV) beamline. BL-27A has two

experimental stations for XPS and radiation biology. It houses a focusing optical system which consists of a cylindrical mirror with a bender and an InSb (111) double-crystal monochromator. BL-27B has an X-ray experiments hutch in which an X-ray diffractometer and an experimental table for EXAFS and radiation biology are installed. It has an Si double-crystal monochromator with the second crystal sagittally. In order to prevent the intrusion of radioactive materials into the beamline and the storage ring and to monitor them if the intrusion would happen, special precautions are taken into account on the beamline. Two monitor chambers (radioisotope inspection ports) are installed for the check of the radioactive contamination. The radioactivity of the ports is monitored at regular intervals. Two additional fast-closing valves (FCV) and a buffer chamber are installed in the BL-27A line. A sheet of polyimide thin film (Kapton film) mounted on a stainless steel mesh is inserted in the upstream of the soft X-ray experimental station.

JAERI has a plan to construct beamline for the researches on radioactive materials in SPring-8. The beamline design in SPring-8 is under discussion.

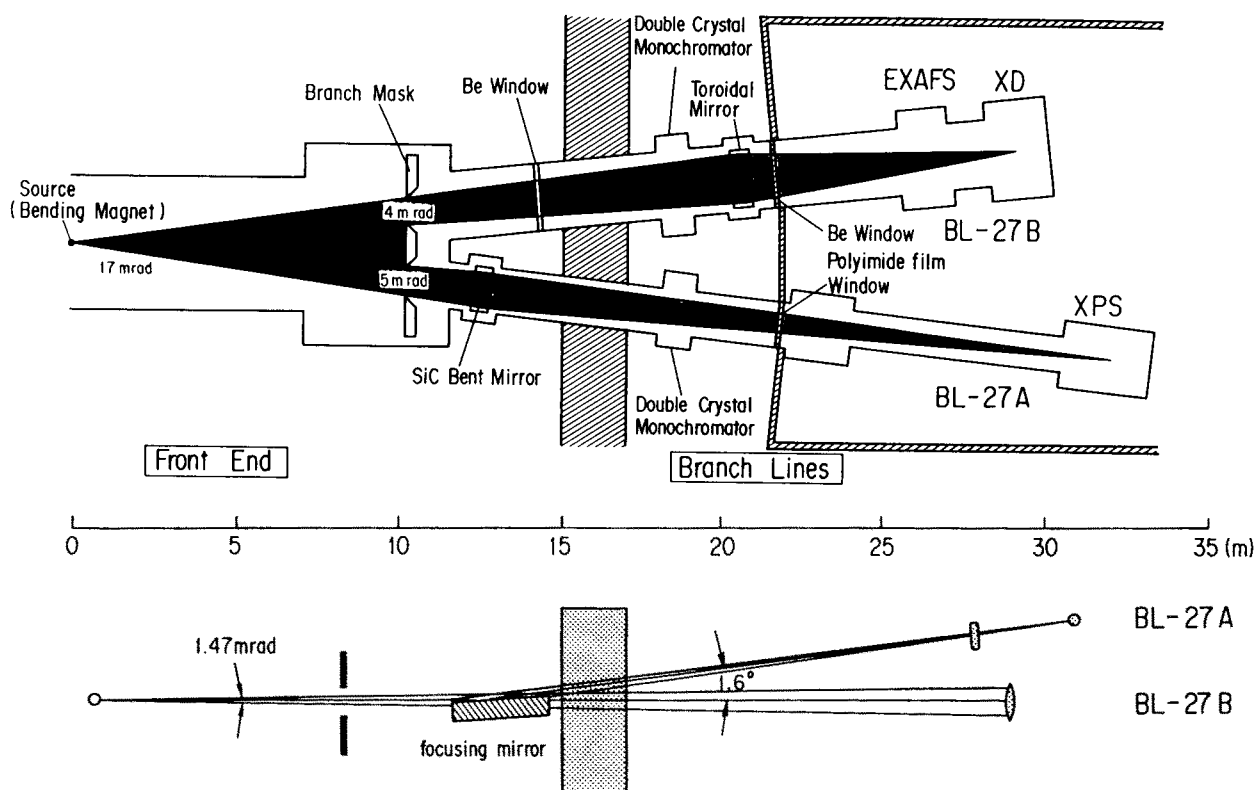


Fig. 1 Schematic layout of BL-27 beamline for RI and actinide experiments.