BL practice at BL25SU

09/17/2008, ver.1, T.Nakamura

Time schedule

9:00- Introduction of beamline design and major scientific activities.
10:00- Sample preparation and introduction to a load lock chamber.
10:30- Introduction of the helicity switching and MCD data acquisition techniques.
11:30- Measurement of beam properties under helicity switching in the 1 Hz mode.
12:30- ------- Lunch ----------
13:30- MCD measurements (Spectra and hysteresis loops). I propose having a time for exchanges of scientific interests and discussion on some technical subjects during the measurements.
16:00- Up to participant's interests and requests.
-17:00 Close

Outline of BL25SU

BL25SU is designed for research on electronic structures, magnetic states and surface structures of solids with high energy-resolution circularly-polarized soft x-rays. Left- and right-handed circularly polarized radiation is obtained along the same optical axis by twin helical undulators. The helicity of the circularly polarized radiation can be periodically switched at 0.1, 1 or 10 Hz by using kicker magnets distributed around the two undulators. The beamline monochromator is a constant deviation type with varied line-spacing plane gratings covering an energy region of 0.22 ~ 2 keV. The resolving power of the monochromator is more than 10,000 in the whole energy region.

Four kinds of spectroscopic techniques are available for public use: **high energy-resolution photoemission spectroscopy**, **magnetic circular dichroism of core absorption**, **two-dimensional angular distributions of photoelectrons**, **photoelectron emission microscope**. Measurements are performed in ultra high vacuum conditions down to 10^{-8} Pa.

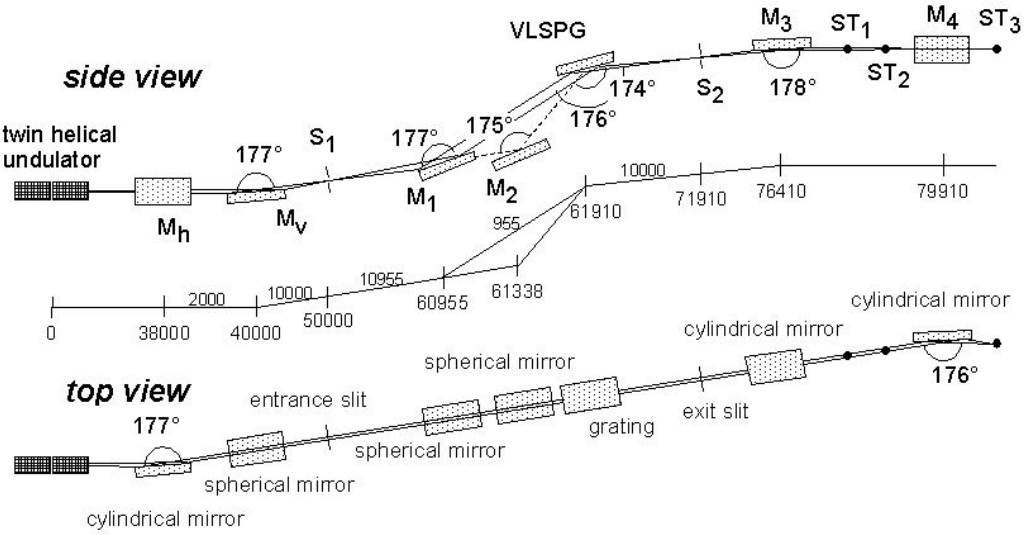

Fig.1 Layouts of beamline optics at BL25SU. MCD apparatus is installed as a station-4 (ST_4) downstream of the ST_3.

X-ray magnetic circular dichroism

Magnetic circular dichroism (MCD) of soft x-ray absorption is a powerful tool to study magnetic and electronic states of ferromagnetic and ferrimagnetic materials. At BL25SU, helicity switching of circularly polarized radiation performed by the twin helical undulators are used for MCD measurements. Two absorption spectra corresponding to an MCD are measured by one energy scan switching the helicity at each energy point. The helicity-switching method is effective for precise measurements. The switching frequency is currently 1 Hz.

Samples are magnetized by a water-cooled type electromagnet equipped with double yorks. The electromagnet generates variable magnetic field up to 1.9 T at the sample position. Sample temperature can be controlled from 10 K to 300 K and from 300 K to 550 K. Absorption intensity is measured by means of the total electron yield. A combination of the helicity switching technique and the apparatus provides element specific magnetic hysteresis (ESMH) measurements.