JAERI Beamline I (BL23SU)

1. Introduction

The beamline BL23SU, which is equipped with a variably polarizing undulator, was designed for solid-state spectroscopy, surface chemistry and biological applications [1,2]. All components of the beamline had been installed by December 1997 [3]. Commissioning commenced in February 1998, and the first monochromatic soft X-rays were obtained in December 1998.

2. Phase Driving Test of the Undulator

ID23, APPLE II type, provides linearly, elliptically or circularly polarized soft X-rays by phase driving the magnetic arrays [4]. The undulator consists of 16 periods with 120 mm length (the total length is 2 m) and the minimum gap is 36 mm. The ID gap and phase driving could cause distortion of the electron orbit in the storage ring. To minimize this, the electric currents for two steering magnets have been corrected.

In November 1998, we preliminarily tested ID phase driving to switch the circular polarization at a 0.5 Hz maximum [5,6]. A typical phase driving pattern is shown in Fig. 1. A successive image of the undulator radiation on a fluorescent screen monitor is shown in Fig. 2. The profiles largely showed higher harmonics of the undulator radiation, which passed through an Al filter. As the polarization was changed from circular to horizontal, the profile of the radiation became flatter and regained at reversed circular polarization. Full control of the polarization state will be possible at each experimental station by using a personal computer [7].

3. Optics

We adopted the basic concept of the monochromator for the SPring-8 public beamline BL25SU [8]. The monochromator is equipped with varied line spacing plane gratings that cover the energy region from 0.5 to 1.8 keV. Six mirrors were also installed to focus the beam [2]. The commissioning of the optics started in October 1998. Each optical component, as well as entrance and exit slit, was finely adjusted by using both a He-Ne laser and the actual beam from the undulator. In December 1998 a monochromatic soft X-

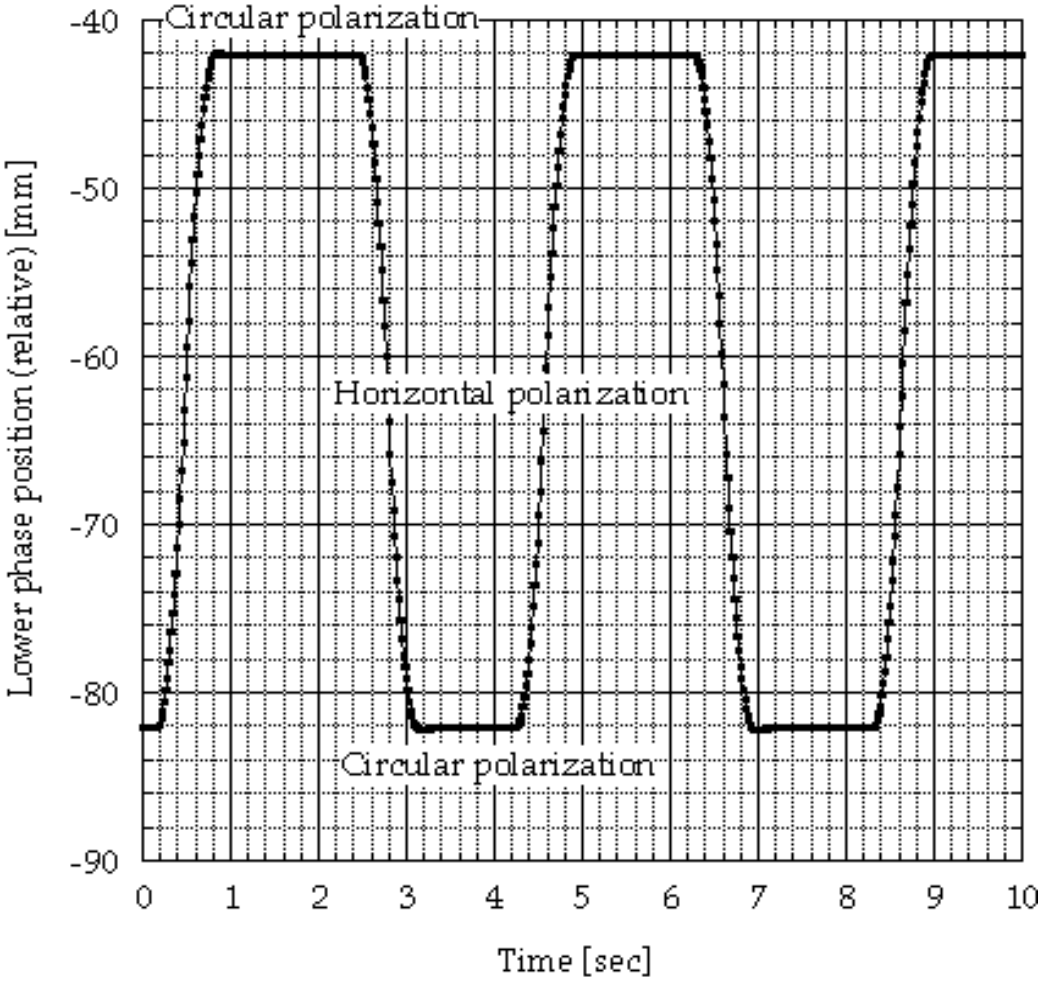

Fig. 1. Typical phase driving pattern of ID 23. Right and left polarization was swithced at 0.25 Hz. Users could change the retention time of the flat top at each circular polarization.

ray beam was obtained at the end station in the experimental hall. The resolving power of the monochromator has been evaluated by measuring the photoabsorption spectrum of Ne gas at 1s absorption energy (0.87 keV). Although further tuning of the optics is needed, the resolving power (E/ΔE) was tentatively estimated to be better than 5,000.

References

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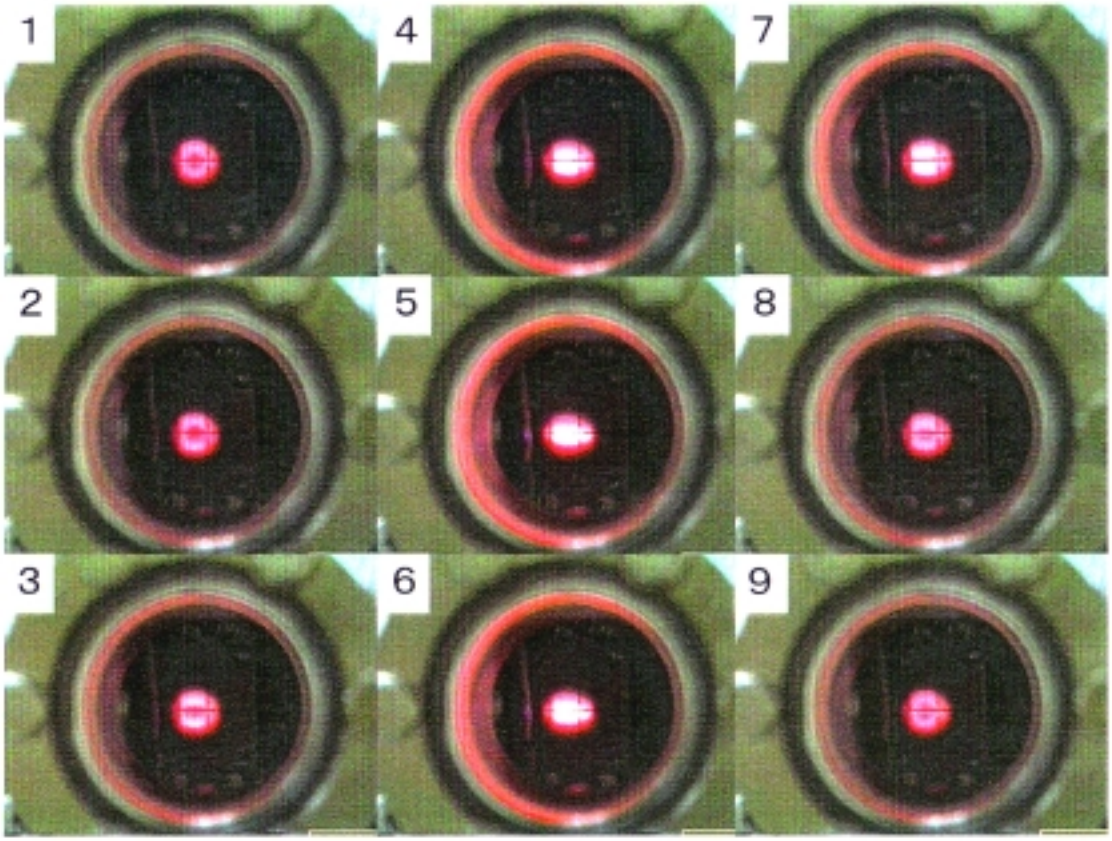

Fig. 2. Images of the undulator radiation on a fluorescent screen monitor at 1 mA ring current and 60 mm of the ID magnet gap (Kx = Ky = 1.5 at circular polarization and Ky = 3 at horizontal polarization mode). The images were recorded by a video-monitor and the pictures in a half period are shown with a time interval of about 0.2 sec.