R&D II (BL46XU)

1. Introduction

BL46XU has been assigned as the second research and development (R&D) beamline for insersion device (ID), in SPring-8 while BL47XU is the first R&D beamline in the field of imaging and R&D for optical elements.

Giving a rough outline of the construction aspects from the source, the undulator was installed during the summer shutdown of 1998. The front end was installed during the winter shutdown, which started from the end of 1998 and ends at the beginning of 1999. The beamline transport channel (TC) components were started to set in the optical hutch from the winter of 1997, including the double crystal monochromator system.

An explanation is first given for the undulator, the so-called in-vacuum hybrid low beta ID. The beamline components are also briefly described.

The front end will be connected with the beamline transport channel in January of 1999. We planned for the commissioning to be carried out in March of 1999.

2. Insertion Device

The insertion device adopted for BL46XU (ID46) is the in-vacuum type as well as the standard ID at SPring-8. The magnet structure is the so-called hybrid type consisting of not only permanent magnets but also pole pieces made of the iron-cobalt alloy called permendur. Figure 1 is a photograph of one magnet unit. As with the magnets of the standard IDs, it is coated with TiN to suppress degassing. The pieces in both sides are permanent magnets, and the pole piece is located in the center. The periodic length is 24 mm, and one period is formed by two sets of the magnet unit. Before installation in the storage ring, magnetic field measurement and correction were made.

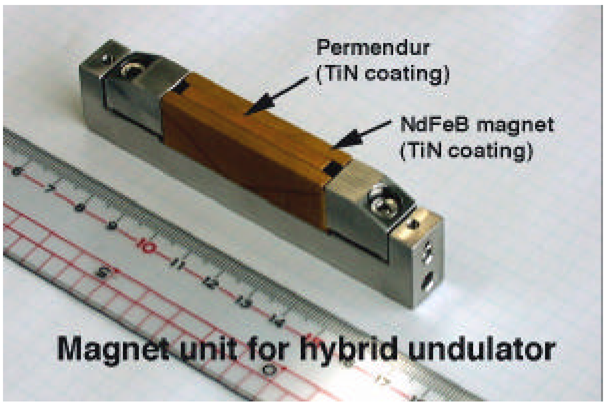

Fig. 1. Magnet unit for hybrid undulator.

Figure 2 shows the relationship between the gap and the measured peak of the magnetic field. In the same figure, the energy of the first harmonic calculated from the peak field is also shown. The figure shows that photon energy between 6 keV and 24 keV is available as the fundamental radiation if the minimum gap is assumed to be 5 mm.

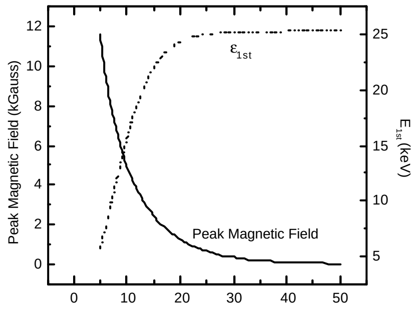

Fig. 2. Magnetic field and the first harmonic energy vs. gap.

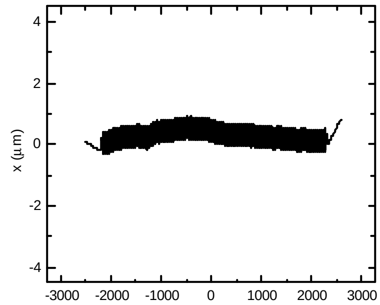

Fig. 3. Calculated electron orbit at the gap of 8 mm.

Figure 3 shows an electron orbit calculated from the measured field at the gap of 8 mm. It looks nearly straight, and no remarkable deflection causing spectral degradation can be seen.

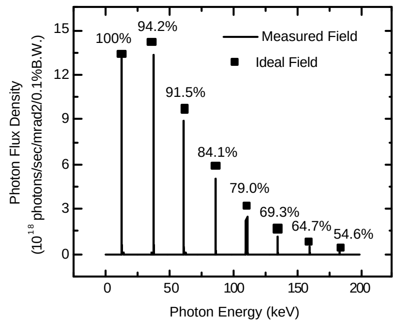

Fig. 4. Calculated spectrum at the gap of 8 mm.

Figure 4 shows the spectrum calculated using the measured field at the gap of 8 mm. The dots show the peak intensity for each harmonic when the magnetic field is ideal (perfectly sinusoidal). Also shown is the ratio of the peak intensity between the measured and ideal fields. It degrades with an increase in harmonic number but remains sufficiently high even for higher harmonics.

3. Transport Channel and Optical Hutch

Some parts of the standard TC were installed in 1997, and after TC installation was accomplished, the vacuum system for these parts started operation. A drawing of the TC of BL46XU in the optical hutch is shown in Fig. 5. The standard TC and monochromator of SPring-8 are used here. In the optical hutch, we plan to install a useful system for optical experiments next year after the commissioning. We now only have an optical hutch here in BL46XU, but the construction of an experimental hutch is now being planned.

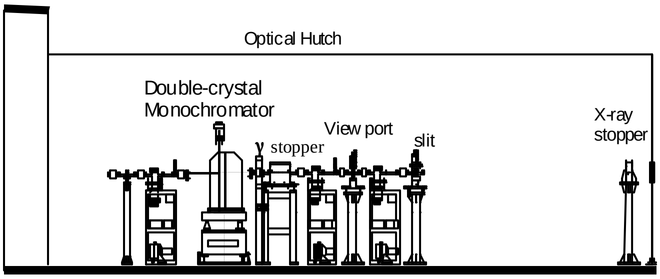

Fig. 5. Transport channel components in the optical hutch. (BL46XU)