Ring Current and Filling Pattern Dependence of X-ray Beam Position Monitors

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1. Introduction

The X-ray beam position monitors (XBPMs) for insertion device (ID) beamlines of SPring-8 have been installed in the front end at the place of 20.3 m from the source points [1]. This monitor has four CVD diamond blades, which work as detector heads in photo-emission mode. Each ID beamline has a XBPM of this type. The readings of the XBPMs reflect the electron beam positions and the directions at the source points. Using these XBPMs, the X-ray beam positions have been measured routinely after regular electron beam injections on condition that the all IDs are set to the minimum gaps, and the data have been recorded by the data base system during user runs.

Here we report the results of the measurements on the ring current and the filling pattern dependence of XBPMs.

2. Measurements at BL47XU

We used the XBPM installed at BL47XU for the measurements. The four current signals (upper-left, upper-right, lower-left, and lower-right) from XBPM were measured with the remote gain controlled I/V converter, and the data were acquired by the BL-workstation [2]. The beam positions (X, Y) can be calculated from the current signal ratios using the correction factors (Ax, Ay) [3]. During measurements, the ID gap of BL47XU had been set to 26 mm, and the other Ids were set to full open.

The dependence of the XBPM readings on the storage ring current was measured as shown in Fig. 1. The measurement range of the ring current was from 1.0 to 69 mA. The nominal effects on the reading are about 40 μm in horizontal and 10 μm in vertical. Since the stability of electron beam is not known exactly, the effect is expected to be less than these numbers.

The dependence of the reading on the filling pattern was also measured as shown in Fig. 2. The measured filling patterns were a full filling, 1, 2, 4, 12, 21, 42 bunches, and 12+48 bunch-train mode. The results show that the filling pattern dependence on the XBPM is very small.

In conclusion, we have measured the ring current and filling pattern dependence of the XBPM, and demonstrated that there are no significant influences on the XBPM readings. The upper limits of the dependence are about 40 μm in horizontal and about 10 μm in vertical. The same measurements under the condition that the electron beam is stabilized by the feed back system are desirable. The FFT analyses using the fast electric circuits are also desirable.

References

[1] H. Aoyagi *et al.*, SPring-8Annual Report 1997, 220 (1997).

[2] T. Kudo *et al.*, SPring-8 Annual Report 1997, 205 (1997).

[3] T. Kudo *et al.*, SPring-8 Annual Report 1996, 200 (1996).

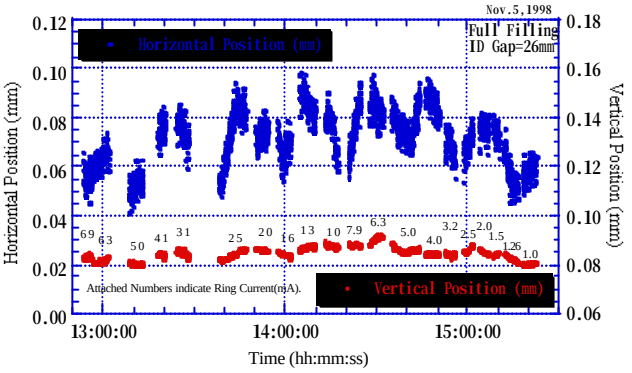

Fig. 1. Ring current dependence of XBPM@BL47XU.

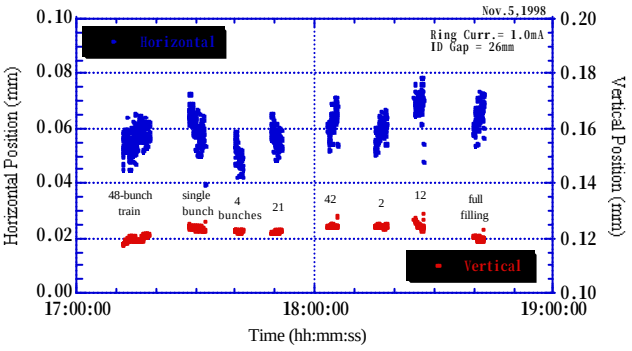

Fig. 2. Filling pattern dependence of XBPM@BL47XU.