Graphite Wire Monitor Tested at BL47XU

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1. Introduction

The observation of the beam profiles is important for X-ray beam diagnostics. The X-ray beam position monitors (XBPMs) are not design to observe their profiles basically. Therefore we have prepared a wire scanning type beam profile monitor whose detector is made of graphite[1]. The main purpose of this monitor is to enhance the feasibility of XBPMs at the SPring-8 beamlines.

Here we describe the beam tests of the graphite wire monitor which has been installed at the front-end section of BL47XU.

2. Structure and Data Acquisition of Graphite Wire Monitor

The schematic view of the graphite wire monitor is shown in Figure 1. This monitor has two wires for the horizontal scan and the vertical scan, which are fixed at a right angle. The wires are made from a highly orientated graphite sheet in order to reduce heat load. The dimensions of wires are 80 mm thick, 0.5 mm wide and about 50 mm long. The signals of photo-emissions are detected independently. The actuator of detector head is driven by the stepping motor at an angle of 45 degree. This monitor is installed at about 19 m from the source point.

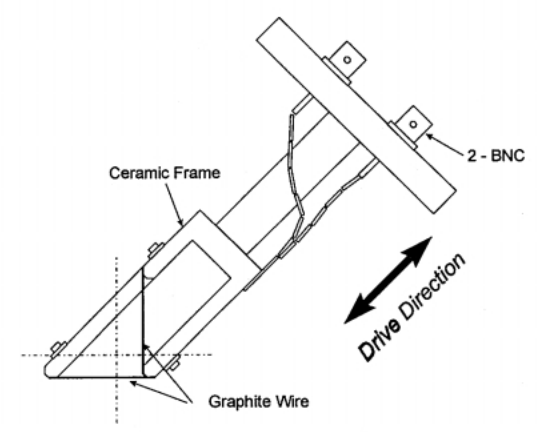

Figure 1 Schematic View of the Wire Monitor

In order to acquire data from the wire monitor, we have prepared Scan Program running on the Beamline Workstation (BL-WS). Scan Program has Graphic User Interface (GUI) for ease operations. It connects to Request Server running on BL-WS by TCP/IP, collects data, indicates auto-scaled graphs, and makes log files. This Program is available not only for the graphite wire monitor at BL47XU but also for other detectors at all beamlines.

3. Beam Tests and Results

The measurements were done at low ring current operation of 0.87 mA not to excess the limitation of the heat load. The bias voltage of +100V was applied on the photoelectron collector which is by the side of the wire. Figure 2 shows the results of the scanning measurements for the horizontal scan (a) and the vertical scan (b). Its vertical axis indicates the signal current from each wire, and the scale is normalized to the storage ring current of 1mA. Its horizontal axis indicates the position of the wire in each direction. The quantum efficiency of photo-emission has a peak on slightly above the K-absorption edge. So that the scan data show their profiles of the low energy parts. The remarkable feature is the double peak structure in vertical scan, which are as evidences for the theoretical calculations[2]. At the condition of ID Gap-Full-Open (GFO), the most of signals come from the radiation of the bending magnets, in the other words, the background. Figure 3 (a) and (b) show the profiles without this background. We have assigned the beam axis by the Gaussian fitting and compared the outputs of the rf-BPMs[2] which are installed just before and after the insertion device of BL47XU. The positions determined by the rf-BPMs are extrapolated on to the position of the wire monitor. The results are shown in Figure 4. The consistency between the wire monitor and the rf-BPM are good, especially in the horizontal scan. We think that the wire monitor can be utilized for the calibration of XBPMs.

References

[1] X. Zhang et al., Rev. Sci. Instrum. 66, 1990 (1995)

[2] SPring-8 ID group, private communication.

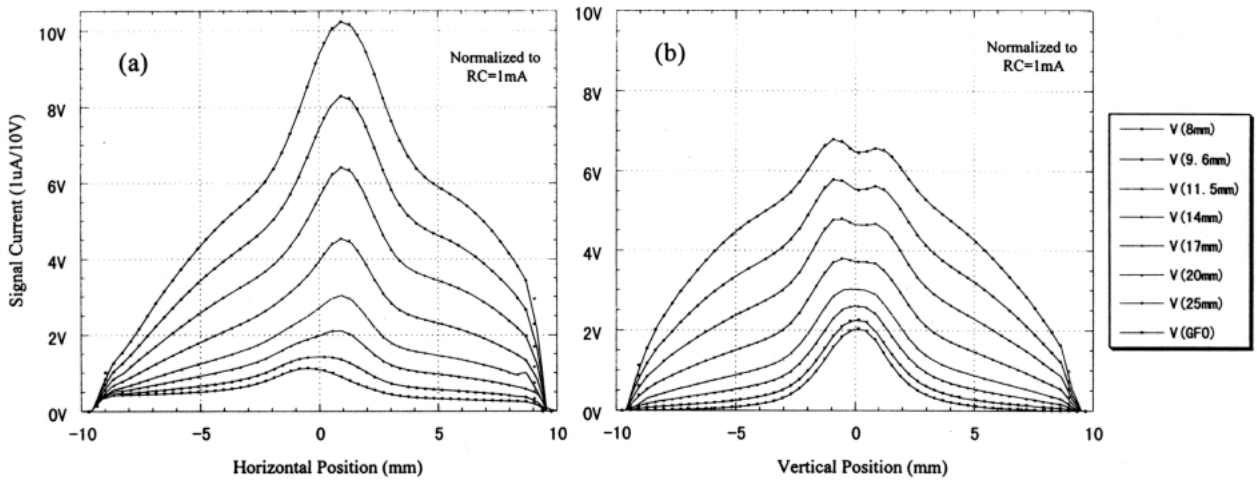

Figure 2 The scan data of the graphite wire monitor including the effect of bending magnets.

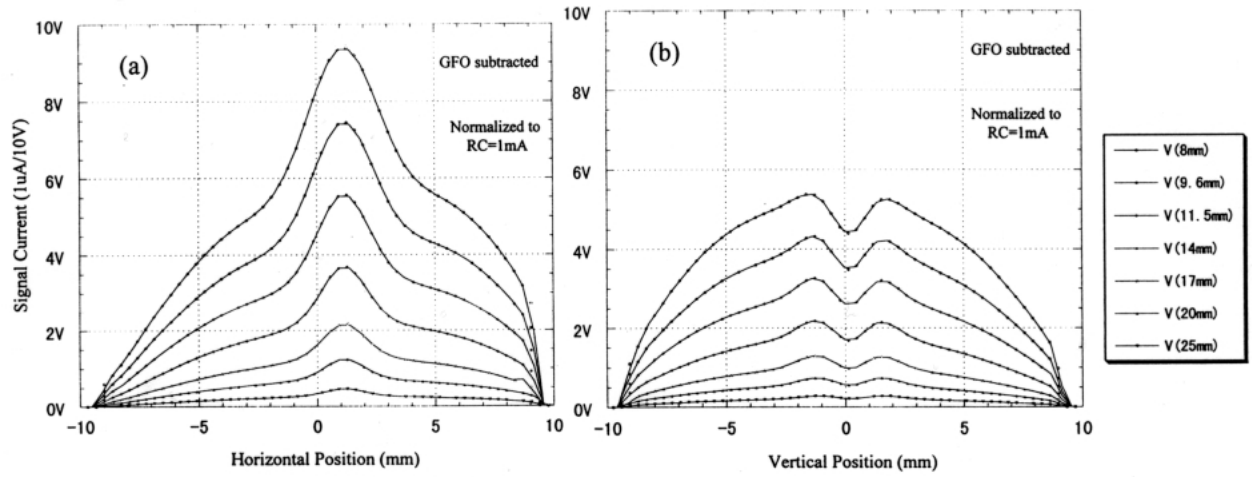

Figure 3 The Scan data of the graphite wire monitor after subtraction of the background.

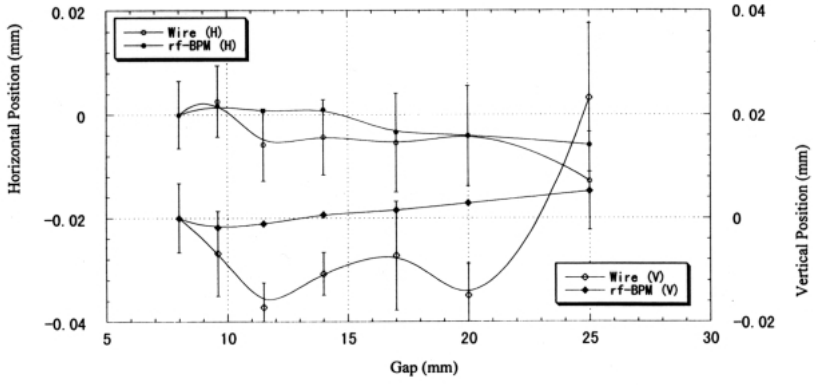

Figure 4 The comparison of the position data between the wire monitor and the rf-BPMs.