

Present Status of Interlock X-ray Monitors

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1. Introduction

There should be an interlock system in each frontend of ID beamline to abort the electron beam of the storage ring immediately, because in the case that electron beam is missteered, it might melt beam pipes or components which do not have a heat proof structure. We decided to use a highly oriented graphite sheet as a detector head of photoemission. This sheet has a hole in the center, and the aperture of this hole corresponds to the acceptance of the SR beam.

2. Estimated Signal Current

The quantum efficiency can be estimated roughly using absorption coefficient of photons and mean free path of electron in the bulk. Figure 1 shows the estimated quantum efficiency of 0.1mm thick graphite sheet. An S/N ratio should be large enough, hence we estimated the difference of signal current of radiation from the undulator and that of the background from the fringing field of the bending magnet. Figure 2 shows the total flux of radiation (K=1.5) and the number of photoelectrons which are caused by the radiation. This says that when the radiation of ID hits graphite sheet directly signal current would be 20 times larger than the background from the bending magnet. Table 1 shows the maximum current of the monitor and the radiation power at various K values. The maximum current tends to be proportional to the total power.

3. Installation

The detector head is made of graphite sheet. The good points of graphite are high thermal conductivity, low absorption coefficient of hard X-ray and high sublimation temperature under the ultra high vacuum.

This graphite sheet is supported by cooper holder which is cooled by water channel. The monitor chamber has linear actuator for horizontal motion, and the detector head can be removed from the SR beam axis completely. The monitor is placed at about 19m from the source point. At the present , four interlock X-ray monitors have been installed at BL09, BL41, BL45 and BL47.

*) Present Address: Ishikawajima-Harima Heavy Industries Co., Ltd.

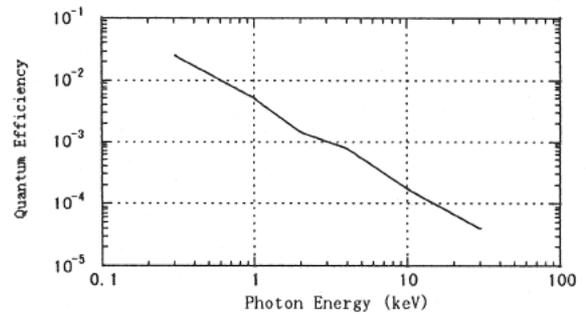


Figure 1 Estimated quantum efficiency

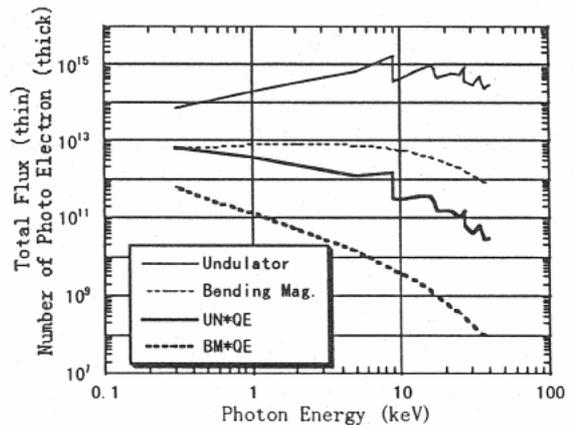


Figure 2 Estimated Signal Current

Table 1

K value	Max.Current [mA]	Total Power [kW]	Max. PD [kW/mrad ²]	σ_x' of Power [μ rad]	σ_y' of Power [μ rad]
0.3	0.09	0.182	31	50.1	45.3
0.8	0.51	1.30	140	60.3	45.3
1.5	1.83	4.56	300	83.2	45.3
2.3	4.39	10.7	450	114.5	45.3
(background)	0.092	~0.03	0.55		