Change of Radiation Protection Policy of Pohang Accelerator Laboratory

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1. Introduction

In Korean Nuclear Safety Act, only radiation control area is defined for dividing from general public area. It is not enough to take care the access control at large accelerator facility like Pohang Light Source or PAL X-ray Free Electron Laser. The recent change of radiation safety rule related to frequent-visitor made a trouble in PAL radiation protection policy. The policy has been updated based on real data of radiation monitoring and operation experience.

2. Fact Check and Change of PAL Policy

Pohang Light Source (PLS) had been operated since 1994 and was upgraded successfully to Pohang Light Source II (PLS-II) in 2011. The third hard X-ray free electron laser, PAL-XFEL, was constructed in 2016 in the world and its beam line has been opened to general users since June in 2017. The fact check for practical radiation environment and personal dose was carried out using data in 2015 and 2016 after enhanced monitoring even though all historical data were recorded at PAL safety system.

2.1 PAL Policy before Update

The dose limits of radiation worker and general publics are 20 mSv and 1 mSv a year at PAL. One of frequent-visitor is 6 mSv a year, which is the same to recently announced nuclear safety act. In buildings of PLS-II and PAL-XFEL, the base dose level is very low and very limited area can be assigned as the radiation control area defined by the nuclear safety act even during accelerator operation. Because of above reason but for enhanced safety control, all areas in PAL have been classified as shown in table 1 and figure 1. The frequent-visitor were mainly synchrotron radiation users and contracted worker and they should wear the personal dosimeter in Generally-Controlled Area(GCA) and higher level areas.

Table I: Area Classification of Radiation Protection Policy

	Dose Level	Remarks
Restricted Area	0.25 < D < 1 mSv/y	
Generally-Controlled Area	1 < D < 20 mSv/y	Dosimeter required
Radiologically Controlled Area	20 mSv/y < D < 1 mSv/h	
High Radiation Area	1 mSv/h < D	No Access

Especially the GCA is introduced for our purpose and it is similar to supervised zone in other regulation. The access to GCA is allowed only when the work wear a personal dosimeter after passing proper radiation safety training. So they were usually classified to a radiation worker or frequent-visitor. However the dose level at main area like the experimental hall was lower than the dose limit of the general public.

2.2 Fact: Radiation Level and Personal Dose

The PAL area radiation monitoring consists of a active system and a passive system. Totally 24 monitoring posts and 32 posts are operating at PLS-II and PAL-XFEL, respectively for the active system. The number of environmental monitoring posts are seven. The OSLN dosimeters are installed at places more than 150 for the passive system. The OSLN dosimeters measure three-month integrated doses at specific places.

All radiation workers and frequent-visitors wear the same type of OSLN dosimeters at the area above GCA. All synchrotron radiation users wore the dosimeter because they were classified as frequent-visitor

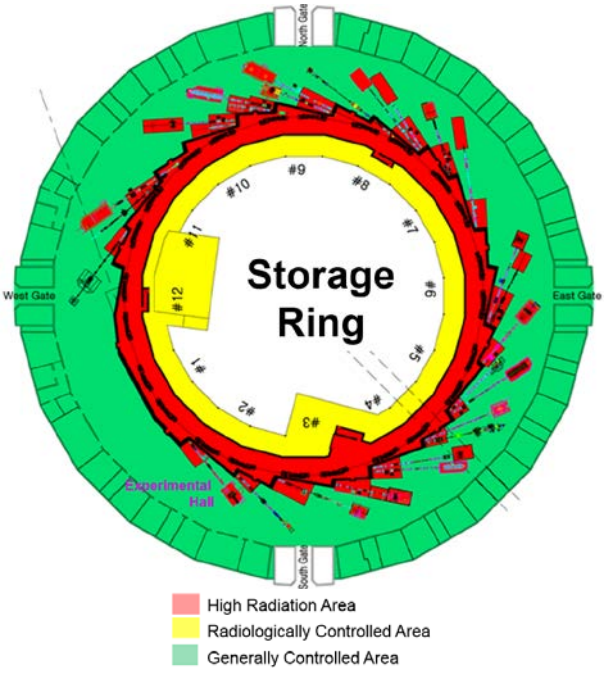

Fig. 1. Area classification in storage ring of PLS when electron beam is operated with synchrotron radiation beamline

A example of annually accumulated dose (2015) of area radiation monitoring in PLS-II storage ring building is shown in figure 2. In the plot, the posts of higher dose above 1 mSv are located at RCA. All other monitors located at GCA like experimental hall showed lower dose level than 1 mSv. The personal doses of all synchrotron radiation users were very low as records in figure 3. It also confirm surely that the radiation environment of PLS-II and PAL-XFEL is safe and some assigned area can be re-assigned as a zone for the general public like restricted area of PAL standard.

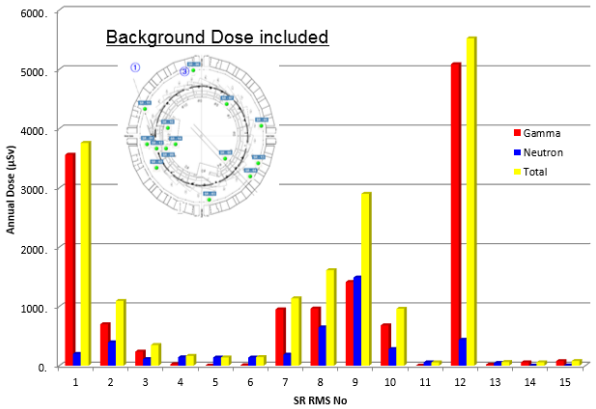

Fig. 2. Annually accumulated dose measured by area radiation monitoring system in PLS-II storage ring building. (including background radiation).

in 2015

	< 0.1 mSv	> 0.1 mSv
Feb	364	
Mar	675	1 (0.11)
Apr	532	
May	436	
Jun	668	
Jul	609	
Aug	12	
Sep	160	
Oct	770	
Nov	709	1 (0.12)
Dec	344	
Total No of Dosimters	5279	1

in 2016

	< 0.1 mSv	>0.1 mSv
Feb	399	
Mar	747	
Apr	713	
May	684	
Jun	645	
Jul	616	
Aug	1	
Sep	258	
Oct	604	
Nov	679	1(0.31)
Dec	543	
Total No of Dosimters	5889	1

Fig. 3. Records of personal dose of synchrotron radiation users in 2015 and 2016. All users except of unexpected three cases were exposed less than 0.1 mSv, which is a reporting level of OSLN dosimetry system.

2.3 Updated Policy of Radiation Protection

Because of enhanced requirements for frequent-visitor by recently-announced Nuclear Safety Act, PAL can not assign the synchrotron radiation users and short-term outside worker to access GCA as a frequent-visitor. Considering their risks expected from accessing to GCA, long training and medical check are not fair. So PAL decides to classify such synchrotron radiation users and short-term workers to the general public. However the fundamental requirements to access to GCA are not changed: short radiation safety training and wearing a personal dosimeter, OSNL have to be required. Long-term outside workers and workers in regular maintenance period are classified to frequent-visitor continuously. They can access to accelerator tunnel in maintenance period, where is assigned as RCA

3. Conclusions

The radiation protection have to be operated by considering its risk, even with the worst assumption. The latest announced government regulation does not consider it carefully. PAL should change the own policy of radiation protection to avoid over-requests and confusion. In this paper, the PAL response and detail consideration of policy change are introduced.

REFERENCES

[1] H.S.Lee, et al., Change of Radiation Safety Control on Synchrotron Radiation User at Experimental Hall, 9th Radsynch, NSRRC, Hsinchu, Taiwan, 2017.

[2] Radiation Safety Control Rule of PAL and POSTECH, in 2017.