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Optimization of protection for KOMAC

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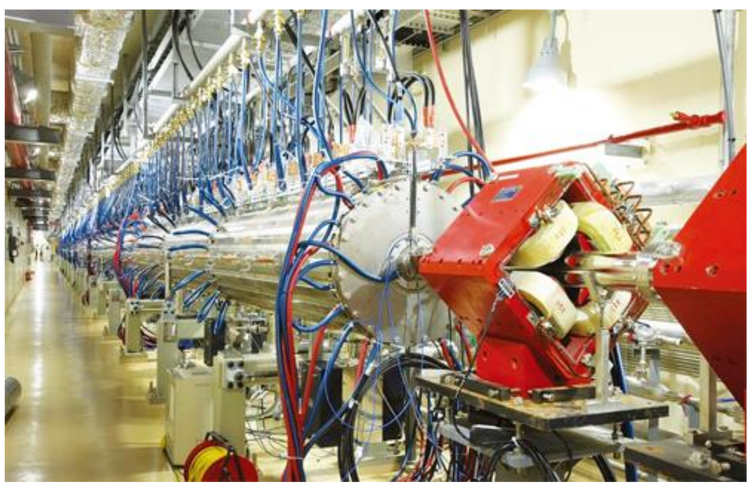
Introduction

ICRP declared the Commission's three fundamental principles of radiological protection is used for evaluation scale for radiation safety these days. Three fundamental principles, JUSTIFICATION : Radiation works should not be carried out if there are not be carried out if there are not any net benefits from the works, OPTIMIZATION : it is intended for application to the works that have been deemed to be justified, and maintains exposure as low as reasonably achievable considering economic and social factors, DOSE LIMIT : even if the justification and optimization is satisfied, it should be under the individual dose limit. **OPTIMIZATION** is a major part of radiation protection and the best option of optimization is that maintain exposure as low as reasonable achievable considering various properties and conditions. So this poster discusses how to apply optimization of protection to KOMAC's condition with three categories (Radiation source, Characteristic of exposure, Social perspective) and introduces the safety systems and management procedures for optimization. Furthermore, this mentions limitation and proposes improvement to the current protection systems.

Experimental method

Radiation source

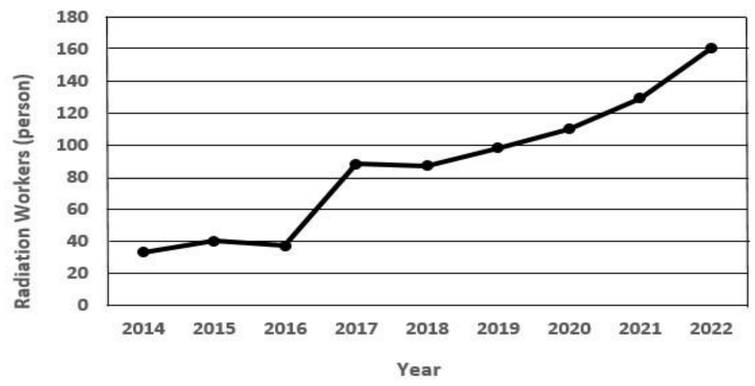
The perspective of radiation source means that the kind of the source, the number of the source and capacity. KOMAC operates 100 MeV 20 mA proton accelerator, five different types of small accelerators, and other radiation generators. Focus on the 100 MeV proton accelerator which capacity is maximum in KOMAC, representative radiations during accelerator on include : proton, neutron, gamma ray. And interaction proton beam with target generates radio-nuclides and they emit gamma rays while decaying. During on the proton irradiation, it is necessary to control not to remain in target rooms and use shielding doors to minimize external exposure.



The main safety systems for 100 MeV proton accelerator are PSIS and RMS. PSIS (Personal Safety Interlock System) could control entrance to high radiation field such as target rooms, and open/close shielding doors by five modes including emergency mode. And by RMS (Radiation Monitoring System), We recognize the level of radiation and keep constant monitoring. These are already got permissions including evaluation of the effects for the exposure from Korea regulators and they should be maintained and operated to protect from the source.

Characteristic of exposure

The characteristic of exposure is that radiation workers, exposure time, the numerical statistics of exposure and latent exposure. As the demand for experiments by using radiation generator and radioactive isotope is increased, the number of workers is also increased.



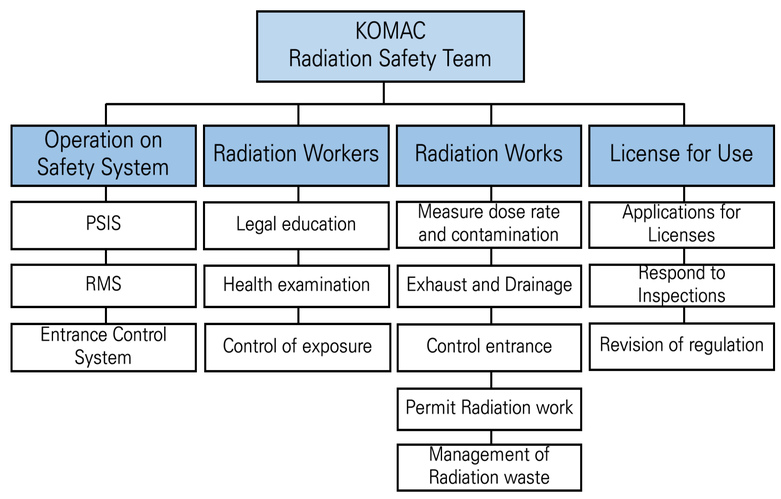
Entrance control system controls only people who permitted already with TLD. By using it, it is easy to apprehend about radiation work times, places, entering time, cumulative dose and collective dose. It can identify the facility or radiation work type which doses are measured high, so manage more carefully for protection.

FACILITY	Work time (hr)	Collective dose (uSv)
RG 1	12413.5	3075.33
RG 2	1695.6	121.56
RG 3	12085	1217.06
RI Product	756	458.69

Based on the data of system and suppose that work for 2000 hours in a year, then 160 workers' collective dose is approximately 361.6 uSv/yr. And all dose rates in every facilities are not exceed our criteria level, 12.5 uSv/hr. The highest collective dose is in RI product facility because of unsealed radioactive isotope. So it is necessary that measuring workers themselves for protection like using Whole body counter.

Social perspective

The social perspective, it includes the purpose of the work which occur radiation exposure, the safety awareness of workers, administrative capacity and so on. And the work performed by the radiation safety team is shown in the picture below and it is divided into four main categories : Operation on safety systems (PSIS, RMS, Entrance control system), Management of radiation workers, Management of radiation works, License for Nuclear facility's use.



Management of radiation works is the most relevant with social perspective.

First, KOMAC measures radiation level, surface and air contamination periodically to prevent deterministic effects and confirms that shield is within the regulation limit. Second, all of workers should get permit about the plan before radiation work. By the advanced work plan, radiation safety team can recognize and recommend that the work should be prepared protection action before works so as not to intrude justification.

Conclusion

This poster explains how to apply optimization of protection to KOMAC with three categories. First, the safety systems are very important to control and protect from radiation by source perspective. Second, almost 160 workers work with various capacity of radiation devices and facilities, so radiation protection should be applied considering each conditions. Last, radiation safety team has managed well since 2015 and its system is specialized. Even safety systems are properly maintained for radiation protection, but there are limit such as the manager can not be present at all time at all radiation workplace, so workers have to work according to the rules to minimize unexpected exposure. So the best optimization of protection method is that workers change their perception of safety through personal inspections.

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