



Radiation and Operation Safety

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The Radiation and Operation Safety Division (ROSD) conducted the following programs in 2000 to ensure that all machine operations and research activities at SRRC comply with safety regulations and pose no direct or potential hazards to personnel and the surrounding environment.

Radiation Monitoring

The Radiation Monitoring System (RMS) operated smoothly during the past years. The continued efforts were devoted to improve the reliability and flexibility of the RMS. With its flexible hardware and software architectures, different types of radiation detectors can be easily incorporated into the system to take advantage of the existed data logging, display and analysis tools. Recently, concerns on the possible health impacts due to exposure of electromagnetic field (EMF) have been greatly arisen. To measure and control it, three EMF monitoring stations were established to provide real-time surveillance over the suspected area. The frequency response range of the EMF probe we applied is from 100 kHz to 5 GHz covering the main RF sources in SRRC. At present, two EMF monitoring stations were installed near the RF transmitter of the storage ring and booster, respectively. For comparison, the third EMF probe was installed in ROSD laboratory located at the staff building. The survey results show that the EMF strengths are far below the IEEE maximum permissible exposure limit for uncontrolled area, even when RF systems are operating. In addition, a high-radiation tolerance ionization chamber FHT 191N was installed inside the tunnel of the storing ring.

Its measuring range is from background up to 10 Sv/h. Due to the wide detection range, it can measure the high radiation level during machine injection and residual activity after machine shutdown which is near background level.

Bubble detectors were introduced to measure the radiation dose from neutrons this year. It consists of an elastic polymer throughout which droplets of superheated liquid were dispersed. When these droplets were hit by neutron particles some small gas bubbles will be formed in the polymer to provide a real time, immediately visual record of the dose. Bubble detectors are widely used in mapping of neutron doses produced by accelerators due to its simplicity, low-cost, light-weighted and more importantly zero sensitivity to photon radiation. Moreover, using bubble detectors with different energy thresholds, the general energy spectrum of neutron fields could be quickly determined. The preliminary tests in SRRC show that it is suitable for personal neutron dose measurement in the accelerator environment.

Personnel Dosimetry

The total number of TLD dosimeters issued and assessed in year 2000 is 5,464. It reveals that average of 455 persons entered our storage ring performing their synchrotron radiation experiments and accelerator related works in the past year. Among them, 65% were outside users. The Statistics of the annual dosages received by these dosimeter users are shown in *Table 1*. It shows that the majority of the dosimeter users

Table 1 SRRC annual dose statistics (2000).

Dose Range (mSv)	Number of Person	Collective Dose (man-mSv)
≤Background (B.G)	639	0.0
B.G ~ 0.1	80	3.06
0.1 ~ 0.2	4	0.54
0.2 ~ 0.3	0	0.0
0.3 ~ 0.4	0	0.0
Total	723	3.6

(around 88%) receive annual radiation dose level indistinguishable to that of the natural background, and no one exceeds the SRRC annual dose limit of 2 mSv. The radiation exposure from working at SRRC is minimal and well under control.

Beamline Safety Review

BL13 IR beamline was the beamline newly constructed and reviewed by Beamline Safety Review Committee in year 2000. Detailed discussions and safety evaluation on radiation shielding, interlock logic, vacuum protection and general safety were made to ensure safe operation of the beamline. A Readiness Review was completed and no safety discrepancy on the IR beam line was found.

BL20B, the multiple-purpose X-ray beamline was proposed to modify and elongate the beamline to accommodate small angle scattering capability. Several minor interlock modifications were recommended and issued to the respondent persons by the Committee. Readiness review for BL20B will be called following the completion of the beam line modification.

The Committee has reached consensus to audit the safety issues of large experimental end-stations that belong to a designate beamline, especially on seismic safety. The logic design for the unified beamline interlock system has been carefully discussed and evaluated in the Committee to ensure current interlock logic has been fully implemented and will be compatible with front-end interlock system.

Experimental Safety Control

Regular seasonal meetings were scheduled by the Experimental Safety Review Committee upon the arrival of experimental proposals to evaluate possible hazard associated the experimental samples and operation procedures. The Committee identified the potential hazards and issued reasonable safety precautions to users.

New “End-station Information Boards” locating near each end-station were deployed this year. Two goals are expected for this system. First, each user group is responsible for updating the End-station Information Board at all times, and normally the users are expected to be “on site” to monitor the progress of experiment during “photon beam open”. Secondly, the users are permitted to leave the SRRC site for up to two hours, while leaving the photon beam in an “open” mode. In that case, the pink card “Notice of Temporary Absence” should be filled out with required information for emergency response.

Safety Training

Refresh training is in practice to ensure all users are aware of new SRRC safety regulations. Users who received radiation safety training at first coming to SRRC should take refresh training every two years to continue the validity of user-card and radiation badge.

Safety Inspection

We had four safety inspections in year 2000, which are reported here as follows:

1. Ten cranes with hanging capability less than 3 tons were inspected in February. A specialist from the Cranes Association of R.O.C. was invited to join this inspection. All checks, including the standard checklist items, the calculating strength and standard counterpoise trial of the hook, were successfully passed.
2. Beamline safety inspection was carried out in April. The items we checked included radiation shielding, exclusion zone, personnel protection interlock system, earthquake prevention and house keeping. No serious shortcomings were found in this inspection.
3. The electrical power systems and cables in the Storage Ring Building were inspected in August. Most of the power devices, such as low voltage power relays, magnetic power switches and partial cables were checked, and the temperatures of transmitters were also measured with the help of the Utility Group.
4. In November, the last inspection was held to check the emergency response equipments. We organized a training for all the EMT members, and then checked the emergency response procedures and equipments. We also examined the sideways of pipelines area that had ever stacked with some stuff before.