8 - 34 Establishment of SESRI 300 MeV Ion Accelerator Radiation Protection System

Yan Weiwei, Li Wuyuan, Yang Bo, Su Youwu, Li Zongqiang, Mao Wang, Li Jinfeng and Liu Xuebo

Space Environment Simulation and Research Infrastructure (SESRI) developed for Harbin Institute of Technology is composed by many facilities including a proton accelerator with a maximum acceleration energy of 300 MeV. The 300 MeV ion accelerator radiation protection system consists of a dose monitoring system and a personal safety interlock system(Fig. 1). The dose monitoring system measures the radiation dose rate in the accelerator hall and the external environment, and displays and stores the data in real time. The personal safety interlock system includes protective doors, beam blockers and other devices, which can realize the logic control of personnel access and beam flow combined with real-time dose rate data. The stable operation of the radiation protection system effectively guarantees the radiation safety of the 300 MeV ion accelerator during operation.

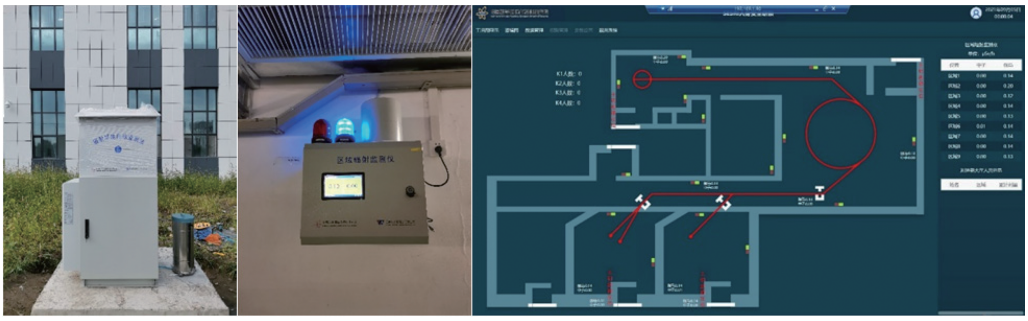

Fig. 1 (color online) Radiation dose monitoring equipment and personal safety interlocking system software.

8 - 35 Induced Radiation Studies and Personnel Dose Assessment in a Carbon Ion Therapy Facility

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Induced radioactivity in the treatment room (uniform scanning model) was investigated on Gansu Heavy Ion Tumor Hospital, a medical facility independently developed by the Institute of Modern Physics. The induced radioactivity of beam delivery system, patients, air, and the dose of medical staff, patients, and carers from the induced radioactivity were examined by the Monte Carlo simulation and experimental measurement.

The results indicated that the multi-leaf collimator and the patient's body were the main sources of induced radioactivity. The main radionuclides were ^{11}C, ^{15}O, ^{181}W, ^{179}Ta, *etc.* The dose rates on the patient obtained by experimental measurements and FLUKA calculation are given in Fig. 1. The data in region A and region B are the results measured in the treatment room and outside the treatment room, respectively. It can be observed that the experimental results are concordant with the FLUKA calculation results. The difference between the two are analyzed in the published paper[1].

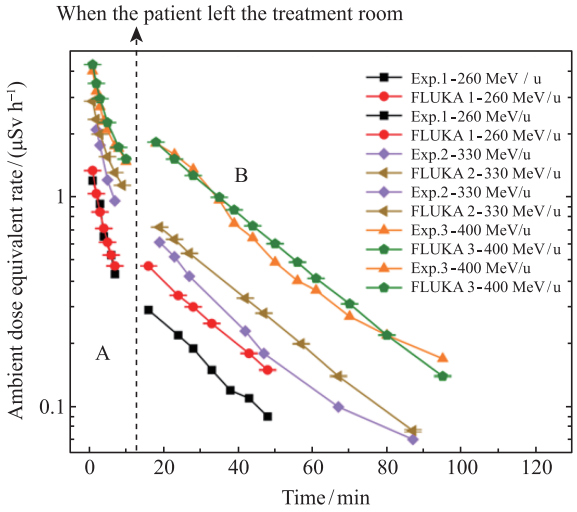

Fig. 1 (color online) Residual dose rates on the surface of the patient's body were obtained by FLUKA calculations and experimental measurements.

The assessment results demonstrated that the maximum annual dose for medical staff was 1.83 mSv, the additional dose of the patient from the residual radioactivity was 1.21 μSv in single irradiation, and the dose of the carers was 0.135 mSv in the course of treatment. The present research results can provide reference for the subsequent operation mode of medical heavy ion facility.

Reference

[1] C. Luo, W. Li, B. Yang, et al., Applied Radiation and Isotopes, 188(2022)110350.

8 - 36 Overall Layout and Mechanical Design of IP-SAFE Project

Zhao Bo, Liu Shuhui, Li Yaguang, Xu Junkai, Liu Lubei, Jiang Guodong, Cheng Yongqi, Wang Fengfeng, Zhu Tieming, Zhang Bin and He Yuan

IP-SAFE Project (Isotope Pharmaceutical Production Platform based on Superconducting Accelerator Facility for Effective Therapy) is in the accelerator tunnel located at Lanzhou New District, which is combined by beam front end sections, four-vane RFQ, middle energy beam line sections, cryomdule sections and target station terminal. The cryomdule sections use the HWR010HWR015 and HWR040 of CiADS superconducting linear accelerator, as shown in Fig. 1. The beam line is 1 500 mm above the tunnel ground. Other sections have been completed with the physics design and preliminary mechanical design. Figure 2 shows the accelerator general model.

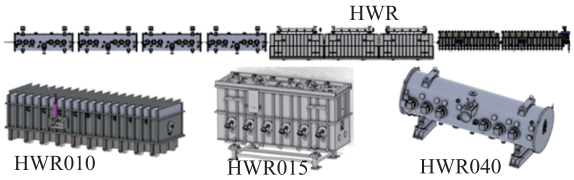

Fig. 1 (color online) Model of the cryomdule sections.

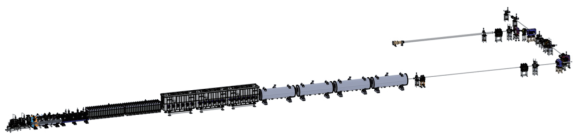

Fig. 2 (color online) General model of the accelerator.

Based on the 3DE collaborative platform, the relevant systems have been completed and the integrated layout of civil engineering, accelerator and cabinets is available. Figure 3 shows multi-system integration design with most of the utilities.