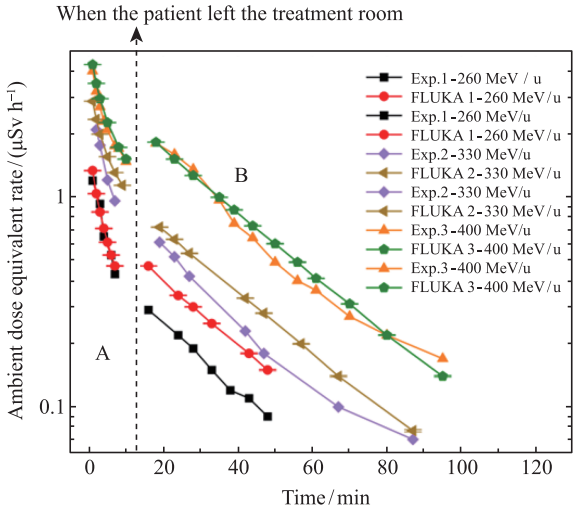


Fig. 1 (color online) Residual dose rates on the surface of the patient's body were obtained by FLUKA calculations and experimental measurements.

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.

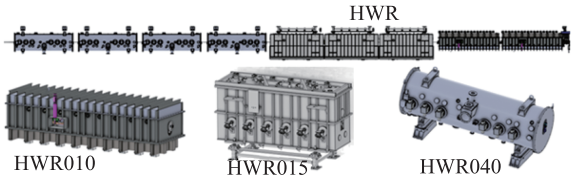


Fig. 1 (color online) Model of the cryomdule sections.

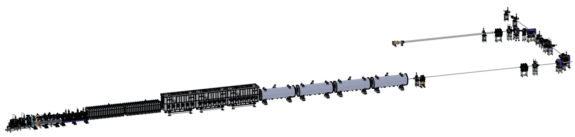

Fig. 2 (color online) General model of the accelerator.

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.

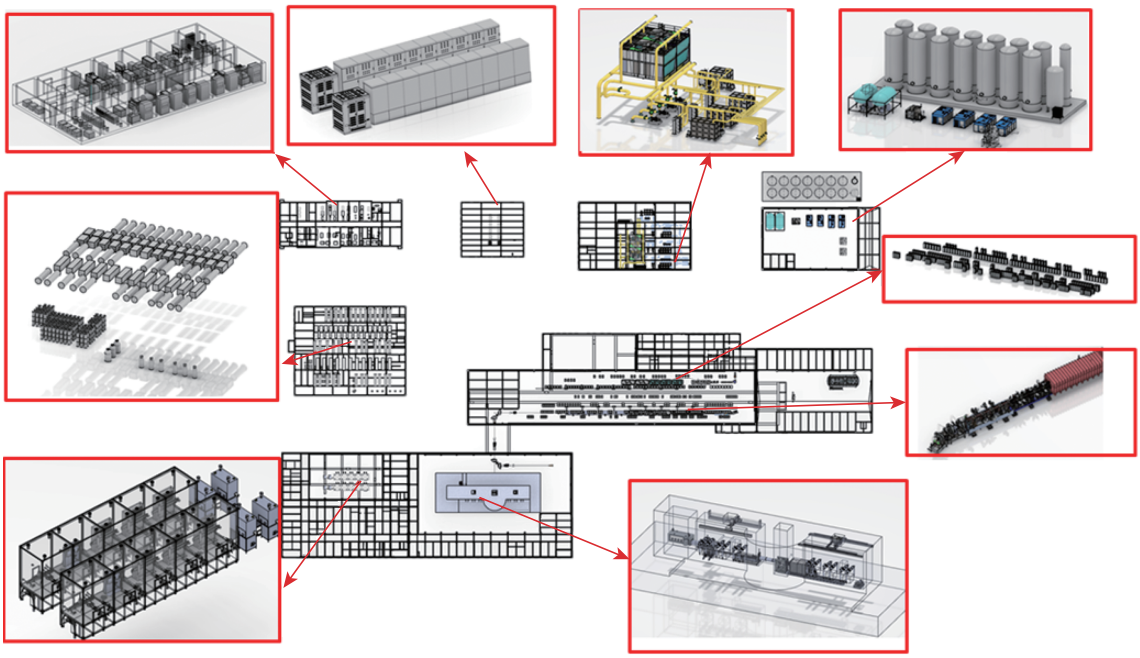

Fig. 3 (color online) Multi-system integration design and implementation based on 3DE platform.

Table 1 Main Parameters of the Cryomdule sections.

| Main parts | Number of Thermostats | Cavity Number of a Thermostat |
|---|---|---|
| HWR010 | 2 | 9 |
| HWR015 | 3 | 6 |
| HWR040 | 4 | 6 |

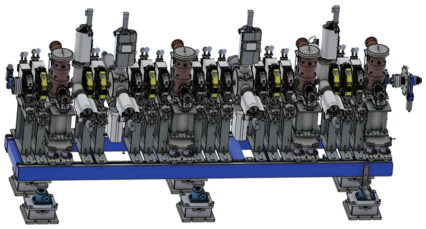

Fig. 4 (color online) Medium energy beamline 3DE model.

Generally, the mechanical integration process of accelerators is dependent on physics design, which effectively realizes the joint design and verification of physics and mechanical systems. The physics parameters of cryomdule sections are given in Table 1. Figure 4 shows the model of medium energy beamline based on beam physics parameters.

## 8 - 37 Design and Optimization of SSC-Linac and Parallel Beam Supply Water Cooling System

Zhu Tieming, Xu Junkai, Li Yaguang and Su Yalong

SSC-Linac is the first continuous wave high charge state strong current heavy ion linear accelerator in China. Its designed output energy is 1.02 MeV/u, which can realize full ion acceleration from hydrogen to uranium. Then, the addition of DTL3 increases the energy of the SSC-Linac heavy ion beam from 0.58 to 1.02 MeV/u, which can be accelerated to 10.7 MeV/u after SSC injection. DTL4 is designed to further increase the energy of the SSC-Linac to 1.48 MeV/u, and the heavy ion energy can be increased to 15 MeV/u after SSC injection. The purpose of parallel beam supply modification is to make the beam of small lines can be injected into the SSC, and at the same time, the CSR can be injected directly. The SSC-Linac and the parallel beam supply modification ultimately improve the flow intensity and energy of heavy ions in HIRFL device. Therefore, the process circulating water must be used in the whole process to take away the heat generated by the system, so as to ensure the normal and stable operation of the accelerator equipment.