Heavy Ion Centers in China

As of December 25, 2024, the WeChat public platform **“Proton China”** has summarized the progress of heavy ion radiotherapy projects in China based on publicly available online information.

According to publicly available online information, as of an incomplete statistical count, there are a total of 19 heavy ion (including combined proton and heavy ion) therapy projects in mainland China, including those in operation, under construction and proposed. Among them, 3 centers are currently operational, including the Gansu Wuwei Tumor Hospital, Lanzhou Campus (Lanzhou Heavy Ion Hospital), which announced the start of treatments in November 2024. Additionally, 12 projects are under construction, and 4 are in the planning stage. Compared to 2023, the number has increased significantly. In the Hong Kong, Macau and Taiwan regions of China, there is one operational heavy ion therapy center—the Heavy Ion Cancer Therapy Center at Taipei Veterans General Hospital, which began treating patients on May 15, 2023.

The table below presents the distribution of 19 heavy ion therapy projects in mainland China. Based on project progress, they are categorized into operational, under construction, and proposed projects. Among them, projects that have commenced construction are classified as under construction, while those that have not yet started construction are considered proposed projects.

Distribution of the heavy ion centers in China each province and area on December 2024.

Authors:
*Dr. YANG Jingfen, Dr. XING Ligang, Dr. ZHU Jian**

Shandong Cancer Hospital and Institute, Jinan, P.R.China, 250117

Corresponding author: Dr. ZHU Jian, zhujian@sdfmu.edu.cn

Data Source: WeChat Public "Proton China"

"Prescribing, Recording, and Reporting Boron Neutron Capture Therapy"

An ICRU Report Committee has been constituted to address the subject of "Prescribing, Recording, and Reporting Boron Neutron Capture Therapy."

The mission of the International Commission on Radiation Units and Measurements (ICRU) is to develop and promulgate internationally accepted recommendations on radiation-related quantities and units, terminology, measurement procedures, and reference data for the safe and efficient application of ionizing radiation to medical diagnosis and therapy, radiation science and technology, and radiation protection of individuals and populations.

The rapidly expanding number of centers administering boron neutron capture therapy (BNCT) has led the ICRU to conclude that the development of a comprehensive report detailing methodologies and guidelines for the prescription, documentation, and reporting of BNCT is imperative. This initiative aims to standardize practices, prevent the emergence of locally adapted methodologies with inconsistent outcomes, and ensure the safe and effective clinical utilization of BNCT. In July 2024, three co-chairs were

nominated (Clifford Chao, Sandro Rossi, Wolfgang Sauerwein). The final appointment of the Report Committee 39 took place in January 2025. Due to the complexity of the task, a total of 11 individuals were appointed to the committee, making this the largest Report Committee in the history of the ICRU. All individuals in the field are encouraged to contact one of the committee co-chairs with suggestions and to provide support with valuable materials

---

Proton Centers in China

As of December 25, 2024, the WeChat public platform **“Proton China”** has summarized the progress of proton radiotherapy projects in China based on publicly available online information.

According to incomplete statistics, there are **49 proton therapy projects** in mainland China, including those **in operation, under construction, and proposed**. A total of **35 medical institutions** have been licensed to configure proton therapy systems, distributed in the cities or area as follows:

- **North China (6 centers):** Beijing, Langfang, Zhuozhou, Tianjin, Hohhot, Taiyuan
- **Northeast China (4 centers):** Harbin, Shenyang (2), Changchun
- **East China (9 centers):** Shanghai (2), Jinan, Zibo, Hefei, Suzhou, Hangzhou, Nanjing, Nanchang
- **Central & South China (10 centers):** Wuhan (2), Zhengzhou (2), Guangzhou (2), Shenzhen (2), Changsha, Nanning, Haikou
- **Southwest China (4 centers):** Chengdu (2), Chongqing (2)
- **Northwest China (2 centers):** Xi’an, Lanzhou

Additionally, Hong Kong, Macau, and Taiwan have 5 operational proton centers:

- **Taiwan (4 centers):** Linkou Chang Gung, Kaohsiung Chang Gung, Taipei Cancer Center (Taipei Medical University), and the Hospital Affiliated with China Medical University
- **Hong Kong (1 center):** Sanatorium & Hospital East Center

Three centers are currently under construction in Hong Kong, Macau and Taiwan:

- Cancer Medical Center, National Taiwan University Hospital
- Taichung Veterans General Hospital
- Changhua Christian Hospital

The following table provides details of the **49 proton projects in mainland China,** categorized by their current status: **in operation, under construction, and proposed**.

The distribution of the proton centers in China, by each province and area, on December 2024.

Authors:

Dr. FAN Yunyi, Dr. XING Ligang, Dr. ZHU Jian

Shandong Cancer Hospital and Institute, Jinan, P.R.China, 250117

Corresponding author: Dr. ZHU Jian, zhujian@sdfmu.edu.cn

Data Source: WeChat Public "Proton China"

CAS Ion Medical Technology Co., Ltd. (CASHIM)

CAS Ion Medical Technology Co., Ltd. (abbreviated as CASHIM) was established in 2018 by the Chinese Academy of Sciences Holdings and the Institute of Modern Physics of the Chinese Academy of Sciences. It is committed to promoting the industrialization of ion cancer therapy technology in China and beyond.

CASHIM is headquartered in Beijing, China, where it operates its marketing and TPS/TCS R&D centers. It has strategically positioned its hardware R&D center in Hangzhou, Zhejiang Province; its heavy ion system production base in Lanzhou, Gansu Province; and its proton system production base in Shaoxing, Zhejiang Province. As the sole entity in China with the requisite qualifications and comprehensive capabilities to design, manufacture, commission, operate, and maintain heavy ion therapy systems, CASHIM has garnered the market recognition by securing nine business contracts to date. Two systems are currently in full operation, and an additional three systems are expected to commence clinical services in 2025. This outstanding achievement has established CASHIM as the global leader in the deployment of heavy ion therapy systems. Located in Wuwei, Gansu Province, the first demonstrative heavy ion therapy system project has been a

resounding success over the past four years, having provided treatment services to over 1,800 patients and yielding highly favorable clinical outcomes.
Throughout the implementation of the projects, CASHIM has not only delivered qualified ion therapy systems of high performance, but also cultivated a team of exceptionally skilled R&D engineers, dedicated operations and maintenance staff, and a sophisticated project management team.

CASHIM's main products include the Integrated Carbon Ion and Proton Therapy System, and Integrated Proton and Helium Ion Therapy System. The details are as follows:

Integrated Carbon Ion and Proton Therapy System: It is equipped with a linear injector, a synchrotron (featuring the world's shortest circumference of 56m), and four treatment rooms. These treatment rooms are designed to meet various clinical requirements, with terminals in horizontal, vertical, 45-degree, and gantry setups. This system can flexibly use carbon ions and protons for therapeutic applications and can also use helium (He) ions and oxygen (O) ions for clinical research. The first Integrated Carbon and Proton Ion Therapy System is scheduled for delivery in 2027.
Integrated Proton and Helium Ion Therapy System: It is equipped with a linear injector, a synchrotron, and treatment rooms designed according to clinical requirements, with horizontal and gantry setups. For treatment, this system can use protons for all suitable tumors, and carbon ions with limited energy for superficial tumors. Additionally, it can use Helium ions for research purposes.

The principal features of CASHIM's products are as follows:

– Multi-energy operation technology
The synchrotron, a key component of CASHIM's products, is equipped with advanced multi-energy operation technology. This technology enables the generation of multiple particle beams with varying energies within a single operational cycle.

Consequently, it significantly enhances the utilization efficiency of the particle beam and reduces the treatment time for patients. Notably, the switching time between different energy beams can be minimized to less than 200 milliseconds, thereby optimizing the overall treatment process.

– Phoenix Plan (Treatment Planning System)

The PHOENIX Plan is a comprehensive, all-in-one software solution to streamline the entire radiation therapy planning process. It integrates all essential clinical modules, namely patient management, target delineation, plan design and optimization, plan evaluation, quality assurance, and system configuration management.

Highly versatile, the PHOENIX Plan is set to incorporate multiple particle therapy modalities, such as carbon ion and proton therapy. It also encompasses a wide range of relative biological effect (RBE) models, supports the automatic contouring of dozens of organs, and features an innovative Monte Carlo carbon ion dose calculation engine. With these capabilities, the PHOENIX Plan is poised to set a new benchmark in treatment planning software.

– Superconducting Gantry

The gantry of CASHIM’s products is engineered using advanced curved composite superconducting magnet technology. Combined with the use of compact scanning magnets, this innovative approach enables a compact and lightweight design. As a result, the overall weight of the gantry is reduced to only 165 tons, making it the lightest heavy-ion gantry in the international market.