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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB 5172-2025

Replacing GB 5172-1985

**Regulations for radiation safety and protection of particle
accelerators**

粒子加速器辐射安全与防护规定

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1 Scope

Foreword

This document was issued on 2 December 2025 by the the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China, Standardization Administration of the People's Republic of China and takes effect on 1 January 2027.

It is a GB standard without the /T suffix: compliance is mandatory in China.

The document runs to 15 pages in translation. The identification, the dates, the table of contents and the clauses reproduced on this page are taken from the standard itself.

GB 5172-2025 Regulations for radiation safety and protection of particle accelerators
English, Anglais, Englisch, Inglés, ???

Regulations for radiation safety and protection of particle accelerators

It replaces GB 5172-1985, which is superseded.

1 Scope

GB 5172-2025 is the Chinese standard for the radiation safety and protection of particle accelerators, effective 1 July 2026. Accelerators are no longer only research machines: China runs several thousand of them in industrial radiography, sterilisation, materials processing and above all radiotherapy, and each is a source of intense radiation that exists only while the machine is energised, which is a different safety problem from a radioactive

source. The standard sets the radiation safety and protection requirements for the siting, design, shielding, interlocks and warning systems of an accelerator installation, for its operation and maintenance, for the monitoring of the workplace and of the personnel, and for the management of the induced radioactivity that an accelerator above a certain energy leaves behind in its own components. It replaces GB 5172-1985, a standard forty years old. For a hospital physics department, an industrial irradiation plant or a designer of accelerator bunkers in China, this is the governing text.

This standard specifies the general requirements for radiation safety and protection of particle accelerators.

This standard applies to the radiation safety and protection of particle accelerators with energy not lower than 1 MeV.

This standard does not apply to portable accelerators such as sealed neutron tubes and accelerators used for cargo/vehicle radiation inspection systems.

2 Normative References

The following documents, or provisions thereof, are referenced in this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including all amendments) applies. If other documents are superseded, modified, or revised by new ones, the new documents apply.

GB 18871 Basic standards for protection against ionizing radiation and for the safety of radiation sources

GB 14500 Regulations for radioactive waste management

3 Terms and Definitions

For the purposes of this standard, the following terms and definitions apply.

3.1

particle accelerator

A device that uses electric or electromagnetic fields to accelerate charged particles to specific energies and confines the movement of charged particles within a specific space.

3.2

particle accelerator facility

A particle accelerator and the facilities housing and operating it, such as the building housing the particle accelerator, supporting systems and facilities.

3.3

accelerator room

The location housing the particle source and the equipment for beam generation, acceleration, and transport of the particle accelerator.

3.4

beam terminal room

The location where the beam extracted from the particle accelerator is used for purposes such as scientific research experiments, industrial applications, and medical treatments, e.g., beamline stations, irradiation rooms, and radiotherapy rooms.

3.5

target

An object that can interact directly with particles to achieve the intended purpose.

3.6

prompt radiation

The primary particles from the particle accelerator and secondary particles such as gamma rays and neutrons produced by their interaction with matter are collectively referred to as prompt radiation, which exists only during the operation of the particle accelerator.

3.7

induced radioactivity

Radioactivity produced by unstable nuclides generated through nuclear reactions when particles such as protons and neutrons produced by the particle accelerator interact with surrounding materials such as air, cooling water, and accelerator components.

3.8

interlock system

A safety control method (device) that interrelates the actions of relevant components, requiring each component to be in a specified state or operating condition; otherwise, the radiation source cannot be put into operation or use, or an operating radiation source is immediately shut down or constrained.

4 General Requirements

4.1 During the design, operation, and decommissioning of a particle accelerator facility, the principles of justification of practices, dose limitation and potential exposure restriction, and optimization of protection and safety shall be followed.

4.2 The annual dose limits for occupational exposure and public exposure shall comply with

the relevant regulations on dose limits in GB 18871.

4.3 Dose constraint values shall be reasonably determined considering the characteristics of the particle accelerator and the application scenario. Generally, the dose constraint for occupational exposure shall not exceed 5 mSv/a, and the dose constraint for public exposure shall not exceed 0.1 mSv/a.

4.4 Radiation level monitoring of the particle accelerator workplace and surrounding environment shall be conducted regularly, and the effectiveness of radiation safety and protection measures shall be evaluated.

4.5 Radioactive waste generated during the operation and decommissioning of the particle accelerator shall be collected, stored, and disposed of properly and in accordance with regulations, following the principles of radioactive waste management to achieve waste minimization.

5 Radiation Safety and Protection Design Requirements

5.1 General Requirements

5.1.1 The principle of defense-in-depth shall be followed by establishing multiple safety and protection measures so that if one level of defense fails, it can be compensated for or corrected by the next level. Important systems, components, and equipment for radiation safety and protection shall have appropriate redundancy, diversity, and independence.

5.1.2 At the design stage of the particle accelerator facility, factors such as future application changes and development shall be appropriately considered. Radiation safety and protection facilities shall be reasonably laid out and designed with appropriate margins.

5.1.3 During the design and construction stages of the particle accelerator facility, personnel with relevant expertise in radiation protection shall participate and specifically organize or be responsible for the design of radiation safety and protection facilities.

5.1.4 The design of the radiation safety interlock system for the particle accelerator shall follow the fail-safe design principle.

5.2 Zoning of Radiation Workplaces

5.2.1 The radiation workplaces of the particle accelerator shall be divided into controlled areas and supervised areas. Areas that require or are likely to require special protection means or safety measures shall be designated as controlled areas, mainly including accelerator rooms, beam terminal rooms, and radioactive waste storage areas, etc. Areas adjacent to controlled areas, where special protection means or safety measures are not usually required but where occupational exposure conditions need to be regularly monitored and evaluated, shall be designated as supervised areas.

5.2.2 Entrances to controlled and supervised areas shall be marked with controlled area