

ICS 13.100



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

GBZ 115-2023

**Standard for radiological protection in low-energy radiation
generating devices
(English Translation)**

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1 Scope

This Standard specifies the radiation protection requirements for non-medical low- energy radiation generating devices.

This Standard applies to X-ray diffractometers, X-ray fluorescence analyzers, ion implantation equipment, electron beam welders, static eliminators, electron microscopes, and X-ray devices used for thickness measurement, weighing, aperture measurement, and density measurement, with energies ranging from the exemption value to 1 MeV.

This Standard does not apply to industrial X-ray flaw detection, industrial X-ray CT flaw detection, and X-ray baggage inspection systems.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

GBZ 98, Health standards for radiation workers

GBZ 128, Specifications of individual monitoring for occupational external exposure

3 Terms and definitions

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

3.1

low-energy radiation generating devices

A device that can generate X-rays, electron beams, and ion beams with energies ranging from the exemption value to 1MeV when powered on.

Example. X-ray diffractometers, X-ray fluorescence analyzers, ion implantation

4 General

4.1

Production and use units shall be responsible for the protection and safety of workers and the public during the installation, commissioning and use of radiation devices.

4.2

Practices involving low-energy radiation generating devices shall comply with the requirements specified in GB 18871. Ensure the legitimacy of the practice. Optimize radiation protection and strictly implement personal dose limit regulations.

4.3

Producer and user shall set up or designate a radiation protection management agency. Equip it with full-time or part-time radiation protection management personnel to be responsible for the radiation protection work of the organization.

4.4

Producer and user shall provide pre-employment and on-the-job radiation protection training to their staff and maintain radiation protection training records. Staff may only begin work after passing the training. If changes in processes, technologies, equipment, or materials result in changes to major radiation hazards, producer and user shall re- train their staff in radiation protection before they begin their work.

4.5

Producer and user shall conduct occupational health monitoring of radiation workers in accordance with GBZ 98. They shall also conduct external radiation personal dose monitoring in accordance with GBZ 128. Health monitoring files and personal dose files shall be established.

5.1.1 For low-energy radiation generating devices with X-ray tubes and shutters, the X-

ray tube housing shall be constructed to ensure that when all shutters are closed, the ambient dose equivalent rate at a distance of 5 cm from the outer surface of the X-ray tube housing is not greater than 25 $\mu\text{Sv/h}$ in any rated operating state.

5.1.2 The ambient dose equivalent rate at 5 cm from the outer surface of the protective cabinet of the radiation generating device or high-voltage power supply shall not exceed 2.5 $\mu\text{Sv/h}$.

5.1.3 When a closed-beam device is in normal use, the ambient dose equivalent rate at a distance of 5 cm from any accessible outer surface of the casing shall not exceed 2.5 $\mu\text{Sv/h}$.

5.2 Radiation levels in the workplace

5.2.1

Opened-beam devices may only be used in specific radiation workplaces. They

5.8.2 When an opened-beam device encounters any of the following overload

conditions, it shall be able to automatically cut off the high voltage.

- a) When the high voltage exceeds the rated value;
- b) When the current exceeds the rated value;
- c) When the set power is exceeded.

6 Safety operation requirements

6.1

When the device is not in use, the beam outlet shall be closed.

6.2

When operating radiation devices, the characteristics of the radiation field shall be analyzed and effective protective measures shall be taken, with particular attention paid to preventing localized radiation such as hands and head.

6.3

The sample shall be replaced without any bundle loss.

6.4 When disassembling or installing the X-ray tube housing and other exposed

components, the shutter shall be closed and the high voltage of the X-ray tube shall be cut off.

6.5 The exposed components of the original radiation device and their assembly

structure and assembly position shall not be changed without authorization.

6.6 When calibrating or debugging X-ray devices, low voltage and current shall be used when using primary radiation. Personnel shall avoid strong X-ray beams and implement local shielding measures. Never debug X-ray devices with the X-ray tube exposed.

6.7 When operating a handheld radiation device, do not aim the primary radiation at yourself or anyone else. Do not hold the sample in your hand. Do not get close to the useful radiation beam.

7.1 Inspection cycle

Users shall develop an inspection plan and conduct regular inspections of safety devices independently. The inspection cycle shall not exceed 6 months.

7.2 Inspection contents of safety devices

7.2.1

The inspection shall include all safety devices, including interlocks, shutters, warning lights, emergency stop switches, etc.

7.2.2

If any fault is found during inspection, the radiation device shall be stopped and not used until the safety device is completely repaired and with written approval.

7.2.3

The user shall keep records of each inspection. The records shall at least include the inspection date, a list of safety devices inspected, information on the inspection instruments and their calibration date, inspection results, and the name of the person who performed the inspection.

8.1 Testing plan

8.1.1

The user shall develop a plan for testing the protection performance of the radiation device. A qualified organization shall be commissioned to conduct regular testing of the protection performance of the radiation device. The regular testing cycle shall be one year.