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

GB/T 14055-1993

Replacing GB/T 14055.1-2008

**Neutron reference radiations - Part 1: Characteristics and
methods of production
(English Translation)**

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents".

Drafting.

This document is Part 1 of GB/T 14055 "Neutron Reference Radiation". GB/T 14055 has already published the following parts.

---Part 1: Radiation Characteristics and Generation Methods;

---Part 2: Calibration basis of radiation protection instruments related to fundamental quantities characterizing the radiation field.

This document supersedes GB/T 14055.1-2008 "Neutron Reference Radiation Part 1: Radiation Characteristics and Generation Methods", and is consistent with...

Compared with GB/T 14055.1-2008, apart from structural adjustments and editorial changes, the main technical changes are as follows.

a) The neutron fluence rate and dose equivalent rate at neutron energy of 1 MeV were removed, and the conversion of neutron fluence to radiation protection standards was also removed.

Dosage information is described in Chapter 1.

b) The following terms have been removed. neutron fluence, neutron fluence rate, spectral neutron fluence, spectral neutron fluence rate, absorbed dose, dose equivalent, and dose equivalent rate.

Terms and definitions such as neutron fluence-dose equivalent conversion factor, [radioactive] activity, dose equivalent average neutron energy, and response (see [link to relevant documentation]).

The 2008 edition (sections 3.1-3.9, 3.14, and 3.15) revised the terms and definitions of "neutron source intensity," "angular source intensity," and "spectral source intensity." Change to "neutron emission rate of neutron source", "directional distribution of neutron emission rate", and "energy distribution of neutron emission rate" (see 3.1, 3.2, etc.).

3.3 (3.10, 3.11, and 3.12 in the 2008 edition);

c) The contents of the "Reference Radioactive Sources Used for Calibrating Neutron Measurement Instruments" table have been modified, and the $^{241}\text{Am-B}(\alpha, n)$ neutron source and reagent have been removed.

Content related to equivalent average energy and spectral average fluence-dose equivalent conversion factor, changing the $^{241}\text{Am-Be}(\alpha, n)$ neutron source to Small source and large source, and updated the relevant data (see Table 1, Table 1 of 2008);

- d) Increased the photon component in the neutron radiation field (see 4.4);
- f) The contents of the table "Neutron Radiation Used to Determine the Energy Response of Neutron Measurement Instruments" have been modified, the thermal neutron energy point has been deleted, and the following has been added.

Other methods for producing monoenergetic neutrons at the 0.008 keV and 17.0 MeV sites and the 0.024 MeV monoenergetic neutron (see Table 2, 2008 edition) (Table 2)

- g) The phrase "thermal neutron beam" has been removed (see 5.3.2 in the 2008 edition);
- h) Change "scattered neutron background" to "accompanying and scattered neutron background" and add corresponding technical content (see 5.3.4, 2008 version).

(5.4.4)

- i) A "thermal neutron reference radiation field" has been added (see Chapter 6);
- j) Emissivity angular distribution data for several neutron sources, including ^{241}Am -Be, have been added (see Appendix A);
- k) The appendix "List and Graphical Representation of Neutron Energy Spectra of Radioactive Sources" has been revised to be informative, and the tables and graphs of the energy spectra of four neutron sources have been deleted.

The figure data has been expanded to include "Energy distribution of neutron emission rate from ^{252}Cf source" (see Appendix E, Appendix A of the 2008 edition).

This document is modified to adopt ISO 8529-1:2021 "Neutron reference radiation field - Part 1: Radiation characteristics and methods of production".

This document has undergone the following structural adjustments compared to ISO 8529-1:2021.

- Appendix A corresponds to Annex E of ISO 8529-1:2021;
- Appendix B corresponds to Appendix C of ISO 8529-1:2021;
- Appendix C corresponds to Appendix D of ISO 8529-1:2021;
- Appendix D corresponds to Appendix B of ISO 8529-1:2021;
- Appendix E corresponds to Appendix A of ISO 8529-1:2021.

The following editorial changes have been made to this document.

- a) To harmonize with existing standards, the standard title will be changed to "Neutron Reference Radiation Part 1: Radiation Characteristics and Production Methods";
- c) 4.2 Footnotes are changed to notes;
- d) The units of the symbols in Figure A.1, Figure A.2 and Table B.2 have been added.

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed and is under the jurisdiction of the National Nuclear Energy Standardization Technical Committee (SAC/TC58).

Introduction

Neutron reference radiation technology is a prerequisite for calibrating neutron measuring instruments and determining their energy and angular responses.

GB/T 14055 "Neutron Reference Radiation" is applied to instruments used for calibrating neutron measuring instruments and determining their energy and angular responses.

Neutron reference radiation, with the development of domestic nuclear energy, nuclear medicine and radiotherapy, nuclear technology applications, environmental protection and national defense, involves...

With the increasing number of radioactive sites and applications, the use of neutron measuring instruments has increased significantly, leading to a growing demand for metrological calibration.

As a result, the use of neutron reference radiation for calibrating neutron measuring instruments and determining their energy and angular responses is gradually increasing in China.

GB/T 14055 is proposed to consist of three parts.

---Part 1: Radiation Characteristics and Generation Methods. The purpose is to standardize the radiation characteristics requirements and generation methods for the neutron reference radiation field.

---Part 2: Calibration basis of radiation protection instruments related to fundamental quantities characterizing the radiation field. The purpose is to lay the foundation for the proposed neutron metrology...

---Part 3: Calibration of site dosimeters and personal dosimeters and determination of their energy and angular responses. The aim is to provide a basis for the use of neutrons.

This provides guidance for personnel who reference radiation calibration sites and personal dosimeters and determine their energy and angular responses.

GB/T 14055 (all parts) systematically defines and specifies the relevant technical requirements for neutron reference radiation, effectively standardizing this process.

The performance of metrology equipment effectively improves the accuracy and reliability of neutron measuring instrument calibration results, thereby reducing the cost for neutron measuring instrument manufacturers.