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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 7164-2022

Characteristics and test methods of radiation detectors for nuclear reactors

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foreword

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

drafted.

This document replaces GB/T 7164-2004 "Characteristics of Radiation Detectors for Nuclear Reactors and Their Test Methods", which is the same as GB/T 7164-

Compared with.2004, except for structural adjustment and editorial changes, the main technical changes are as follows.

--- Modified the content of the detector characteristics (see Chapter 4, 4.1, 4.2 of the.2004 edition);

--- Increased the requirements for test equipment (see Chapter 5);

--- Modified the measurement of neutron proportional counter tube, fission ionization chamber plateau characteristics, discrimination characteristics and neutron sensitivity working in pulse mode

Quantitative methods (see 6.3.2.1, 6.3.2.3, 6.3.2.4, 7.2, 7.1, 7.3 of the.2004 edition);

--- Modified the test method for the upper limit of the linear count rate (see 6.3.2.7, 7.6 of the.2004 edition);

--- Added the test method for the upper limit of the neutron fluence rate allowed by the neutron proportional counter tube and the fission ionization chamber working in the pulse mode (see

6.3.2.8);

--- Added gamma compensation characteristic test method (see 6.3.3.4);

--- Modified the test method for the upper limit of linear output current (see 6.3.3.6, 7.6 of the.2004 edition);

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---Modified the temperature test, constant damp heat test, vibration test, impact test, packaging and transportation test, water test, electromagnetic environment test

Reference standards (see 6.4, 7.15, 7.16, 7.18, 7.19, 7.21, 7.17, 7.20 of the.2004 edition);

--- Added reference standard for equipment qualification test (see 6.5).

This document is drafted with reference to IEC 60515.2007 "Characteristics and test methods of radiation detectors for equipment important to safety in nuclear power plants", consistent with

The degree of sexuality is not equivalent.

Please note that some content of this document may be patented. The issuing agency of this document assumes no responsibility for identifying patents.

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1 Scope

This document specifies the characteristics and test methods for radiation detectors used in nuclear reactors.

The radiation detectors used in nuclear reactors described in this document are all gas ionizing radiation detectors, and their working medium is gas.

This document applies to the neutron proportional counter tubes (BF3 counter tube, 3He counter tube, boron-coated counter tube) used in the nuclear testing system outside the nuclear reactor

several tubes), fission ionization chamber (working in pulse mode, working in mean square voltage mode, working in current mode), boron-coated ionization chamber (including gamma)

Compensated ionization chamber, non-compensated boron-coated ionization chamber), also suitable for mobile micro fission ionization chamber used in nuclear reactor core measurement system.

Similar detectors in other applications can be used for reference.

2 Normative references

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, dated citations

documents, only the version corresponding to that date applies to this document; for undated references, the latest edition (including all amendments) applies to

this document.

GB/T 2423.38 Environmental Testing of Electrical and Electronic Products Part 2.Test

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Method Test R. Water Test and Guidelines

GB/T 2900.97-2016 Electrotechnical Terminology Nuclear Instruments. Physical Phenomenon, Basic Concepts, Instruments, Systems, Equipment and Detectors

GB/T 4960.2-1996 Nuclear Science and Technology Terminology Fission Reactor

GB/T 4960.6-2008 Nuclear Science and Technology Terminology Part 6.Nuclear Instrumentation

GB/T 10263-2006 Environmental conditions and test methods for nuclear radiation detectors

GB/T 12727-2017 Appraisal of safety-grade electrical equipment for nuclear power plants

GB/T 17626.2-2018 Electromagnetic Compatibility Test and Measurement Technology Electrostatic Discharge Immunity Test

GB/T 17626.3-2016 Electromagnetic compatibility test and measurement technology Radio frequency electromagnetic field radiation immunity test

GB/T 17626.8-2006 Electromagnetic Compatibility Test and Measurement Technology Power Frequency Magnetic Field Immunity Test

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3 Terms and Definitions

GB/T 2900.97-2016, GB/T 4960.2-1996, GB/T 4960.6-2008 and the following terms and definitions apply

in this document.

3.1

amplituderesolution

Percentage of peak width at half maximum and peak location in the detector pulse amplitude distribution curve.

3.2

The upper limit of the count rate that increases in the same proportion as the neutron fluence rate increases.

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