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

GB/T 47843-2026

**Instrumentation important to safety for nuclear power plants -
Characteristics and test methods of in-core self-powered
neutron detectors**

核电厂安全重要仪表系统 堆芯自给能中子探测器特性和测试方法
(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 modified to adopt IEC 61468:2021 "Safety-Critical Instrumentation Systems in Nuclear Power Plants - Core Instrumentation. Self-Powered Neutron Detectors" Sex and testing methods.

This document has undergone significant structural adjustments compared to IEC 61468:2021.A table comparing the structural numbering changes between the two documents is provided.

See Appendix A.

The technical differences between this document and IEC 61468:2021, and the reasons therefor, are as follows.

- a) The scope of application has been modified (see Chapter 1) to adapt to my country's technical conditions and increase operability;
- b) Added normative references to GB/T 2900.97 (see Chapter 3), GB/T 2421 (see 4.1.6, 4.2.3, 5.1.5, 5.2.3) and NB/T 20225 (see 5.2.9) removes IEC 60515:2007, IEC 61226, and IEC 61513 to adapt to my country's technical requirements.

Conditions, increasing operability;

c) IEC 60568:2006 (see Chapter 3, 5.1.2) has been replaced with the normatively referenced GB/T 8995-2026 to adapt to my country's...

Technical conditions, increasing operability;

d) The terms "neutron sensitivity consistency deviation," "self-powered neutron detector assembly," and "response time" were added, while the term "beta" was deleted.

"decay", "burnup", "Compton effect", "cross section", "decay constant", "flux rate", "core neutron detector", "integrated self-sufficient neutron" "Detector", "Modular self-powered neutron detector", "Isotope", "Photoelectric effect", "Transient response", "Radioactive half-life", "Radioactivity" "Isotopes", "self-shielding", "core detector assembly", "sensitivity at typical neutron fluence rates", "thermal neutrons", and "lifespan"

e) Abbreviations have been removed (see Chapter 4 of IEC 61468:2021) to adapt to my country's technical conditions and increase operability;

f) Performance requirements for self-sufficient neutron detectors and components have been increased (see Chapter 4) to adapt to my country's technological conditions and enhance their reliability.

Operability;

g) IEC/IEEE 60780-323.2016 (see 5.2.10) has been replaced with the normatively referenced GB/T 12727 to adapt to my country's technical standards.

Improve technical conditions and increase operability;

h) The test items and methods for the manufacturing and acceptance phases of self-powered neutron detectors and components have been modified (see Chapter 5, IEC 61468.

Chapter 9 of 2021, to adapt to my country's technological conditions and increase operability;

i) The advantages and disadvantages of self-powered neutron detectors (see Chapter 5 of IEC 61468:2021) have been removed to adapt to my country's technical conditions.

Add components to increase operability;

j) The application recommendations (see Chapter 7 of IEC 61468:2021) have been removed to adapt to my country's technical conditions and increase operability;

k) The design recommendations (see Chapter 8 of IEC 61468:2021) have been removed to adapt to my country's technical conditions and increase operability.

The following editorial changes have been made to this document.

---To align with existing standards, the standard name has been changed to "Characteristics of Core Self-Powered Neutron Detectors in Safety-Important

Instrumentation Systems of Nuclear Power Plants".

"And Testing Methods";

---Informative references have been added to GB/T 4960.6-2008, NB/T.20007.8-2024 and NB/T.20007.14-2024.

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 Technical Committee on Standardization of Nuclear Instruments and Meters (SAC/TC30).

1 Scope

This document specifies the performance requirements for core-self-powered neutron detectors and components, and describes the corresponding test methods.

This document applies to the design, manufacture, and testing of core-self-powered neutron detectors and assemblies used in pressurized water reactor nuclear power plants. Other types Reference use of core self-sufficient neutron detectors and components for nuclear reactors.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included.

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

This document.

GB/T 2421 Overview and Guidelines for Environmental Testing (GB/T 2421.1-2020, IEC 60068-1:2013, IDT) GB/T 2900.97 Electrical Engineering Terminology - Nuclear Instruments. Physical Phenomena, Basic Concepts, Instruments, Systems, Equipment and Detectors (GB/T 2900.97-2016, IEC 60050-395:2014, IDT) GB/T 8995-2026 Instruments for measuring neutron flux rate in reactor cores of nuclear power plants (IEC 60568:2006, MOD) GB/T 12727 Qualification of critical electrical equipment for safety in nuclear power plants (GB/T 12727-2023, IEC/IEEE 60780-323) NB/T 20225 Qualification of Safety-Grade Electrical Connections for Nuclear Power Plants

3 Terms and Definitions

The terms and definitions defined in GB/T 2900.97 and GB/T 8995-2026, as well as the following terms and definitions, apply to this document.

neutron sensitivity

The response of the neutron detector to a unit neutron fluence rate is derived from formula (1).

ΔI

$\Delta \phi$

In the formula.

S --- Neutron sensitivity;

ΔI --- The change in the detector's output signal caused by the change in neutron fluence rate;

$\Delta \phi$ --- The change in quantum fluence rate in the environment in which the detector is located.

The deviation between the neutron sensitivity of any detector of the same specification and the average neutron sensitivity of detectors of that specification.

Burn-up life

An estimated value that a neutron detector can withstand a neutron fluence of a given energy distribution. Beyond this value, the detector's sensitive materials will degrade.