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

GB/T 24247-2009

**Calibration and usage of ionization chamber systems for assay
of radionuclides**

测定放射性核素用电离室系统的校准和使用

(English Translation)

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Table of Contents

Foreword...	3
1 Scope...	4
2 Normative References...	4
3 Terms and Definitions...	4
4 Procedure...	6
5 Uncertainty Component...	9
6 Main Factors Causing Measurement Differences...	10

Foreword

This Standard modifies and adopts IEC 61145:1992 Calibration and Usage of Ionization Chamber Systems for Assay of Radionuclides (English version).

In comparison with IEC 61145:1992, this Standard has following differences:

---The definition of "accuracy" is modified; the index is modified from 10% to 5%, and calculated in accordance with the formula of measurement error (see

Chapter 1, 3.1 and 4.6.1);

---reproducible is translated as "repeatable"; "repeatability" is modified from 5% to 2%; the formula of calculated by relative standard deviation is added (see

Chapter 1 and 4.6.2);

---The foreword and introduction part of IEC 61145 are deleted; the description of "system" in the introduction part is brought into Chapter 1 "Scope";

---In "Normative References", Chinese national standards are used to replace IEC standards quoted in IEC 61145 (Chapter 2);

---In "Terms and Definitions" in Chapter 3, "Uncertainty of Measurement" (3.2) and "Repeatability (of results of measurements)" (3.3) are added; "shall" and

"should" are deleted;

---Two typical representatives of radionuclide source are added (131I, 60Co); the calibrated energy range is expanded (4.3.3);

---The title of Chapter 5 is modified from "Error Source" into "Uncertainty Component"; two components of instrument, "inherent error" and "repeatability" are added;

---The title of Chapter 6 is modified from "Prompts" into "Main Factors Causing Measurement Differences".

This Standard as proposed by China National Nuclear Corporation.

This Standard shall be under the jurisdiction of National Technical Committee on Nuclear Instruments of Standardization Administration of China.

The drafting organizations of this Standard: Shenzhen Academy of Metrology & Quality Inspection; Nuclear Industry Standardization Institute.

1 Scope

This Standard specifies the quantitative technique for the determination of radionuclides' activity using various ionization chambers that are currently available.

The application of this Standard is limited to instruments that contain well-type ionization chambers as detectors. It is a composite system that includes an ionization chamber and an appropriate circuit in overall connection to it that converts the current in the ionization chamber into a reading in the unit of activity.

This Standard provides methods to obtain measurement whose accuracy does not exceed $\pm 6\%$ and whose repeatability is not more than 2% (generally for radionuclides larger than 3.7×10^6 Bq (100 μ Ci)).

2 Normative References

Through the reference in this Standard, the clauses of the following documents become clauses of this Standard. In terms of references with a specified date, all the subsequent modification sheets (excluding the corrected content) or revised versions are not applicable to this Part. However, the various parties that reach an agreement in accordance with this Part are encouraged to explore the possibility of adopting the latest version of these documents. In terms of references without a specified date, the latest version is applicable to this Part.

GB/T 4960.6-2008 Glossary of Terms for Nuclear Science and Technology - Part 6:

Nuclear Instrumentation

GB/T 4078-2008 Dimension of Sample Planchets, Vials and Test Tubes for

Radioactivity Measurement

3 Terms and Definitions

What is defined in GB/T 4960.6-2008, and the following terms and definitions are applicable to this Standard.

3.1 Accuracy of Measurement

Accuracy of measurement refers to the degree of consistency between the measurement result and the conventional true value.

[3.3.34 of GB/T 4960.6-2008]

NOTE: in this Standard, accuracy is expressed in relative error, namely, the quotient of the difference between the measurement result and the conventional true value divided by the conventional true value (expressed in percentage).

3.2 Uncertainty of Measurement

Uncertainty of measurement refers to a parameter related to the measurement result that indicates the degree, to which, the measured value may be reasonable distributed.

NOTE: for example, uncertainty might be a standard deviation (or a given multiple), or a half-width interval with a given confidence.

[3.3.35 of GB/T 4960.6-2008]

3.3 Repeatability (of results of measurements)

Repeatability (of results of measurements) refers to the degree of consistency of continuous measurement results of the same physical quantity being measured under the same measurement conditions.

[3.3.38 of GB/T 4960.6-2008]

NOTE: the calculation of repeatability in this Standard adopts the calculation formula of relative standard deviation.

3.4 Activity

Activity refers to the quotient of dN divided by dt , where dN is the expected value of the number of spontaneous nuclear transitions with the time interval dt , namely, $A = dN/dt$.

3.5 Calibration

Calibration refers to the process of determining the numerical relationship between the observed value of the measurement system and the actual quantity measured based on the standard source within the entire specified uncertainty.

3.6 Simulated Sources

Simulated source generally contains a single or composite long-life radionuclide, which is selected through photon or particle emission to simulate short-life radionuclide of interest.

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