

ICS 13.280
CCS C57



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

GB/T 16145-2022

Replacing GB/T 16145-2020

**Gamma-ray spectrometry method for the determination of
radionuclides in environmental and biological samples**

环境及生物样品中放射性核素的 γ 能谱分析方法

Issued on: December 30, 2022

Implemented on: July 1, 2023

**Issued by: State Administration for Market Regulation;
Standardization Administration of China**

Table of Contents

1 Scope	1
2 Normative references	1
3 Terms and Definitions	1
4 Summary of method	2
5 Measurement system	2
6 Energy Scale	3
7 Efficiency Scale	4
8 Sample preparation and measurement	5
9 Gamma Spectroscopy	7
10 Uncertainty assessment	8
40 Reference	41

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 for Standardization Documents" drafting. This document replaces GB/T 16145-2020 "Methods for the Analysis of Radionuclides in Biological Samples by Gamma Spectroscopy", GB/T 16140-2018 "Gamma Spectrum Analysis Method of Radionuclide in Water", GB/T 11743-2013 "Gamma Spectrum Analysis Method of Radionuclide in Soil". Book The document is mainly based on GB/T 16145-2020, integrating the contents of GB/T 16140-2018 and GB/T 11743-2013. and Compared with GB/T 16145-2020, except for structural adjustment and editorial changes, the main technical changes are as follows:

--- Increased the terms and definitions of "environmental samples" (see Chapter 3). The following editorial changes have been made to this document.

--- Change the name of the standard to "Gamma Spectroscopy Analysis Method for Radionuclides in Environmental and Biological Samples";

--- Added "soil, sediment (sediment) sample collection, preparation and measurement" (see Appendix E);

--- Added "water sample collection, preparation and measurement" (see Appendix F);

--- Added "air sample collection, preparation and measurement" (see Appendix H). Please

note that some contents of this document may refer to patents. The issuing agency of this document assumes no responsibility for identifying patents. This document was proposed and managed by the National Health Commission of the People's Republic of China. This document was drafted by: Institute of Radiation Protection and Nuclear Safety Medicine, Chinese Center for Disease Control and Prevention, Institute of Radiation Medicine, Shandong Academy of Medical Sciences Research Institute, Guangdong Provincial Institute of Occupational Disease Prevention, Jiangsu Provincial Center for Disease Control and Prevention, Shenzhen Institute of Occupational Disease Prevention and Control, Zhejiang Provincial Center for Disease Control and Prevention center. The main drafters of this document. Tuofei, Yang Baolu, Xu Jiaang, Zhang Qing, Zhang Jing, Zhou Qiang, Lin Yongqin, Li Zeshu, Liu Yanbing, Yang Xiaoyong, Xuan Zhiqiang. The previous versions of the documents replaced by this document are as follows:

---GB/T 16140, first released in.1995, first revised in.2018;

---GB/T 16145, first released in.1995, first revised in 2020;

---GB/T 11743, first published in 1989, first revised in.2013. Radionuclides in environmental and biological samples Gamma Spectroscopy Method

1 Scope

GB/T 16145-2022 is the Chinese national standard on gamma-ray spectrometry method for the determination of radionuclides in environmental and biological samples, in the field of environment and health protection, safety. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 30 December 2022 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 July 2023. Classification: ICS 13.280, CCS C57. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This document specifies the method for analyzing the activity concentration of gamma radionuclides in environmental and biological samples by high-purity germanium (HPGe) gamma spectrometer. This document is applicable to the measurement of gamma radionuclide activity concentration in environmental and biological samples, similar to the measurement of gamma radionuclide activity in matrix samples. The measurement of concentration is carried out according to the reference.

2 Normative references

This document has no normative references.

3 Terms and Definitions

The following terms and definitions apply to this document.

3.1 environmental sample environmental sample The basic link of the environmental system, the basic unit of the environmental structure.

Note. The environmental samples referred to in this document include water, air, soil, rocks, etc.

3.2 biological sample biological sample Representative biological substances collected according to the requirements of bioradiation detection and used as test samples.

Note. The biological samples referred to in this document include food crops, fruits and vegetables, tea, grass, milk, mushrooms, livestock, poultry, indicative wild animals and plants and other terrestrial animals and plants Fish, shrimp, crab, algae and other aquatic organisms in sea or fresh water, as well as human and animal hair, tissue, blood and excrement, etc.

3.3 energy calibration energycalibration The process of determining the corresponding relationship between the gamma ray energy of the gamma spectrometer system and the track site.

3.4 For a given measurement condition and gamma-ray energy, the net counts within the detected full-energy peak are comparable to those emitted by the radiation source during the same time interval. The ratio of the total number of gamma photons of this energy.

3.5 Under the given measurement conditions, establish the relationship curve between gamma-ray energy and its all-energy peak efficiency, or determine some specific nuclide calibration coefficients.

3.6 radioactive aerosol radioactive aerosol Dispersion system formed by solid or liquid radioactive particles suspended in air or gaseous medium.

3.7 Detection limit detection limit; DL The lowest activity that can be detected by a spectrometer at a given confidence level.