



Designation: D3648 – 23

Standard Practices for the Measurement of Radioactivity¹

This standard is issued under the fixed designation D3648; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 These practices cover a review of the accepted counting practices currently used in radiochemical analyses. The practices are divided into four sections:

	Section
General Information	6 – 11
Alpha Counting	12 – 22
Beta Counting	23 – 33
Gamma Counting	34 – 41

1.2 The general information sections contain information applicable to all types of radioactive measurements, while each of the other sections is specific for a particular type of radiation.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

D1066 Practice for Sampling Steam

D1129 Terminology Relating to Water

D1943 Test Method for Alpha Particle Radioactivity of Water

D2459 Test Method for Gamma Spectrometry of Industrial Water and Industrial Waste Water (Withdrawn 1986)³

D3084 Practice for Alpha-Particle Spectrometry of Water

D3085 Practice for Measurement of Low-Level Activity in Water (Withdrawn 1987)³

D3370 Practices for Sampling Water from Flowing Process Streams

D3649 Practice for High-Resolution Gamma-Ray Spectrometry of Water

D7902 Terminology for Radiochemical Analyses

D8293 Guide for Evaluating and Expressing the Uncertainty of Radiochemical Measurements

IEEE/ASTM SI 10 American National Standard for Metric Practice

2.2 ANSI Standards:⁴

ANSI N42.14 Calibration and Use of Germanium Spectrometers for the Measurement of Gamma-Ray Emission Rates of Radionuclides

2.3 Other Documents:

JCGM 100:2008 Evaluation of measurement data—Guide to the expression of uncertainty in measurement⁵

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in these practices, refer to Terminology D1129 and Terminology D7902. For an explanation of the metric system, including units, symbols, and conversion factors, see IEEE/ASTM SI 10.

4. Summary of Practices

4.1 The practices are a compilation of the various counting techniques employed in the measurement of radioactivity. The important variables that affect the accuracy or precision of counting data are presented. Because a wide variety of instruments and techniques are available for radiochemical laboratories, the types of instruments and techniques to be selected will be determined by the information desired. In a

¹ These practices are under the jurisdiction of ASTM Committee D19 on Water and are the direct responsibility of D19.04 on Methods of Radiochemical Analysis.

Current edition approved June 1, 2023. Published July 2023. Originally approved in 1978. Last previous edition approved in 2014 as D3648 – 14 which was withdrawn January 2023 and reinstated in June 2023. DOI: 10.1520/D3648-23.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

⁵ Available from www.bipm.org/utls/common/documents/jcgm/JCGM_100_2008_E.pdf.