



Designation: C1514 – 08 (Reapproved 2017)

Standard Test Method for Measurement of ^{235}U Fraction Using Enrichment Meter Principle¹

This standard is issued under the fixed designation C1514; 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 This test method covers the quantitative determination of the fraction of ^{235}U in uranium using measurement of the 185.7 keV gamma-ray produced during the decay of ^{235}U .

1.2 This test method is applicable to items containing homogeneous uranium-bearing materials of known chemical composition in which the compound is considered infinitely thick with respect to 185.7 keV gamma-rays.

1.3 This test method can be used for the entire range of ^{235}U fraction as a weight percent, from depleted (0.2 % ^{235}U) to highly enriched (97.5 % ^{235}U).

1.4 Measurement of items that have not reached secular equilibrium between ^{238}U and ^{234}Th may not produce the stated bias when low-resolution detectors are used with the computational method listed in [Annex A2](#).

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

1.6 *This standard may involve hazardous materials, operations, and equipment. 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[C1030 Test Method for Determination of Plutonium Isotopic Composition by Gamma-Ray Spectrometry](#)
[C1490 Guide for the Selection, Training and Qualification of Nondestructive Assay \(NDA\) Personnel](#)

¹ This test method is under the jurisdiction of ASTM Committee [C26](#) on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee [C26.10](#) on Non Destructive Assay.

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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.

[C1592 Guide for Nondestructive Assay Measurements](#)

[C26.10 Terminology Guide](#)

2.2 *ANSI Standard:*

[N42.14 Calibration and Use of Germanium Spectrometers for the Measurement of Gamma-Ray Emission Rates of Radionuclides](#)³

3. Terminology

3.1 For definitions of terms used in this test method, refer to Terminology [C26.10](#).

4. Summary of Test Method

4.1 The test method consists of measuring the emission rate of 185.7 keV gamma-rays from an item in a controlled geometry and correlating that emission rate with the enrichment of the uranium contained in the item.

4.2 Calibration is achieved using reference materials of known enrichment. Corrections are made for attenuating materials present between the uranium-bearing material and the detector and for chemical compounds different from the calibration reference materials used for calibration.

4.3 The measured items must completely fill the field of view of the detector, and must contain a uranium-bearing material which is infinitely thick with respect to the 185.7 keV gamma-ray. If the field of view is not filled, a correction factor must be applied.

5. Significance and Use

5.1 The enrichment meter principle provides a nondestructive measurement of the ^{235}U fraction of uranium-bearing items. Sampling is not required and no waste is generated, minimizing exposure to hazardous materials and resulting in reduced sampling error.

5.2 This method relies on a fixed and controlled geometry. The uranium-bearing materials in the measured items and calibration reference materials used for calibration must fill the detector field of view.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.