



Standard Test Method for Nondestructive Assay of Radioactive Material by Tomographic Gamma Scanning¹

This standard is issued under the fixed designation C1718; 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 describes the nondestructive assay (NDA) of gamma ray emitting radionuclides inside containers using tomographic gamma scanning (TGS). High resolution gamma ray spectroscopy is used to detect and quantify the radionuclides of interest. The attenuation of an external gamma ray transmission source is used to correct the measurement of the emission gamma rays from radionuclides to arrive at a quantitative determination of the radionuclides present in the item.

1.2 The TGS technique covered by the test method may be used to assay scrap or waste material in cans or drums in the 1 to 500 litre volume range. Other items may be assayed as well.

1.3 The test method will cover two implementations of the TGS procedure: (1) Isotope Specific Calibration that uses standards of known radionuclide masses (or activities) to determine system response in a mass (or activity) versus corrected count rate calibration, that applies to only those specific radionuclides for which it is calibrated, and (2) Response Curve Calibration that uses gamma ray standards to determine system response as a function of gamma ray energy and thereby establishes calibration for all gamma emitting radionuclides of interest.

1.4 This test method will also include a technique to extend the range of calibration above and below the extremes of the measured calibration data.

1.5 The assay technique covered by the test method is applicable to a wide range of item sizes, and for a wide range of matrix attenuation. The matrix attenuation is a function of the matrix composition, photon energy, and the matrix density. The matrix types that can be assayed range from light combustibles to cemented sludge or concrete. It is particularly well suited for items that have heterogeneous matrix material and non-uniform radioisotope distributions. Measured transmission values should be available to permit valid attenuation

corrections, but are not needed for all volume elements in the container, for example, if interpolation is justified.

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

1.7 *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
- C1128 Guide for Preparation of Working Reference Materials for Use in Analysis of Nuclear Fuel Cycle Materials
- C1490 Guide for the Selection, Training and Qualification of Nondestructive Assay (NDA) Personnel
- C1156 Guide for Establishing Calibration for a Measurement Method Used to Analyze Nuclear Fuel Cycle Materials
- C1592 Guide for Nondestructive Assay Measurements
- C1673 Terminology of C26.10 Nondestructive Assay Methods

2.2 ANSI Standards:³

- ANSI N15.37 Guide to the Automation of Nondestructive Assay Systems for Nuclear Materials Control

2.3 Nuclear Regulatory Commission (NRC) Guides⁴

- NRC Guide 5.9 Guidelines for Germanium Spectroscopy Systems for Measurement of Special Nuclear Material, Revision 2, December 1983

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.

Current edition approved Jan. 1, 2010. Published February 2010. DOI: 10.1520/C1718-10.

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

⁴ Available from U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, <http://nrc.gov>.