



Standard Test Method for Nondestructive Assay of Plutonium in Scrap and Waste by Passive Neutron Coincidence Counting¹

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1. Scope

1.1 This test method describes the nondestructive assay of scrap or waste for plutonium content using passive thermal-neutron coincidence counting. This test method provides rapid results and can be applied to a variety of carefully sorted materials in containers as large as 208-L drums. The test method applies to measurements of ²³⁸Pu, ²⁴⁰Pu, and ²⁴²Pu and has been used to assay items whose total plutonium content ranges from 0.01 to 6000 g (1).²

1.2 This test method requires knowledge of the relative abundances of the plutonium isotopes to determine the total plutonium mass.

1.3 This test method may not be applicable to the assay of scrap or waste containing other spontaneously fissioning nuclides.

1.3.1 This test method may give biased results for measurements of containers that include large amounts of hydrogenous materials.

1.3.2 The techniques described in this test method have been applied to materials other than scrap and waste (2, 3).

1.4 This test method assumes the use of shift-register-based coincidence technology (4).

1.5 Several other techniques that are related to passive neutron coincidence counting exist. These include neutron multiplicity counting (5,6), add-a-source analysis (7), and cosmic-ray rejection (8). Discussions of these techniques are not included in this method.

1.6 *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:

C 859 Terminology Relating to Nuclear Materials³

C 986 Guide for Developing Training Programs in the Nuclear Fuel Cycle³

C 1009 Guide for Establishing a Quality Assurance Program for Analytical Chemistry Laboratories Within the Nuclear Industry³

C 1030 Test Method for Determination of Plutonium Isotopic Composition by Gamma-Ray Spectrometry³

C 1068 Guide for Qualification of Measurement Methods by a Laboratory Within the Nuclear Industry³

C 1128 Guide for the Preparation of Working Reference Materials for Use in the Analysis of Nuclear Fuel Cycle Materials³

C 1133 Standard Test Method for NDA of Special Nuclear Material in Low Density Scrap and Waste by Segmented Passive Gamma-Ray Scanning³

C 1156 Guide for Establishing Calibration for a Measurement Method Used to Analyze Cycle Materials³

C 1210 Guide for Establishing a Measurement System Quality Control Program for Analytical Chemistry Laboratories within the Nuclear Industry³

C 1215 Guide for Preparing and Interpreting Precision and Bias Statements in Test Method Standards Used in the Nuclear Industry³

C 1500 Test Method for Nondestructive Assay of Plutonium by Passive Neutron Multiplicity Counting³

2.2 ANSI Standards:⁴

ANSI 15.20 Guide to Calibrating Nondestructive Assay Systems

ANSI 15.35 Guide to Preparing Calibration Materials for NDA Systems that Count Passive Gamma-Rays

ANSI 15.36 Nondestructive Assay Measurement Control and Assurance

¹ This practice is under the jurisdiction of ASTM Committee C26 on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee C26.10 on Nondestructive Assay.

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² The boldface numbers in parentheses refer to the list of references at the end of this test method.

³ Annual Book of ASTM Standards, Vol 12.01.

⁴ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.