

ANSI N15.56-2014

American National Standard

*for Methods of Nuclear Material Control –
Nondestructive Assay Program –
Nondestructive Assay Measurements
of Nuclear Material Holdup:
General Provisions*



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N15.56-2014

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Secretariat

Institute of Nuclear Materials Management

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American National Standard

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Foreword (This foreword is not part of American National Standard ANSI N15.56-2014.)

This standard was developed under the procedures of the American National Standards Institute by Accredited Standards Committee N15 on Methods of Nuclear Material Control. The secretariat of N15 is held by the Institute of Nuclear Materials Management (INMM). Committee N15 has the following scope:

Standards for the protection, control, and accounting of special nuclear materials in all phases of the nuclear fuel cycle, including analytical procedures where necessary and special to this purpose, except that physical protection of special nuclear materials within a nuclear power plant is not included.

This standard defines administrative practices for generating and reporting of nondestructive assay (NDA) data regarding holdup deposits. It provides guidance on procedures, definition of terms, definition of data quality objectives, vocabulary, recordkeeping, application of techniques, calculation, reporting of values, and uncertainties so that some consistency of use can be achieved by as large a community of stakeholders as practicable.

Suggestions for improvement of the standard will be welcome. They should be sent to the Institute of Nuclear Materials Management, 111 Deer Lake Road, Suite 100, Deerfield, IL 60015. (Additional information about the INMM may be found at <http://www.inmm.org>.)

This standard was prepared by Committee N15 following ANSI requirements for due process and for obtaining consensus. N15 Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the N15 Committee had the following members:

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Nuclear Material Holdup: General Provisions

0. Introduction

Facilities that handle, store, and process special nuclear materials (SNM) for national defense applications and the commercial nuclear fuel cycle contain large, complex, and often highly interconnected equipment. SNM is routinely deposited or entrapped in the equipment itself, in the extensive interconnecting piping, ductwork, hoods, glove boxes, and other equipment used in material handling. This entrapped material is referred to as material “held up in process” or simply just “holdup.” Understanding the measurements of this holdup—and specifically the associated measurement uncertainties—can avoid significant problems at nuclear facilities.

It is important to quantify (with meaningful uncertainty determinations) the holdup in a facility for purposes of process control, nuclear criticality safety, waste compliance, material control and accountability, radiological protection, potential nuclear material release from various accident scenarios, deactivation and decommissioning (D&D) of facilities, and safeguards purposes.

Nondestructive assay (NDA) measurements often are used to quantify holdup *in situ*. These complex and technically demanding measurements are often complicated by an elevated and often highly variable background radiation and by a lack of knowledge of SNM spatial distribution and density, matrix effects, SNM physical and chemical form, SNM isotopic composition, and attenuation and shielding within potentially complex equipment. Frequently, these complications lead to NDA measurement results with large uncertainties that are not only difficult to quantify but also are difficult to communicate to the various stakeholders or end users. Other complications arise when measurement methods are facility specific and may even vary considerably within a single facility. The facility-specific nature of the measurements, measurement equipment, and measurement techniques complicates communication and the interchange of knowledge or lessons learned among facilities performing NDA measurements of nuclear material *in situ*.

In the remainder of this document, the word "shall" is used to denote a requirement, the word "should" to denote a recommendation, and the word "may" to denote permission, neither a requirement nor a recommendation. To conform to this standard, all operations shall be performed in accordance with its requirements, but not necessarily with its recommendations. When recommendations are not implemented, justification shall be documented.

1. Scope and purpose

1.1 Scope

This standard addresses topics concerning the generation and reporting of NDA measurement data regarding holdup deposits, taking into consideration end user data quality objectives. End users of the data may include personnel engaged in nuclear material accounting and safeguards,

nuclear criticality safety, waste management, radiological protection, facility characterization, D&D, safety analysis, and licensing activities.

The technical aspects of performing holdup measurements are outside the scope of this document.

1.2 Purpose

This consensus standard provides guidance and specifies general provisions concerning the generation and reporting of NDA measurement data regarding holdup deposits. The complexity of NDA holdup measurements and the challenges faced in estimating their measurement uncertainties necessitates specific consideration throughout the document. This Standard provides guidance regarding procedures and method selection, definition of data quality objectives, special word usage standardized to the extent possible, recordkeeping, consistent application of techniques, considerations during calculation of results and uncertainties, and reporting of NDA measurements in a way that is consistent with data quality objectives and end use of the data.

2. References

2.1 Normative references

The following standards contain provisions, which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards and publications are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards and publications listed below.

ANSI N15.36-2010, *Nondestructive assay measurement control and assurance*¹

ANSI N15.41-1984 (R1994), *Derivation of measurement control programs – General principles*¹

ASTM C1490-04 (Reapproved 2010), *The selection, training and qualification of nondestructive assay (NDA) personnel*²

2.1 Informative references

Informative references are indicated in the text by numbers in brackets, [], and are listed in annex A.

3. Definitions

The definitions in this standard apply to the use of *in situ* holdup measurement data generation and reporting methods and procedures in all of the various applications and end uses of the results from these measurements.

3.1 ASTM International: Formerly the acronym for the American Society for Testing and Materials; now used by the Society as its complete name.

¹ Available from the ANSI Electronic Standards Store (ESS) at www.webstore.ansi.org.

² Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 (<http://www.astm.org/>).