



Designation: D8293 – 19

Standard Guide for Evaluating and Expressing the Uncertainty of Radiochemical Measurements¹

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1. Scope

1.1 This guide provides concepts, terminology, symbols, and recommendations for the evaluation and expression of the uncertainty of radiochemical measurements of water and other environmental media by testing laboratories. It applies to measurements of radionuclide activities, including gross activities, regardless of whether they involve chemical preparation of the samples.

1.2 This guide does not provide a complete tutorial on measurement uncertainty. Interested readers should refer to the documents listed in Section 2 and References for more information. See, for example, GUM, QUAM, Taylor and Kuyatt (1)², and Chapter 19 of MARLAP (2).

1.3 The system of units for this guide is not specified. Dimensional quantities in the guide are presented only as illustrations of calculation methods. The examples are not binding on products or test methods treated.

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:³

D1129 Terminology Relating to Water

D7902 Terminology for Radiochemical Analyses

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E288 Specification for Laboratory Glass Volumetric Flasks

E438 Specification for Glasses in Laboratory Apparatus

E456 Terminology Relating to Quality and Statistics

E542 Practice for Calibration of Laboratory Volumetric Apparatus

E617 Specification for Laboratory Weights and Precision Mass Standards

E898 Practice for Calibration of Non-Automatic Weighing Instruments

E969 Specification for Glass Volumetric (Transfer) Pipets

E1272 Specification for Laboratory Glass Graduated Cylinders

E2655 Guide for Reporting Uncertainty of Test Results and Use of the Term Measurement Uncertainty in ASTM Test Methods

2.2 ANSI Standards:⁴

ANSI N42.23 Measurement and Associated Instrumentation Quality Assurance for Radioassay Laboratories

2.3 BIPM Documents:

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

JCGM 101:2008 Evaluation of measurement data—Supplement 1 to the “Guide to the expression of uncertainty in measurement”—Propagation of distributions using a Monte Carlo method⁶

JCGM 102:2011 Evaluation of measurement data—Supplement 2 to the “Guide to the expression of uncertainty in measurement”—Extension to any number of quantities⁷

¹ This guide is under the jurisdiction of ASTM Committee D19 on Water and is the direct responsibility of Subcommittee D19.04 on Methods of Radiochemical Analysis.

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

³ 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.

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, accessed June 2018.

⁶ Available from www.bipm.org/utls/common/documents/jcgm/JCGM_101_2008_E.pdf, accessed June 2018.

⁷ Available from www.bipm.org/utls/common/documents/jcgm/JCGM_102_2011_E.pdf, accessed June 2018.