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Guidance for dosimetry for radiation research

Lignes directrices de la dosimétrie pour la recherche dans le domaine de l'irradiation

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by ASTM Committee E61, *Radiation processing* (as ASTM E1900-97), and drafted in accordance with its editorial rules. It was assigned to Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies and radiation protection*.

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ISO/ASTM 51900:2023(E)

Standard Guidance for Dosimetry for Radiation Research[1]

This standard is issued under the fixed designation ISO/ASTM 51900; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision.

1. Scope

1.1 This document covers essential recommendations for dosimetry needed to conduct research on the effects of ionizing radiation on materials, products and biological samples. Such research includes establishment of the quantitative relationship between absorbed dose and the relevant effects. This document also describes the overall need for dosimetry in such research, and for reporting of the results. Dosimetry should be considered an integral part of the experiment, and the researcher is responsible for ensuring the accuracy and applicability of the dosimetry system used.

NOTE 1—For research involving food products, note that the Codex Alimentarius Commission has developed an international General Standard and a Code of Practice that address the application of ionizing radiation to the treatment of foods and which strongly emphasizes the role of dosimetry for ensuring that irradiation will be properly performed (**1**).[2]

NOTE 2—This document includes tutorial information in the form of Notes. Researchers should also refer to the references provided at the end of the standard, and other applicable scientific literature, to assist in the experimental methodology as applied to dosimetry (**2-5**).

1.2 This document covers research conducted using the following types of ionizing radiation: gamma radiation (typically from Cobalt-60 or Cesium-137 sources), X-radiation (bremsstrahlung, typically with energies between 50 keV and 7.5 MeV), and electrons (typically with energies ranging from 80 keV to more than 10 MeV). See ISO/ASTM 51608, 51649, 51818 and 51702.

1.3 This document describes dosimetry recommendations for establishing the experimental method. It does not include dosimetry recommendations for installation qualification or operational qualification of the irradiation facility. These subjects are treated in ISO/ASTM 51608, 51649, 51818 and 51702.

1.4 This document is not intended to limit the flexibility of the researcher in the determination of the experimental methodology. The purpose of the document is to ensure that the radiation source and experimental methodology are chosen such that the results of the experiment will be useful and understandable to other scientists and regulatory agencies. The total uncertainty in the absorbed-dose measurement results and the absorbed-dose variation within the irradiated sample should be taken into account in the interpretation of the research results (see ISO/ASTM Guide 51707).

1.5 This document is one of a set of standards that provides recommendations for properly implementing dosimetry in radiation processing, and describes a means of achieving compliance with the requirements of ISO/ASTM 52628. This document is thus intended to be read in conjunction with ISO/ASTM 52628.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *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]

E2232 Guide for Selection and Use of Mathematical Methods for Calculating Absorbed Dose in Radiation Processing Applications

E3083 Terminology Relating to Radiation Processing: Dosimetry and Applications

2.2 *ISO/ASTM Standards:*[3]

51205 Practice for Use of a Ceric-Cerous Sulfate Dosimetry System

51026 Practice for Using the Fricke Dosimetry System

51261 Practice for Calibration of Routine Dosimetry Systems for Radiation Processing

51275 Practice for Use of a Radiochromic Film Dosimetry System

[1] This document is under the jurisdiction of ASTM Committee E61 on Radiation Processing and is the direct responsibility of Subcommittee E61.04 on Specialty Application, and is also under the jurisdiction of ISO/TC 85/WG 3.

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[2] The boldface numbers in parentheses refer to the bibliography at the end of this document.

[3] For referenced ASTM and ISO/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.

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