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Guide for dosimetry in radiation research on food and agricultural products

*Guide de la dosimétrie pour la recherche dans le domaine de
l'irradiation des produits alimentaires et agricoles*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75% of the member bodies casting a vote.

ASTM International is one of the world's largest voluntary standards development organizations with global participation from affected stakeholders. ASTM technical committees follow rigorous due process balloting procedures.

A project between ISO and ASTM International has been formed to develop and maintain a group of ISO/ASTM radiation processing dosimetry standards. Under this project, ASTM Subcommittee E10.01, Radiation Processing: Dosimetry and Applications, is responsible for the development and maintenance of these dosimetry standards with unrestricted participation and input from appropriate ISO member bodies.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. Neither ISO nor ASTM International shall be held responsible for identifying any or all such patent rights.

International Standard ISO/ASTM 51900 was developed by ASTM Committee E10, Nuclear Technology and Applications, through Subcommittee E10.01, and by Technical Committee ISO/TC 85, Nuclear energy.

This second edition cancels and replaces the first edition (ISO/ASTM 51900:2002), which has been technically revised.



Standard Guide for Dosimetry in Radiation Research on Food and Agricultural Products¹

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 guide covers the minimum requirements for dosimetry needed to conduct research on the effect of radiation on food and agricultural products. Such research includes establishment of the quantitative relationship between absorbed dose and the relevant effects in these products. This guide also describes the overall need for dosimetry in such research, and in reporting of the results. Dosimetry must be considered as an integral part of the experiment.

NOTE 1—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 that strongly emphasize the role of dosimetry for ensuring that irradiation will be properly performed (1).²

NOTE 2—This guide 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 (2-10).

1.2 This guide covers research conducted using the following types of ionizing radiation: gamma radiation, X-ray (bremsstrahlung), and electron beams.

1.3 This guide describes dosimetry requirements for establishing the experimental method and for routine experiments. It does not include dosimetry requirements for installation qualification or operational qualification of the irradiation facility. These subjects are treated in ISO/ASTM Practices 51204, 51431, 51608, 51649, and 51702.

1.4 This guide is not intended to limit the flexibility of the experimenter in the determination of the experimental methodology. The purpose of the guide 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.

1.5 The overall uncertainty in the absorbed-dose measurement and the inherent absorbed-dose variation within the irradiated sample should be taken into account (see ISO/ASTM Guide 51707).

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:³

E 170 Terminology Relating to Radiation Measurements and Dosimetry

E 925 Practice for Monitoring the Calibration of Ultraviolet-Visible Spectrophotometers whose Spectral Slit Width does not Exceed 2 nm

E 1026 Practice for Using the Fricke Reference-Standard Dosimetry System

E 2232 Guide for Selection and Use of Mathematical Methods for Calculating Absorbed Dose in Radiation Processing Applications

E 2303 Guide for Absorbed-Dose Mapping in Radiation Processing Facilities

E 2304 Practice for Use of a LiF Photo-Fluorescent Film Dosimetry System

E 2481 Guide for Dosimetry In Radiation Processing of Fluidized Beds and Fluid Streams

F 1355 Guide for Irradiation of Fresh Agricultural Produce as a Phytosanitary Treatment

F 1356 Practice for Irradiation of Fresh and Frozen Red Meat and Poultry to Control Pathogens and Other Microorganisms

F 1640 Guide for Selection and Use of Packaging Materials for Foods to Be Irradiated

F 1736 Guide for Irradiation of Finfish and Aquatic Invertebrates Used as Food to Control Pathogens and Spoilage Microorganisms

F 1885 Guide for Irradiation of Dried Spices, Herbs, and Vegetable Seasonings to Control Pathogens and Other Microorganisms

2.2 ISO/ASTM Standards:³

51204 Practice for Dosimetry in Gamma Irradiation Facilities for Food Processing

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

¹ This guide is under the jurisdiction of ASTM Committee E10 on Nuclear Technology and Applications and is the direct responsibility of Subcommittee E10.01 on Radiation Processing: Dosimetry and Applications, 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 guide.

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.