
**Practice for use of thermoluminescence-
dosimetry (TLD) systems for radiation
processing**

*Pratique de l'utilisation des systèmes dosimétriques à
thermoluminescence pour le traitement par irradiation*



Reference number
ISO/ASTM 51956:2005(E)

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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, Dosimetry for Radiation Processing, 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 51956 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 51956:2002), which has been technically revised.



Standard Practice for Use of Thermoluminescence Dosimetry (TLD) Systems for Radiation Processing¹

This standard is issued under the fixed designation ISO/ASTM 51956; 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 practice covers procedures for the use of thermoluminescence dosimeters (TLDs) to determine the absorbed dose in materials irradiated by photons or electrons in terms of absorbed dose to water.

1.2 This practice covers systems that permit absorbed dose measurements under the following conditions:

1.2.1 The absorbed-dose range is from 1 Gy to 100 kGy.

1.2.2 The absorbed-dose rate is between 1×10^{-2} and 1×10^{10} Gy s⁻¹.

1.2.3 The radiation-energy range for photons and electrons is from 0.1 to 50 MeV.

1.3 Absorbed dose and absorbed-dose rate measurements in materials subjected to neutron irradiation are not covered in this practice.

1.4 Procedures for the use of TLDs for determining absorbed dose in radiation-hardness testing of electronic devices are given in ASTM Practice E 668.

1.5 *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:²

E 170 Terminology Relating to Radiation Measurements and Dosimetry

E 668 Practice for Application of Thermoluminescence Dosimetry (TLD) Systems for Determining Absorbed Dose in Radiation-Hardness Testing of Electronic Devices

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

2.2 ISO/ASTM Standards:²

51204 Practice for Dosimetry in Gamma Irradiation Facilities for Food Processing

51261 Guide for Selection and Calibration of Dosimetry Systems of Radiation Processing

51400 Practice for Characterization and Performance of a High-Dose Radiation Dosimetry Calibration Laboratory

51431 Practice for Dosimetry in Electron Beam and X-ray (Bremsstrahlung) Irradiation Facilities for Food Processing

51608 Practice for Dosimetry in an X-Ray (Bremsstrahlung) Facility for Radiation Processing

51649 Practice for Dosimetry in an Electron-Beam Facility for Radiation Processing at Energies Between 300 keV and 25 MeV

51702 Practice for Dosimetry in Gamma Irradiation Facilities for Radiation Processing

51707 Guide for Estimating Uncertainties in Dosimetry for Radiation Processing

51939 Practice for Blood Irradiation Dosimetry

51940 Guide for Dosimetry for Sterile Insect Release Programs

52116 Practice for Dosimetry for a Self-Contained Dry-Storage Gamma-Ray Irradiator

2.3 International Commission on Radiation Units and Measurements (ICRU) Reports:³

ICRU Report 14 Radiation Dosimetry: X Rays and Gamma Rays with Maximum Photon Energies Between 0.6 and 50 MeV

ICRU Report 17 Radiation Dosimetry: X Rays Generated at Potentials of 5 to 150 kV

ICRU Report 34 The Dosimetry of Pulsed Radiation

ICRU Report 60 Fundamental Quantities and Units for Ionizing Radiation

3. Terminology

3.1 Definitions:

3.1.1 *absorbed-dose rate* ($\dot{D}$) absorbed dose in a material per incremental time interval, that is, the quotient of dD by dt .

$$\dot{D} = \frac{dD}{dt} \quad (1)$$

Unit: Gy · s⁻¹.

3.1.1.1 *Discussion*—(1) The absorbed-dose rate is often specified in terms of its average value over longer time intervals, for example, in units of Gy · min⁻¹ or Gy · h⁻¹. (2) In gamma industrial irradiators, dose rate may be significantly

¹ This practice is under the jurisdiction of ASTM Committee E10 on Nuclear Technology and Applications and is the direct responsibility of Subcommittee E10.01 on Dosimetry for Radiation Processing, and is also under the jurisdiction of ISO/TC 85/WG 3.

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² 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.

³ Available from International Commission on Radiation Units and Measurements, 7910 Woodmont Ave., Suite 800, Bethesda, MD 20814, USA.