BS EN ISO 4037-4:2021

BSI Standards Publication

Radiological protection — X and gamma reference radiation for calibrating dosemeters and doserate meters and for determining their response as a function of photon energy

Part 4: Calibration of area and personal dosemeters in low energy X reference radiation fields

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National foreword

This British Standard is the UK implementation of EN ISO 4037-4:2021. It is identical to ISO 4037-4:2019. It supersedes BS ISO 4037-4:2019, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee NCE/2, Radiation protection and measurement.

A list of organizations represented on this committee can be obtained on request to its committee manager.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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28 February 2021	This corrigendum renumbers BS ISO 4037-4:2019 as BS EN ISO 4037-4:2021

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English Version

Radiological protection - X and gamma reference radiation for calibrating dosemeters and doserate meters and for determining their response as a function of photon energy - Part 4: Calibration of area and personal dosemeters in low energy X reference radiation fields (ISO 4037-4:2019)

Radioprotection - Rayonnements X et gamma de référence pour l'étalonnage des dosimètres et des débitmètres et pour la détermination de leur réponse en fonction de l'énergie des photons - Partie 4: Étalonnage des dosimètres de zone et individuels dans des champs de référence X de faible énergie (ISO 4037-4:2019)

Strahlenschutz - Röntgen- und Gamma-Referenzstrahlungsfelder zur Kalibrierung von Dosimetern und Dosisleistungsmessgeräten und zur Bestimmung ihres Ansprechvermögens als Funktion der Photonenenergie - Teil 4: Kalibrierung von Orts- und Personendosimetern in niedrigenergetischen Röntgen-Referenzstrahlungsfeldern (ISO 4037-4:2019)

This European Standard was approved by CEN on 18 January 2021.

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The text of ISO 4037-4:2019 has been prepared by Technical Committee ISO/TC 85 "Nuclear energy, nuclear technologies, and radiological protection" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 4037-4:2021 by Technical Committee CEN/TC 430 "Nuclear energy, nuclear technologies, and radiological protection" the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2021, and conflicting national standards shall be withdrawn at the latest by August 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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Endorsement notice

The text of ISO 4037-4:2019 has been approved by CEN as EN ISO 4037-4:2021 without any modification.

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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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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies and radiological protection*, Subcommittee SC 2, *Radiological protection*.

This second edition cancels and replaces the first edition (ISO 4037-4:2004), which has been technically revised.

A list of all the parts in the ISO 4037 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The maintenance release of this document adjusts this fourth part to the second edition of the first three parts. This includes the improvements on high voltage generators from 1996 to 2017 (e.g., the use of high frequency switching supplies providing nearly constant potential), and the spectral measurements at irradiation facilities equipped with such generators (e.g., the catalogue of X-ray spectra by Ankerhold[1]). It also incorporates all published information with the aim to adjust the requirements for the technical parameters of the reference fields to the targeted overall uncertainty of about 6 % to 10 % for the phantom related operational quantities of the International Commission on Radiation Units and Measurements (ICRU)[2]. It does not change the concept of ISO 4037.

ISO 4037, focusing on photon reference radiation fields, is divided into four parts. ISO 4037-1 gives the methods of production and characterization of reference radiation fields in terms of the quantities photon fluence and air kerma free-in-air. ISO 4037-2 describes the dosimetry of the reference radiation qualities in terms of air kerma and in terms of the phantom related operational quantities of the International Commission on Radiation Units and Measurements (ICRU)[2]. ISO 4037-3 describes the methods for calibrating and determining the response of dosemeters and doserate meters in terms of the operational quantities of the ICRU[2]. This document gives special considerations and additional requirements for calibration of area and personal dosemeters in low energy X reference radiation fields, which are reference fields with generating potential lower or equal to 30 kV.

The general procedures described in ISO 29661 including Amendment 1 are used as far as possible in this document. In addition, the symbols used are in line with ISO 29661.

NOTE For irradiation of the whole body, $H_p(10)$ and $H^*(10)$ are relevant for radiation protection, as long as they are closer to their limit than $H'(0{,}07)$ and $H_p(0{,}07)$. This is the case down to about 15 keV.

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Radiological protection — X and gamma reference radiation for calibrating dosemeters and doserate meters and for determining their response as a function of photon energy —

Part 4: Calibration of area and personal dosemeters in low energy X reference radiation fields

1 Scope

This document gives guidelines on additional aspects of the characterization of low energy photon radiations and on the procedures for calibration and determination of the response of area and personal dose(rate)meters as a function of photon energy and angle of incidence. This document concentrates on the accurate determination of conversion coefficients from air kerma to $H_p(10)$, $H^*(10)$, $H_p(3)$ and $H'(3)$ and for the spectra of low energy photon radiations. As an alternative to the use of conversion coefficients the direct calibration in terms of these quantities by means of appropriate reference instruments is described.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4037-1, *Radiological protection — X and gamma reference radiation for calibrating dosemeters and doserate meters and for determining their response as a function of photon energy — Part 1: Radiation characteristics and production methods*

ISO 4037-2:2019, *Radiological protection — X and gamma reference radiation for calibrating dosemeters and doserate meters and for determining their response as a function of photon energy — Part 2: Dosimetry for radiation protection over the energy ranges from 8 keV to 1,3 MeV and 4 MeV to 9 MeV*

ISO 4037-3:2019, *Radiological protection — X and gamma reference radiation for calibrating dosemeters and doserate meters and for determining their response as a function of photon energy — Part 3: Calibration of area and personal dosemeters and the measurement of their response as a function of energy and angle of incidence*

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ISO 29661, *Reference radiation fields for radiation protection — Definitions and fundamental concepts*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4037-1, ISO 29661 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

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