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RÖNTGENI JA GAMMA REFERENTSKIIRGUS DOSIMEETRITE JA DOOSIKIIRUSE MÕÕTESEADMETE KALIBREERIMISEKS JA NENDE KOSTE MÄÄRAMISEKS SÕLTUVANA FOOTONI ENERGIAST

Osa 3: Pindala- ja isikudosimeetrite kalibreerimine ja nende koste mõõtmine kiirguse energia ja langemisnurga funktsioonina

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 4037-3:1999)

EESTI STANDARDIKESKUS
ESTONIAN CENTRE FOR STANDARDISATION

EESTI STANDARDI EESSÕNA	NATIONAL FOREWORD
See Eesti standard EVS-ISO 4037-3:2016 „Röntgeni ja gamma referentskiirgus dosimeetrite ja doosikiiruse mõõteseadmete kalibreerimiseks ja nende koste määramiseks sõltuvana footoni energiast. Osa 3: Pindala- ja isikudosimeetrite kalibreerimine ja nende koste mõõtmine kiirguse energia ja langemisnurga funktsioonina“ sisaldab rahvusvahelise standardi ISO 4037-3:1999 „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“ identset ingliskeelset teksti.	This Estonian Standard EVS-ISO 4037-3:2016 consists of the identical English text of the International Standard ISO 4037-3:1999 „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“.
Ettepaneku rahvusvahelise standardi ümbertrüki meetodil ülevõtuks on esitanud EVS/TK 28, standardi avaldamist on korraldanud Eesti Standardikeskus.	Proposal to adopt the International Standard by reprint method has been presented by EVS/TK 28, the Estonian standard has been published by the Estonian Centre for Standardisation.
Standard EVS-ISO 4037-3:2016 on jõustunud sellekohase teate avaldamisega EVS Teataja 2016. aasta maikuu numbris.	Standard EVS-ISO 4037-3:2016 has been endorsed with a notification published in the May 2016 issue of the official bulletin of the Estonian Centre for Standardisation.
Standard on kättesaadav Eesti Standardikeskusest.	This standard is available from the Estonian Centre for Standardisation.

Käsitlusala

Standardi ISO 4037 see osa käsitleb dosimeetrite ja doosikiiruse mõõteseadmete kalibreerimist, mida kasutatakse individuaalseks ja pindala seireks footoni referentskiirgusväljades, mille keskmine energia asub vahemikus 8 keV kuni 9 MeV (vt standard ISO 4037-1). Individuaalse seire puhul käsitletakse nii kogukeha- kui ka jäsemetedosimeetreid ning pindala seire puhul portatiivseid ja fikseeritud dosimeetreid. Standardi ISO 4037 see osa tegeleb koste kui pealelangeva footoni energia ja kiirguse langemisnurga funktsiooni määratlemisega. Sellised mõõtmised võivad kujutada endast osa tüübikatsest, mille käigus uuritakse täiendavate suuruste mõju kostele.

Standardi ISO 4037 see osa ei hõlma fikseeritud pindaladosimeetrite *in-situ* kalibreerimist, mida käsitletakse tulevases standardis.

Kirjeldatud on protseduure, mida tuleb eri tüüpi dosimeetrite puhul järgida. Samuti antakse soovitusi kasutatava fantoomi ja rakendatavate teisendustegurite kohta. Peale selle annab see rahvusvaheline standard juhised määramatuste hindamiseks ning kalibreerimisprotokollide ja sertifikaatide koostamiseks.

MÄRKUS 1 Terminit „dosimeeter“ kasutatakse üldmõistena kõigi individuaalseks ja pindala seireks kasutatavate dosimeetrite ja doosikiiruse mõõteseadmete kohta.

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MÄRKUS 2 Standardi ISO 4037 selles osas kasutatakse terminit „kerma“ vabalt õhus tekkiva õhukerma tähistamiseks, kui pole teisiti osutatud.

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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.

International Standard ISO 4037-3 was prepared by Technical Committee ISO/TC 85 *Nuclear energy*, Subcommittee SC 2, *Radiation protection*.

ISO 4037 consists of the following parts, under the general title *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*

— *Part 2: Dosimetry for radiation protection over the energy ranges 8 keV to 1,3 MeV and 4 MeV to 9 MeV*

— *Part 3: Calibration of area and personal dosemeters and the measurement of their response as a function of energy and angle of incidence*

Introduction

This part of ISO 4037 is closely related to two other International Standards. The first, ISO 4037-1, describes the methods of production and characterization of the photon reference radiations. The second, ISO 4037-2, describes the dosimetry of the reference radiations.

This part of ISO 4037 is the third part of the series, and it describes procedures for calibrating and determining the response of dosemeters and doserate meters in terms of the International Commission on Radiation Units and Measurements (ICRU) operational quantities [1,2,3,4] for radiation protection purposes [5]. The rationale for using the operational quantities is based on the fact that the effective dose as defined in ICRP 60 [6] cannot be measured directly. The operational quantities provide a reasonable and conservative approximation to the effective dose for most photon radiations.

The determination of the response of dosemeters and doserate meters is essentially a three-step process. First a basic quantity such as air kerma is measured free in air at the point of test. Then the appropriate operational quantity is derived by the application of the conversion coefficient that relates the quantity measured to the selected operational quantity. Finally the device under test is placed at the same point for the determination of its response. Depending on the type of dosemeter under test, the irradiation is either carried out on a phantom or free in air for personal and area dosemeters, respectively. For area and individual monitoring, this part of ISO 4037 describes the methods and the conversion coefficients to be used for the determination of the response of dosemeters and doserate meters in terms of the ICRU operational quantities for photons.

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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

1 Scope

This part of ISO 4037 specifies the calibration of dosemeters and doserate meters used for individual and for area monitoring in photon reference radiation fields with mean energies between 8 keV and 9 MeV (see ISO 4037-1). For individual monitoring, both whole body and extremity dosemeters are covered and for area monitoring both portable and installed dosemeters are covered. This part of ISO 4037 also deals with the determination of the response as a function of photon energy and angle of radiation incidence. Such measurements may represent part of a type test in the course of which the effect of further influence quantities on the response is examined.

This part of ISO 4037 does not cover the *in-situ* calibration of fixed installed area dosemeters which will be covered in a future standard.

The procedures to be followed for the different types of dosemeters are described. Recommendations are given on the phantom to be used and on the conversion coefficients to be applied. In addition, this International Standard gives guidance on the statement of uncertainties and on the preparation of calibration records and certificates.

NOTE 1 The term dosemeter is used as a generic term denoting any dose or doserate meter for individual or area monitoring.

NOTE 2 Throughout this part of ISO 4037, unless otherwise stated, the term kerma is used to denote air kerma free in air.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 4037. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 4037 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 4037-1:1996, *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 4037-2:1997, *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 8 keV to 1,3 MeV and 4 MeV to 9 MeV.*

ISO Guide to the Expression of Uncertainty in Measurement, 1993.