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

Part 1: Radiation characteristics and production methods

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 1: Caractéristiques des rayonnements et méthodes de production



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Contents

	Page
Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	3
3 Terms and definitions	3
4 Continuous reference filtered X radiation	7
4.1 General.....	7
4.1.1 Realisation of reference radiation fields.....	7
4.1.2 Basis of conversion coefficients.....	7
4.1.3 Radiation quality.....	8
4.1.4 Choice of reference radiation.....	8
4.2 Conditions and methods for producing reference X radiation.....	13
4.2.1 Characteristics of the high voltage generator.....	13
4.2.2 Tube potential and protective resistor.....	14
4.2.3 Filtration.....	15
4.2.4 Limitations concerning matched fields.....	19
4.2.5 X radiation shutter.....	20
4.2.6 Beam aperture.....	20
4.3 Field uniformity and scattered radiation.....	20
4.3.1 Field diameter.....	20
4.3.2 Field uniformity.....	20
4.3.3 Scattered radiation.....	20
4.4 Summary of the requirements for reference X radiation fields.....	21
4.5 Validation of reference X radiation.....	21
4.5.1 General.....	21
4.5.2 Criteria for validation by HVL determination.....	22
4.5.3 Apparatus for HVL measurement.....	23
4.5.4 HVL measurement procedure.....	24
4.5.5 Criteria for validation by dosimetry.....	24
4.5.6 Criteria for validation by spectrometry.....	24
5 Gamma radiation emitted by radionuclides	25
5.1 General.....	25
5.2 Radionuclides used for the production of gamma radiation.....	25
5.3 Specification of radiation sources.....	25
5.3.1 Sources.....	25
5.3.2 Encapsulation.....	26
5.4 Irradiation facility and influence of scattered radiation.....	26
5.4.1 General requirements.....	26
5.4.2 Collimated geometry installation.....	26
5.4.3 Variation of air kerma rate by means of lead attenuators.....	27
5.5 Checking installation conformity.....	27
6 Photon radiation with energies between 4 MeV and 9 MeV	28
6.1 General.....	28
6.2 Production of reference radiation.....	28
6.2.1 General.....	28
6.2.2 Photon reference radiation from de-excitation of ^{16}O in the $^{19}\text{F}(p, \alpha\gamma)^{16}\text{O}$ reaction.....	28
6.2.3 Photon reference radiation from de-excitation of ^{12}C	30
6.3 Beam diameter and uniformity of radiation field.....	31
6.4 Contamination of photon reference radiation.....	31
6.4.1 General.....	31

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6.4.2	Contamination of reference radiation common to all methods of production of reference radiation.....	32
6.4.3	Additional contamination of accelerator produced reference radiation from de-excitation of ^{16}O	32
Annex A (informative) Fluorescence X radiation with not enough information for matched or characterized fields.....		33
Annex B (informative) Gamma radiation emitted by ^{241}Am radionuclide with not enough information for matched or characterized fields.....		40
Annex C (informative) Continuous filtered X radiation based on the quality index.....		42
Bibliography.....		45

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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.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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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 4037-1:1996), which has been technically revised. The main changes are:

- introduction of two types of reference fields, matched reference fields and characterized reference fields;
- introduction of validation for matched reference fields;
- introduction of limits for the allowed deviation of parameters like high voltage, filter purity and filter thickness from their nominal values. These limits now depend on the definition depth of the phantom related quantity. This is done to achieve an overall uncertainty ($k = 2$) of about 6 % to 10 % for the phantom related operational quantities.

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.

Introduction

This maintenance release of this document incorporates the improvements to 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^[4]). 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)^[5]. It does not change the general concept of the existing 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 spectral 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)^[5]. ISO 4037-3 describes the methods for calibrating and determining the response of dosimeters and doserate meters in terms of the phantom related operational quantities of the ICRU^[5]. ISO 4037-4 gives special considerations and additional requirements for calibration of area and personal dosimeters 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 are used as far as possible in this document. Also, the symbols used are in line with ISO 29661.