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Second edition
2022-10

Nuclear energy — Reference beta-particle radiation —

Part 2: Calibration fundamentals related to basic quantities characterizing the radiation field

Énergie nucléaire — Rayonnement bêta de référence —

*Partie 2: Concepts d'étalonnage en relation avec les grandeurs
fondamentales caractérisant le champ du rayonnement*



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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Contents

| | Page |
|---|-----------|
| Foreword | iv |
| Introduction | v |
| 1 Scope | 1 |
| 2 Normative references | 1 |
| 3 Terms and definitions | 1 |
| 4 Symbols and abbreviated terms and reference and standard test conditions | 3 |
| 5 Calibration and traceability of reference radiation fields | 6 |
| 6 General principles for calibration of radionuclide beta-particle fields | 6 |
| 6.1 General..... | 6 |
| 6.2 Scaling to derive equivalent thicknesses of various materials..... | 7 |
| 6.3 Characterization of the radiation field in terms of penetrability..... | 8 |
| 7 Calibration procedures using an extrapolation chamber | 8 |
| 7.1 General..... | 8 |
| 7.2 Determination of the reference beta-particle absorbed-dose rate..... | 9 |
| 8 Calibration with ionization chambers | 10 |
| 9 Measurements at non-perpendicular incidence | 10 |
| 10 Uncertainties | 10 |
| Annex A (normative) Reference conditions and standard test conditions | 18 |
| Annex B (informative) Extrapolation chamber measurements | 20 |
| Annex C (normative) Extrapolation chamber measurement correction factors | 24 |
| Annex D (informative) Example of an uncertainty analysis | 35 |
| Bibliography | 39 |

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 of ISO 6980-2 cancels and replaces ISO 6980-2:2004, which has been technically revised. The main changes are the following:

- inclusion of the quantities $H_p(3)$ and $H'(3;\Omega)$;
- inclusion of $^{106}\text{Ru}/^{106}\text{Rh}$ series 1 sources;
- inclusion of energy-reduced beta-particle fields based on $^{90}\text{Sr}/^{90}\text{Y}$ sources;
- removal of ^{14}C sources;
- reference to ISO 29661 and its terms and definitions in [Clause 3](#);
- inclusion of correction factors for primary dosimetry based on radiation transport simulations – replacing some of the factors used in the 2004 edition;
- inclusion of a correction factor for primary dosimetry to use the Spencer-Attix theory instead of the Bragg-Gray theory, k_{SA} ;
- inclusion of a correction factor for the stopping power ratio at different phantom depths, k_{Sta} ;
- inclusion of a correction factor for the source to chamber distance at different phantom depths, k_{ph} ;
- use of Chebyshev polynomials with twelve parameters instead of ordinary polynomials with three parameters for the description of transmission functions.

A list of all the parts in the ISO 6980 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

ISO 6980 series covers the production, calibration, and use of beta-particle reference radiation fields for the calibration of dosimeters and dose-rate meters for protection purposes. This document describes the procedures for the determination of absorbed dose rate to a reference depth of tissue from beta particle reference radiation fields. ISO 6980-1 describes methods of production and characterization of the reference radiation. ISO 6980-3 describes procedures for the calibration of dosimeters and dose-rate meters and the determination of their response as a function of beta-particle energy and angle of beta-particle incidence.

For beta particles, the calibration and the determination of the response of dosimeters and dose-rate meters is essentially a three-step process. First, the basic field quantity, absorbed dose to tissue at a depth of 0,07 mm (and optionally also at a depth of 3 mm) in a tissue-equivalent slab geometry is measured at the point of test, using methods described in this document. Then, the appropriate operational quantity is derived by the application of a conversion coefficient that relates the quantity measured (reference absorbed dose) to the selected operational quantity for the selected irradiation geometry. Finally, the reference point of the device under test is placed at the point of test for the calibration and determination of the response of the dosimeter. Depending on the type of dosimeter under test, the irradiation is either carried out on a phantom or free-in-air for personal and area dosimeters, respectively. For individual and area monitoring, this document describes the methods and the conversion coefficients to be used for the determination of the response of dosimeters and dose-rate meters in terms of the ICRU operational quantities, i.e., directional dose equivalent, $H'(0,07;\Omega)$ and $H'(3;\Omega)$, as well as personal dose equivalent, $H_p(0,07)$ and $H_p(3)$.