



## ISO 6980-2

### **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 de rayonnement*

**Third edition  
2023-11**

**Corrected version  
2024-03**



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Published in Switzerland

This is a preview of ISO 6980-2:2023. [Click here to purchase the full version from the ANSI store.](#)

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Symbols and abbreviated terms and reference and standard test conditions</b> .....	<b>3</b>
<b>5 Calibration and traceability of reference radiation fields</b> .....	<b>6</b>
<b>6 General principles for calibration of beta-particle radiation fields</b> .....	<b>6</b>
6.1 General.....	6
6.2 Scaling to derive equivalent thicknesses of various materials.....	6
6.3 Characterization of the radiation field in terms of penetrability.....	7
<b>7 Calibration procedures using an extrapolation chamber</b> .....	<b>8</b>
7.1 General.....	8
7.2 Determination of the reference beta-particle absorbed-dose rate.....	8
<b>8 Calibration with ionization chambers</b> .....	<b>10</b>
<b>9 Measurements at non-perpendicular incidence</b> .....	<b>10</b>
<b>10 Uncertainties</b> .....	<b>10</b>
<b>Annex A (normative) Reference conditions and standard test conditions</b> .....	<b>19</b>
<b>Annex B (informative) Extrapolation chamber measurements</b> .....	<b>21</b>
<b>Annex C (informative) Extrapolation chamber measurement correction factors</b> .....	<b>25</b>
<b>Annex D (informative) Example of an uncertainty analysis</b> .....	<b>37</b>
<b>Bibliography</b> .....	<b>41</b>

This is a preview of ISO 6980-2:2023. [Click here to purchase the full version from the ANSI store.](#)

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 document 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](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of 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 [www.iso.org/iso/foreword.html](http://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 third edition of ISO 6980-2 cancels and replaces ISO 6980-2:2022, of which it constitutes a minor revision.

The main changes are as follows:

- editorial changes throughout the document.

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](http://www.iso.org/members.html).

This corrected version of ISO 6980-2:2023 incorporates the following corrections:

- several wrong values have been corrected in [Table C.7](#).

This is a preview of ISO 6980-2:2023. [Click here to purchase the full version from the ANSI store.](#)

ISO 6980 series covers the production, calibration, and use of reference beta-particle 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 reference beta particle 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  $H_p(3)$ .