

STN	Jadrová energia Referenčné beta žiarenie Časť 1: Metódy produkcie (ISO 6980-1: 2023)	STN EN ISO 6980-1 40 1030
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Nuclear energy - Reference beta-particle radiation - Part 1: Methods of production (ISO 6980-1:2023)

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

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Énergie nucléaire - Rayonnement bêta de référence -
Partie 1: Méthodes de production (ISO 6980-1:2023)

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EN ISO 6980-1:2025 (E)

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European foreword

The text of ISO 6980-1:2023 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 6980-1:2025 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of an identical text or by endorsement, at the latest by March 2026, and conflicting national standards shall be withdrawn at the latest by March 2026.

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Endorsement notice

The text of ISO 6980-1:2023 has been approved by CEN as EN ISO 6980-1:2025 without any modification.

INTERNATIONAL STANDARD

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Nuclear energy — Reference beta- particle radiation —

Part 1: Methods of production

*Énergie nucléaire — Rayonnement bêta de référence —
Partie 1: Méthodes de production*



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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 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).

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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 6980-1 cancels and replaces ISO 6980-1:2022, 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.

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Introduction

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 methods of production and characterization of the reference radiation. ISO 6980-2 describes procedures for the determination of absorbed dose rate to a reference depth of tissue from beta particle reference radiation fields. 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 ISO 6980-2. 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 $H_p(3)$.

Nuclear energy — Reference beta-particle radiation —

Part 1: Methods of production

1 Scope

This document specifies the requirements for reference beta radiation fields produced by radioactive sources to be used for the calibration of personal and area dosimeters and dose-rate meters to be used for the determination of the quantities $H_p(0,07)$, $H'(0,07;\Omega)$, $H_p(3)$ and $H'(3;\Omega)$, and for the determination of their response as a function of beta particle energy and angle of incidence. The basic quantity in beta dosimetry is the absorbed-dose rate in a tissue-equivalent slab phantom. This document gives the characteristics of radionuclides that have been used to produce reference beta radiation fields, gives examples of suitable source constructions and describes methods for the measurement of the residual maximum beta particle energy and the dose equivalent rate at a depth of 0,07 mm in the International Commission on Radiation Units and Measurements (ICRU) sphere. The energy range involved lies between 0,22 MeV and 3,6 MeV maximum beta energy corresponding to 0,07 MeV to 1,2 MeV mean beta energy and the dose equivalent rates are in the range from about $10 \mu\text{Sv}\cdot\text{h}^{-1}$ to at least $10 \text{Sv}\cdot\text{h}^{-1}$. In addition, for some sources, variations of the dose equivalent rate as a function of the angle of incidence are given. However, as noted in ICRU 56^[5], the ambient dose equivalent, $H^*(10)$, used for area monitoring, and the personal dose equivalent, $H_p(10)$, as used for individual monitoring, of strongly penetrating radiation, are not appropriate quantities for any beta radiation, even that which penetrates 10 mm of tissue ($E_{\text{max}} > 2 \text{MeV}$).

This document is applicable to two series of reference beta radiation fields, from which the radiation necessary for determining the characteristics (calibration and energy and angular dependence of response) of an instrument can be selected.

Series 1 reference radiation fields are produced by radioactive sources used with beam-flattening filters designed to give uniform dose equivalent rates over a large area at a specified distance. The proposed sources of $^{106}\text{Ru}/^{106}\text{Rh}$, $^{90}\text{Sr}/^{90}\text{Y}$, ^{85}Kr , ^{204}Tl and ^{147}Pm produce maximum dose equivalent rates of approximately $200 \text{mSv}\cdot\text{h}^{-1}$.

Series 2 reference radiation fields are produced without the use of beam-flattening filters, which allows large area planar sources and a range of source-to-calibration plane distances to be used. Close to the sources, only relatively small areas of uniform dose rate are produced, but this series has the advantage of extending the energy and dose rate ranges beyond those of series 1. The series also include radiation fields using polymethylmethacrylate (PMMA) absorbers to reduce the maximum beta particle energy. The radionuclides used are those of series 1; these sources produce dose equivalent rates of up to $10 \text{Sv}\cdot\text{h}^{-1}$.

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

ISO/IEC Guide 99, *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*

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