INTERNATIONAL STANDARD

ISO 20956

First edition
2023-09

Radiological protection — Low dose rate calibration of instruments for environmental and area monitoring

Radioprotection — Étalonnage d'instruments à faible débit de dose pour la surveillance de zone et de l'environnement

Reference number
ISO 20956:2023(E)

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Published in Switzerland

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Foreword

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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*.

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Introduction

The ISO 4037 documentary standard is an International Standard for the calibration of dosemeters in X and gamma-ray reference fields. The air kerma rate range for which the standard applies is above 1 μGy·h^{-1} being nearly equivalent to 1 μSv·h^{-1} in terms of the operational quantities. The standard however does not address dosemeters that are currently available for environmental monitoring that can measure below 1 μSv·h^{-1}. The reliability of environmental monitoring equipment is important for the evaluation of potential dose of the general public during any radiation incident such as an accident that could occur at a nuclear power plant or at any radiation facility.

This document extends the scope of ISO 4037 for calibrating area and environmental type monitors to dose rates below 1 μSv·h^{-1} to improve the reliability of environmental monitoring.

Three detector calibration methods are described in Clause 5 of this document for 3 different situations: ground level facilities with normal background levels (see 5.2), ground level facilities with lower than normal background levels (see 5.3) and underground facilities with lower than normal background levels (see 5.4). Clause 6 discusses routine checks while Clause 7 is dedicated to the calibration of environmental and area dosemeters that are fixed in place. These methods are based on free-in-air and simultaneous irradiation procedures, derived from those described in ISO 29661. This document extends the dose rate range of ISO 4037-1 below 1,0 μSv·h^{-1}. The specific uncertainty components are described for these calibration methods.

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Radiological protection — Low dose rate calibration of instruments for environmental and area monitoring

1 Scope

This document specifies the calibration methods under laboratory conditions for dosemeters used for environmental and area monitoring of X and gamma-rays with respect to the operational quantities of the International Commission on Radiation Units and Measurements (ICRU)[1].

This document extends the dose rate range of ISO 4037-1 below 1,0 $\mu Sv \cdot h^{-1}$. The specific uncertainty components are described for these calibration methods.

This document also specifies the method for routine checking of active area dosemeters. Routine checking is not a calibration, nor does it replace a calibration, but it is a simple and effective method to routinely verify that the performance of the equipment is continuously maintained after calibration and that the calibration is still valid.

This document does not deal with the special requirements for the calibration of spectrometer-based environmental dosemeters and passive dosemeters.

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 4037-1, *Radiological protection — 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 4037-2:2019, *Radiological protection — 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 from 8 keV to 1,3 MeV and 4 MeV to 9 MeV*

ISO 4037-3:2019, *Radiological protection — 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 29661, *Reference radiation fields for radiation protection — Definitions and fundamental concepts*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 29661 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

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