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2023-09

Neutron reference radiation fields —

Part 3: Calibration of area and personal dosemeters and determination of their response as a function of neutron energy and angle of incidence

Champs de rayonnement neutronique de référence —

Partie 3: Étalonnage des dosimètres de zone et individuels et détermination de leur réponse en fonction de l'énergie et de l'angle d'incidence des neutrons

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Contents

Foreword

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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).

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This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies, and radiological protection,* Subcommittee SC 2, *Radiation protection*.

This second edition cancels and replaces the first edition (ISO 8529-3:1998), which has been technically revised.

The main changes are as follows:

— The second and last edition of ISO 8529-1:2021 revised the neutron reference radiation fields produced with radionuclide sources as well as those produced with monoenergetic neutrons, thus requiring calculation of new conversion coefficients from neutron fluence to ambient dose equivalent or personal dose equivalent.

A list of all parts in the ISO 8529 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.

This corrected version of ISO 8529-3:2023 incorporates the following corrections:

— The unit "pSv cm^{-2}" was corrected to "pSv cm^{2}" in Tables 1 to 4.

Introduction

This document is closely related to ISO 8529-1 and ISO 8529-2 concerning the calibration of dosemeters and doserate meters for neutron radiation. ISO 8529-1 specifies the reference neutron radiation fields, in the energy range from thermal up to 20 MeV, and their production methods. ISO 8529-2 describes the calibration fundamentals of radiation protection devices related to basic quantities characterising the radiation field and specifies the procedures to be used for realising the calibration conditions of radiation protection devices produced by calibration sources with emphasis on correction for extraneous effects.

This document deals with dosemeters for area and individual monitoring. Unless differently specified, the word "dosemeter" always refers to both. Area dosemeters are often called area monitors or area survey meters, and dosemeters for individual monitoring are often called personal dosemeters or personal dosimeters. This document describes procedures for calibrating and determining the response in terms of the International Commission on Radiation Units and Measurements (ICRU) operational quantities. These are defined in ICRU Report 39[1] and ICRU Report51[2]. For radiation protection purposes, these operational quantities are considered to be a sufficiently accurate approximation to the protection quantities. For the purposes of this document, the emphasis will be on the evaluation of the operational quantities at 10 mm depth defined in the body using conversion coefficients in the appropriate phantom. Cold neutrons may present special problems in dosimetry and are outside the scope of this document, as are the photon calibrations of instruments designed to measure both photons and neutrons.

The determination of the response of dosemeters is essentially a three-step process. First, a primary quantity such as the neutron fluence is determined at the point of test. Second, the reference point of the device being calibrated is then placed at the point of test to determine the fluence response. Third, the response of the device with respect to the appropriate operational quantity is then determined by the application of conversion coefficients that relate the physical quantity (the fluence) to the operational quantity (the dose equivalent). This document describes the methods and the conversion coefficients to be used for the determination of the response of area and personal dosemeters in terms of the respective ICRU operational quantities for neutrons.