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Reference neutron radiations —

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

Rayonnements neutroniques de référence —

Partie 3: Étalonnage des dosimètres de zone (ou d'ambiance) 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

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 8529-3 was prepared by Technical Committee ISO/TC 85, *Nuclear energy,* Subcommittee SC 2, *Radiation protection*.

ISO 8529 consists of the following parts, under the general title *Reference neutron radiations*

— *Part 1: Characteristics and methods of production*

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

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

Annexes A and B of this part of ISO 8529 are for information only.

Introduction

This part of ISO 8529 is closely related to two other standards concerning the calibration of dosimeters and dose-rate meters for neutron radiation. The first standard, ISO 8529-1 (in preparation), specifies the reference neutron radiations, in the energy range from thermal up to 20 MeV, and their production methods. The second standard, ISO 8529-2 (in preparation), describes fundamentals related to the physical quantities characterizing the radiation field and calibration procedures in general terms, with emphasis on active dose-rate meters and the use of radionuclide sources. ISO 8529-2 and this part of ISO 8529 replace ISO 10647:1996, *Procedures for calibrating and determining the response of neutron-measuring devices used for radiation protection purposes*.

This part of ISO 8529 deals with dosimeters for area and individual monitoring; area dosimeters are often called area monitors or survey meters, and dosimeters for individual monitoring are often called personal dosimeters. This part of ISO 8529 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 Reports 39, 43, 47 and 51 ([3], [4], [5] and [6], respectively, in the Bibliography). For radiation protection purposes, these operational quantities are considered to be a sufficiently accurate approximation to the protection quantities. For the purposes of this part of ISO 8529, neutrons of all energies are considered to be strongly penetrating and the emphasis will be on the evaluation of the operational quantities at 10 mm depth in the body or in the appropriate phantom. Cold neutrons may present special problems in dosimetry, which are outside the scope of this part of ISO 8529, as are the photon calibrations of instruments designed to measure both photons and neutrons.

The determination of the response of dosimeters is essentially a three step process. Firstly, a primary quantity such as the neutron fluence is determined at the point of test. Secondly, the reference point of the device being calibrated is then placed at the point of test to determine the fluence response. Thirdly, 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 part of ISO 8529 will describe the methods and the conversion coefficients to be used for the determination of the response of personal and area dosimeters in terms of the respective ICRU operational quantities for neutrons.