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Dosimetry of X and γ reference radiations for radiation protection over the energy range from 8 keV to 1,3 MeV

*Dosimétrie des rayonnements de référence X et gamma pour la radioprotection dans le
domaine d'énergie compris entre 8 keV et 1,3 MeV*

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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 approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 8963 was prepared by Technical Committee ISO/TC 85, *Nuclear energy*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Contents

	Page
0 Introduction	1
1 Scope and field of application	1
2 Reference	1
3 Definitions	1
4 Apparatus	2
5 General procedures	3
6 Additional procedures and precautions specific to γ radiation dosimetry	5
7 Additional procedures and precautions specific to X radiation dosimetry	5
8 Special procedures and precautions specific to fluorescence X radiations — Limitation of extraneous radiation in beams	6
9 Uncertainty of measurement	6
Bibliography	8

Dosimetry of X and γ reference radiations for radiation protection over the energy range from 8 keV to 1,3 MeV

0 Introduction

The term "dosimetry" is used in this International Standard to describe the method by which the value of a physical quantity characterizing the interaction of the radiation field with matter may be measured at a given point by the use of a calibrated standard instrument. Dosimetry is the basis for the calibration of radiation protection instruments and devices and the determination of their response as a function of the energy of the radiation of interest.

At present, the quantities in which photon secondary standard instruments or sources are calibrated for use in radiological protection calibration laboratories relate to measurements made in free air, i.e. air kerma^[1]; for simplicity, the term "kerma" is used instead of "air kerma" throughout this International Standard.

In order to correlate measured physical quantities with the magnitude of a biological effect, a quantity of the dose-equivalent type^[2] is required for use in radiation protection. ICRU¹⁾ has recently defined such a quantity^[3] and will publish tables of conversion coefficients to convert kerma to dose equivalent quantities.

1 Scope and field of application

This International Standard specifies the procedures for the dosimetry of X and γ reference radiations for the calibration of radiation protection instruments over the energy range from approximately 8 keV to 1,3 MeV. The methods of production and nominal kerma rates obtained from these reference radiations are given in ISO 4037.

It applies mainly to secondary laboratories.

2 Reference

ISO 4037, *X and γ reference radiations for calibrating dose-meters and dose ratemeters and for determining their response as a function of photon energy*.

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 reference conditions : Conditions of use for a measuring instrument prescribed for performance testing or conditions to ensure valid comparison of results of measurements^[4].

NOTE — The reference conditions generally specify reference values or reference ranges for the influence quantities affecting the measuring instrument.

For the purposes of this International Standard, the reference values for temperature, atmospheric pressure and relative humidity are as follows :

Ambient temperature : 293,15 K
Atmospheric pressure : 101,3 kPa
Relative humidity : 65 %

3.2 standard test conditions : A value (or a range of values) of the influence quantities^[4] or instrument parameters that are specified for the dosimetry of the radiation fields.

NOTE — The range of values for ambient temperature, atmospheric pressure and relative humidity are as follows :

Ambient temperature : 291,15 to 295,15 K
Ambient pressure : 86 to 106 kPa
Relative humidity : 30 % to 75 %

Working outside this range may result in reduced accuracy.

3.3 ionization chamber : Ionization detector consisting of a chamber filled with a suitable gas, in which an electric field, insufficient to induce gas multiplication, is provided for the collection at the electrodes of charges associated with the ions and the electrons produced in the sensitive volume of the detector by the ionizing radiation^[5].

NOTE — The ionization chamber includes the sensitive volume, the collecting and polarizing electrodes, the guard electrode, if any, the chamber wall, the parts of the insulator adjacent to the sensitive volume and any necessary caps to ensure electron equilibrium.

3.4 ionization chamber assembly : Ionization chamber and all other parts to which the chamber is permanently attached, except the measuring assembly.

1) ICRU : International Commission on Radiation Units and Measurements.