PD ISO/TS 18090-1:2015

BSI Standards Publication

Radiological protection — Characteristics of reference pulsed radiation

Part 1: Photon radiation

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee NCE/2, Radiation protection and measurement.

A list of organizations represented on this committee can be obtained on request to its secretary.

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ISBN 978 0 580 85828 4

ICS 13.280

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This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 July 2015.

Amendments issued since publication

Date	Text affected

PD ISO/TS 18090-1:2015

TECHNICAL SPECIFICATION

ISO/TS 18090-1

First edition
2015-08-01

Radiological protection — Characteristics of reference pulsed radiation —

Part 1: **Photon radiation**

Radioprotection — Caractéristiques des champs de rayonnement pulsés de référence —

Partie 1: Radiation de photons

Reference number
ISO/TS 18090-1:2015(E)

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Contents

Page

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 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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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 85, *Nuclear energy, nuclear technologies, and radiological protection*, Subcommittee SC 2, *Radiological protection*.

ISO/TS 18090 consists of the following parts, under the general title *Radiological protection — Characteristics of reference pulsed radiation*:

— *Part 1: Photon radiation*

Introduction

The specification and determination of the special characteristics required for radiation protection dosemeters to be used in pulsed fields of ionizing radiation have been excluded from all International Standards for personal and environmental dosemeters issued so far. Due to the increased use of pulsed radiation in medicine and industry, such International Standards are currently under development. A prerequisite for such International Standards is the availability of the required reference fields for pulsed radiation. This Technical Specification provides the necessary information for such reference fields.

The concept is based on the existing standards for radiation qualities defined in ISO and IEC standards. It only adds the parameters of the pulsed field and gives some guidance for their determination. Therefore, no new radiation qualities are defined, only the link between the parameters for pulsed radiation and the parameters for continuous radiation are given. The main required parameters for pulsed radiation fields are the following:

— radiation pulse duration, t_{pulse};

— radiation pulse air kerma rate, $\dot{K}_{\mathrm{a,pulse}}$;

— air kerma per radiation pulse, $K_{\mathrm{a,pulse}}$;

— for repeated pulses, their repetition frequency, f_{pulse}.

The pulse parameters were determined by using an equivalent trapezoidal radiation pulse, which is equivalent with respect to air kerma and air kerma rate. Reference pulsed radiation is characterized by specified maximum deviations of the given pulse from the equivalent trapezoidal radiation pulse and by requirements concerning the change of radiation quality during the given radiation pulse.

The pulse parameters with respect to the phantom related quantities were determined using conversion coefficients according to ISO 4037 (all parts).

This publication contains information for which worldwide experience is not available at the date of its development. Therefore, it was decided to publish it as a Technical Specification. It is expected that within the following years, experience will be gained and the maintenance of this Technical Specification could lead to an International Standard.

Radiological protection — Characteristics of reference pulsed radiation —

Part 1: Photon radiation

1 Scope

This part of ISO/TS 18090 is directly applicable to pulsed X-radiation with pulse duration of 0,1 ms up to 10 s. This covers the whole range used in medical diagnostics at the time of publication. Some specifications may also be applicable for much shorter pulses; one example is the air kerma of one pulse. Such a pulse may be produced, e.g. by X-ray flash units or high-intensity femtosecond-lasers. Other specifications are not applicable for much shorter pulses; one example is the time-dependent behaviour of the air kerma rate. This may not be measurable for technical reasons as no suitable instrument is available, e.g. for pulses produced by a femtosecond-laser.

This part of ISO/TS 18090 specifies the characteristics of reference pulsed radiation for calibrating and testing radiation protection dosemeters and dose rate meters with respect to their response to pulsed radiation. The radiation characteristics includes the following:

a) time-dependent behaviour of the air kerma rate of the pulse;

b) time-dependent behaviour of the X-ray tube high voltage during the pulse;

c) uniformity of the air kerma rate within a cross-sectional area of the radiation beam;

d) air kerma of one radiation pulse;

e) air kerma rate of the radiation pulse;

f) repetition frequency.

This part of ISO/TS 18090 does not define new radiation qualities. Instead, it uses those radiation qualities specified in existing ISO and IEC standards. This part of ISO/TS 18090 gives the link between the parameters for pulsed radiation and the parameters for continuous radiation specifying the radiation qualities. It does not specify specific values or series of values for the pulsed radiation field but specifies only those limits for the relevant pulsed radiation parameters that are required for calibrating dosemeters and dose rate meters and for determining their response depending on the said parameters.

The pulse parameters with respect to the phantom-related quantities were determined using conversion coefficients according to ISO 4037 (all parts). This is possible as the radiation qualities specified in existing ISO and IEC standards are used.

A given reference pulsed X-ray facility is characterized by the parameter ranges over which the full specifications and requirements according to this part of ISO/TS 18090 are met. Therefore, not all reference pulsed X-ray facilities can produce pulses covering the same parameter ranges.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.