

INTERNATIONAL STANDARD



Radiation protection instrumentation – **Passive-integrating** Dosimetry systems
with **integrating passive detectors** for **personal** individual, workplace and
environmental monitoring of photon and beta radiation

Document Preview

[IEC 62387:2020](#)

<https://standards.iteh.ai/catalog/standards/iec/355f0b34-d1ca-4cd2-8eb3-dba13f7830a0/iec-62387-2020>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2020 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

[IEC 62387:2020](https://standards.iteh.ai/catalog/standards/iec/355f0b34-d1ca-4cd2-8eb3-dba1317830a0/iec-62387-2020)

<https://standards.iteh.ai/catalog/standards/iec/355f0b34-d1ca-4cd2-8eb3-dba1317830a0/iec-62387-2020>



IEC 62387

Edition 2.0 2020-01
REDLINE VERSION

INTERNATIONAL STANDARD



Radiation protection instrumentation – **Passive integrating** Dosimetry systems
with integrating passive detectors for **personal** individual, workplace and
environmental monitoring of photon and beta radiation

Document Preview

[IEC 62387:2020](#)

<https://standards.iteh.ai/catalog/standards/iec/355f0b34-d1ca-4cd2-8eb3-dba13f7830a0/iec-62387-2020>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 13.280

ISBN 978-2-8322-5317-5

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	8
INTRODUCTION.....	10
1 Scope.....	11
2 Normative references	12
3 Terms and definitions	13
4 Units and symbols	24
5 General test procedures	24
5.1 Basic test procedures	24
5.1.1 Instructions for use	24
5.1.2 Nature of tests	24
5.1.3 Reference conditions and standard test conditions	25
5.1.4 Production of reference radiation	25
5.1.5 Choice of phantom for the purpose of testing.....	25
5.1.6 Position of dosimeter for the purpose of testing	25
5.2 Test procedures to be considered for every test.....	25
5.2.1 Number of dosimeters used for each test.....	25
5.2.2 Consideration of the uncertainty of the conventional quantity value	25
5.2.3 Consideration of non-linearity	25
5.2.4 Consideration of natural background radiation	26
5.2.5 Consideration of several detectors or signals in a dosimeter.....	26
5.2.6 Performing the tests efficiently.....	26
6 Performance requirements: summary	26
7 Capability of a dosimetry system	28
7.1 General.....	28
7.2 Measuring range and type of radiation	28
7.3 Rated ranges of the influence quantities	28
7.4 Maximum rated measurement time t_{\max}	28
7.5 Reusability.....	28
7.6 Model function	28
7.7 Example for the capabilities of a dosimetry system	29
8 Requirements for the design of the dosimetry system	29
8.1 General.....	29
8.2 Indication of the dose value (dosimetry system).....	29
8.3 Assignment of the dose value to the dosimeter (dosimetry system).....	30
8.4 Information given on the devices (reader and dosimeter)	30
8.5 Retention and removal of radioactive contamination (dosimeter).....	30
8.6 Algorithm to evaluate the indicated value (dosimetry system).....	30
8.7 Use of dosimeters in mixed radiation fields (dosimetry system).....	31
9 Instruction manual	31
9.1 General.....	31
9.2 Specification of the technical data.....	31
10 Software, data and interfaces of the dosimetry system	32
10.1 General.....	32
10.2 Design and structure of the software	33
10.2.1 Requirements	33

10.2.2	Method of test.....	33
10.3	Identification of the software	33
10.3.1	Requirements	33
10.3.2	Method of test.....	33
10.4	Authenticity of the software and the presentation of results.....	33
10.4.1	Requirements	33
10.4.2	Method of test.....	34
10.5	Alarm and stop of system operation under abnormal operating conditions.....	34
10.5.1	Requirements	34
10.5.2	Method of test.....	34
10.6	Control of input data by the dosimetry system.....	35
10.6.1	Requirements	35
10.6.2	Method of test.....	35
10.7	Storage of data	35
10.7.1	Requirements	35
10.7.2	Method of test.....	36
10.8	Transmission of data.....	36
10.8.1	Requirements	36
10.8.2	Method of test.....	36
10.9	Hardware interfaces and software interfaces.....	37
10.9.1	Requirements	37
10.9.2	Method of test.....	37
10.10	Documentation for the software test.....	37
10.10.1	Requirements	37
10.10.2	Method of test.....	38
11	Radiation performance requirements and tests (dosimetry system).....	38
11.1	General.....	38
11.2	Coefficient of variation	39
11.3	Non-linearity	39
11.3.1	Requirements	39
11.3.2	Method of test.....	39
11.3.3	Interpretation of results.....	39
11.4	Overload characteristics, after-effects, and reusability	41
11.4.1	Requirements	41
11.4.2	Method of test.....	41
11.4.3	Interpretation of the results.....	41
11.5	Radiation energy and angle of incidence for $H_p(10)$ or $H^*(10)$ dosimeters.....	42
11.5.1	Photon radiation	42
11.5.2	Beta radiation	44
11.6	Radiation energy and angle of incidence for $H_p(3)$ or $H'(3)$ dosimeters	44
11.6.1	Photon radiation	44
11.6.2	Beta radiation	46
11.7	Radiation energy and angle of incidence for $H_p(0,07)$ or $H'(0,07)$ dosimeters	47
11.7.1	Photon radiation	47
11.7.2	Beta radiation	49
11.8	Over-response indication due to radiation incidence incident from the side of an $H_p(10)$, $H_p(3)$ or $H_p(0,07)$ dosimeter	50
11.8.1	Requirements	50
11.8.2	Method of test.....	50

11.8.3	Interpretation of the results	51
11.9	Indication of the presence of beta dose for $H_p(0,07)$ whole body dosimeters	51
12	Response to mixed irradiations (dosimetry system)	51
12.1	Requirements	51
12.2	Method of test	52
12.2.1	General	52
12.2.2	Preparation of the test	52
12.2.3	Practical test	52
12.3	Interpretation of the results	53
13	Environmental performance requirements and tests	53
13.1	General	53
13.1.1	General requirement	53
13.1.2	General method of test	53
13.2	Ambient temperature and relative humidity (dosemeter)	54
13.2.1	General	54
13.2.2	Requirements	54
13.2.3	Method of test	54
13.2.4	Interpretation of the results	55
13.3	Light exposure (dosemeter)	55
13.3.1	General	55
13.3.2	Requirements	55
13.3.3	Method of test	55
13.3.4	Interpretation of the results	56
13.4	Dose build-up, fading and self-irradiation, and response to natural radiation (dosemeter)	56
13.4.1	General	56
13.4.2	Requirements	56
13.4.3	Method of test	56
13.4.4	Interpretation of the results	57
13.5	Sealing (dosemeter)	58
13.6	Reader stability (reader)	58
13.6.1	General	58
13.6.2	Requirements	58
13.6.3	Method of test	58
13.6.4	Interpretation of the results	58
13.7	Ambient temperature (reader)	59
13.7.1	General	59
13.7.2	Requirements	59
13.7.3	Method of test	59
13.7.4	Interpretation of the results	59
13.8	Light exposure (reader)	60
13.8.1	General	60
13.8.2	Requirements	60
13.8.3	Method of test	60
13.8.4	Interpretation of the results	60
13.9	Primary power supply (reader)	61
13.9.1	General	61
13.9.2	Requirements	61
13.9.3	Method of test	61

iTech Standards
<https://standards.itoh.at/>
 Document Preview

https://standards.iteh.ai/catalog/standards/sist/62387-2020/iec-62387-2020

13.9.4	Interpretation of the results	61
14	Electromagnetic performance requirements and tests (dosimetry system)	62
14.1	General	62
14.2	Requirements	62
14.3	Method of test	62
14.4	Interpretation of the results	63
15	Mechanical performance requirements and tests	63
15.1	General requirement	63
15.2	Drop (dosemeter)	64
15.2.1	Requirements	64
15.2.2	Method of test	64
15.2.3	Interpretation of the results	64
16	Documentation	64
16.1	Type test report	64
16.2	Certificate issued by the laboratory performing the type test	65
Annex A	(normative) Confidence limits	79
A.1	General	79
A.2	Confidence interval for the mean, \bar{x}	80
A.3	Confidence interval for a combined quantity	80
Annex B	(informative) Causal connection between readout signals, indicated value and measured value	82
Annex C	(informative) Overview of the necessary actions that have to be performed for a type test according to this document	83
Annex D	(informative) Usage categories of passive dosimeters	84
Annex E	D (informative) Uncertainty of dosimetry systems	85
Annex F	(informative) Conversion coefficients $h_{pK}(3;\alpha)$, $h_{pK}(0,07;\alpha)$, and $h'_{K}(0,07;\alpha)$ from air kerma, K_a, to the dose equivalent $H_p(3)$, $H_p(0,07)$, and $H'(0,07)$, respectively, for radiation qualities defined in ISO 4037-1	86
Annex G	(informative) Conversion coefficients $h_{pD}(0,07;source;\alpha)$ and $h_{pD}(3;source;\alpha)$ from personal absorbed dose in 0,07 mm depth, $D_p(0,07)$, to the dose equivalent $H_p(0,07)$ and $H_p(3)$, respectively, for radiation qualities defined in ISO 6980-1	87
Annex E	(informative) Conversion coefficients $h_{pD}(0,07;source;\alpha)$, $h'_{D}(0,07;source;\alpha)$, $h_{pD}(3;source;\alpha)$, and $h'_{D}(3;source;\alpha)$ from personal absorbed dose in 0,07 mm depth, $D_p(0,07)$, to the corresponding dose equivalent quantities for radiation qualities defined in ISO 6980-1	89
Annex H	F (informative) Computational method of test for mixed irradiations	93
	Bibliography	95
	Figure 1 – Stepwise irradiation of an $H^*(10)$ dosimeter at 90° angle of incidence	43
	Figure A.1 – Test for confidence interval	79
	Figure B.1 – Data evaluation in dosimetry systems	82
	Figure F.1 – Flow chart of a computer program to perform tests according to 12.2	94
	Table 1 – Mandatory and maximum energy ranges covered by this document	11
	Table 2 – Values of c_1 and c_2 for w different dose values and n indications for each dose value	40
	Table 3 – Angular irradiations Angles of incidence of irradiation for $H_p(10)$ and $H^*(10)$ dosimeters	42

Table 4 – Angular irradiations Angles of incidence of irradiation for $H_p(3)$ and $H'(3)$ dosimeters	45
Table 5 – Angles of incidence of irradiation for $H_p(0,07)$ and $H'(0,07)$ dosimeters	48
Table 6 – Symbols	66
Table 7 – Reference conditions and standard test conditions	69
Table 8 – Performance requirements for $H_p(10)$ dosimeters	70
Table 9 – Performance requirements for $H_p(3)$ dosimeters	71
Table 10 – Performance requirements for $H_p(0,07)$ dosimeters	72
Table 11 – Performance requirements for $H^*(10)$ dosimeters	73
Table 12 – Performance requirements for $H'(3)$ dosimeters	74
Table 13 – Performance requirements for $H'(0,07)$ dosimeters	75
Table 14 – Environmental performance requirements for dosimeters and readers	76
Table 15 – Electromagnetic disturbance performance requirements for dosimetry systems according to Clause 14	77
Table 16 – Mechanical disturbances performance requirements for dosimeters	78
Table 17 – List of abbreviations	78
Table A.1 – Student's t -value for a double sided 95 % confidence interval	80
Table C.1 – Schedule for a type test of a dosimeter for $H_p(10)$ fulfilling the requirements within the mandatory ranges	83
Table D.1 – Usage categories of passive dosimeters	
Table F.1 – Conversion coefficients $h_{pK}(3;N,\alpha)$ from air kerma, K_a, to the dose equivalent $H_p(3)$ for radiation qualities defined in ISO 4037-1 and for the slab phantom, reference distance 2 m	
Table F.2 – Conversion coefficients $h_{pK}(3;S,\alpha)$ and $h_{pK}(3;R,\alpha)$ from air kerma, K_a, to the dose equivalent $H_p(3)$ for radiation qualities defined in ISO 4037-1 and for the slab phantom	
Table F.3 – Conversion coefficients $h_{pK}(0,07;S,\alpha)$ and $h_{pK}(0,07;R,\alpha)$ from air kerma, K_a, to the dose equivalent $H_p(0,07)$ for radiation qualities defined in ISO 4037-1 and for the rod, pillar, and slab phantom	
Table F.4 – Conversion coefficients $h'_{pK}(0,07;N,\alpha)$, $h'_{pK}(0,07;S,\alpha)$, and $h'_{pK}(0,07;R,\alpha)$ from air kerma, K_a, to $H'(0,07)$ for radiation qualities defined in ISO 4037-1	
Table G.1 – Measured conversion coefficients $h_{pD}(3;source;\alpha)$ from personal absorbed dose in 0,07 mm depth, $D_p(0,07)$, to the dose equivalent $H_p(3)$ for the slab phantom for radiation qualities defined in ISO 6980-1	
Table G.2 – Measured conversion coefficients $h_{pD}(0,07;source;\alpha)$ from personal absorbed dose in 0,07 mm depth, $D_p(0,07)$, to the dose equivalent $H_p(0,07)$ for the slab phantom for radiation qualities defined in ISO 6980-1	
Table E.1 – Conversion coefficients $h_{pD}(0,07;source;\alpha)_{\text{slab}}$ from personal absorbed dose in 0,07 mm depth, $D_p(0,07)$, to the dose equivalent $H_p(0,07)$ for the slab phantom for radiation qualities defined in ISO 6980-1	89
Table E.2 – Conversion coefficients $h_{pD}(0,07;source;\alpha)_{\text{rod}}$ from personal absorbed dose in 0,07 mm depth, $D_p(0,07)$, to the dose equivalent $H_p(0,07)$ for the rod phantom for radiation qualities defined in ISO 6980-1	90
Table E.3 – Conversion coefficients $h'_{pD}(0,07;source;\alpha)$ from personal absorbed dose in 0,07 mm depth, $D_p(0,07)$, to the dose equivalent $H'(0,07)$ for the ICRU sphere for radiation qualities defined in ISO 6980-1	91
Table E.4 – Conversion coefficients $h_{pD}(3;source;\alpha)_{\text{cylinder}}$ from personal absorbed dose in 0,07 mm depth, $D_p(0,07)$, to the dose equivalent $H_p(3)$ for the cylinder phantom for radiation qualities defined in ISO 6980-1	92

Table E.5 – Conversion coefficients $h'_D(3;source;\alpha)$ from personal absorbed dose in 0,07 mm depth, $D_p(0,07)$, to the dose equivalent $H'(3)$ for the ICRU sphere for radiation qualities defined in ISO 6980-1.....	92
Table F.1 – Example of dosimeter response table and range limits	93

iTeh Standards
(<https://standards.itih.ai>)
Document Preview

[IEC 62387:2020](#)

<https://standards.itih.ai/catalog/standards/iec/355f0b34-d1ca-4cd2-8eb3-dba13f7830a0/iec-62387-2020>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

RADIATION PROTECTION INSTRUMENTATION –
~~PASSIVE INTEGRATING~~ DOSIMETRY SYSTEMS WITH INTEGRATING
PASSIVE DETECTORS FOR ~~PERSONAL~~ INDIVIDUAL, WORKPLACE AND
ENVIRONMENTAL MONITORING OF PHOTON AND BETA RADIATION

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 62387 has been prepared by subcommittee 45B: Radiation protection instrumentation, of IEC technical committee 45: Nuclear instrumentation.

This second edition cancels and replaces the first edition of IEC 62387 published in 2012. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- Modification of title.
- Addition of performance requirements for dosimeters to measure $H'(3)$ for both photon and beta radiation.
- Adoption of the cylinder instead of the slab phantom for the quantity $H_p(3)$.
- Correction and clarification of several subclauses to obtain a better applicability.

The text of this standard is based on the following documents:

FDIS	Report on voting
45B/945/FDIS	45B/954/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

A dosimetry system may consist of the following elements:

- a) a passive device, referred to herein as a *detector*, which, after the exposure to radiation, stores a signal for use in measuring one or more quantities of the incident radiation field;
- b) a “dosemeter”, that incorporates some means of identification and contains one or more detectors and may contain electronic components, e.g. for the readout (e.g., in a direct ion storage (DIS) dosimeter);
- c) a “reader” which is used to readout the stored information (signal) from the detector, in order to determine the radiation dose;
- d) a “computer” with appropriate “software” to control the reader, store the signals transmitted from the reader, calculate, display and store the evaluated dose in the form of an electronic file or paper copy;
- e) “additional equipment” and documented procedures (instruction manual) for performing associated processes such as deleting stored dose information, cleaning dosimeters, or those needed to ensure the effectiveness of the whole system.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC 62387:2020](#)

<https://standards.iteh.ai/catalog/standards/iec/355f0b34-d1ca-4cd2-8eb3-dba13f7830a0/iec-62387-2020>

RADIATION PROTECTION INSTRUMENTATION – **PASSIVE-INTEGRATING** DOSIMETRY SYSTEMS WITH INTEGRATING **PASSIVE DETECTORS FOR PERSONAL** INDIVIDUAL, WORKPLACE AND ENVIRONMENTAL MONITORING OF PHOTON AND BETA RADIATION

1 Scope

This document applies to all kinds of passive dosimetry systems that are used for measuring:

- the personal dose equivalent $H_p(10)$ (for individual whole body ~~dosimetry~~ monitoring),
- the personal dose equivalent $H_p(3)$ (for individual eye lens ~~dosimetry~~ monitoring),
- the personal dose equivalent $H_p(0,07)$ (for both individual whole body skin and local skin for extremity ~~dosimetry~~ monitoring),
- the ambient dose equivalent $H^*(10)$ (for workplace and environmental ~~dosimetry~~ monitoring),
- the directional dose equivalent $H'(3)$ (for workplace and environmental monitoring), or
- the directional dose equivalent $H'(0,07)$ (for workplace and environmental ~~dosimetry~~ monitoring).

NOTE 1—The term “environmental dosimetry” means ambient, area, and environmental monitoring in this standard.

This document applies to dosimetry systems that measure external photon and/or beta radiation in the dose range between 0,01 mSv and 10 Sv and in the energy ranges given in Table 1. All the energy values are mean energies with respect to the ~~prevailing dose quantity~~ fluence. The dosimetry systems usually use electronic devices for the data evaluation and thus are often computer controlled.

IEC 62387:2020
 Table 1 – Mandatory and maximum energy ranges covered by this document

Measuring quantity	Mandatory mean energy range for photon radiation	Maximum mean energy range for testing photon radiation	Mandatory mean energy range for beta-particle radiation ^a	Maximum mean energy range for testing beta-particle radiation ^a
$H_p(10)$, $H^*(10)$	80 keV to 1,25 MeV ^b	12 keV to 10 7 MeV	–	–
$H_p(3)$, $H'(3)$	30 keV to 250 keV	8 keV to 10 7 MeV	0,8 MeV ^c almost equivalent to an E_{max} of 2,27 MeV	0,7 MeV ^{b,c} to 1,2 MeV almost equivalent to E_{max} from 2,27 MeV to 3,54 MeV
$H_p(0,07)$, $H'(0,07)$	30 keV to 250 keV	8 keV to 10 MeV 1,25 MeV ^b	0,24 MeV to 0,8 MeV almost equivalent to an E_{max} of 2,27 MeV	0,06 MeV ^e to 1,2 MeV almost equivalent to E_{max} from 0,225 MeV to 3,54 MeV 0,07 MeV ^d to 1,2 MeV ^e

^a The following beta radiation sources are suggested for the different mean energies: For 0,06 MeV: ¹⁴⁷Pm; for 0,8 MeV: ⁹⁰Sr/⁹⁰Y; for 1,2 MeV: ¹⁰⁶Ru/¹⁰⁶Rh.

^b 1,25 MeV is the mean energy of photon radiation from ⁶⁰Co.

^{b,c} For beta-particle radiation, an energy of 0,7 MeV is required to reach the radiation sensitive layers of the eye lens in a depth of about 3 mm (approximately 3 mm of ICRU tissue).

^{c,d} For beta-particle radiation, an energy of 0,07 MeV is required to penetrate the dead layer of skin of 0,07 mm (approximately 0,07 mm of ICRU tissue).

^e 0,07 MeV, 0,8 MeV and 1,2 MeV beta mean energy are almost equivalent to an E_{max} of 0,225 MeV, 2,27 MeV and 3,54 MeV, respectively.

NOTE 21 In this document, “dose” means dose equivalent, unless otherwise stated.

NOTE 32 For $H_p(10)$ and $H^*(10)$ no beta radiation is considered. Reasons:

- a) $H_p(10)$ and $H^*(10)$ are a conservative estimate for the effective dose which is not a suitable quantity for beta radiation.
- b) No conversion coefficients are available in ICRU 56, ICRU 57 or ISO 6980-3.

NOTE 43 The maximum energy ranges are the energy limits within which type tests according to this document are possible.

NOTE 4 Direct ion storage (DIS) dosimeters are covered in this document as they are often operated without an online display but a separate reader.

The test methods concerning the design (Clause 8), the instruction manual (Clause 9), the software (Clause 10), environmental influences (Clause 13), electromagnetic influences (Clause 14), mechanical influences (Clause 15), and the documentation (Clause 16) are independent of the type of radiation. Therefore, they can also be applied to other dosimetry systems, e.g. for neutrons, utilizing the corresponding type of radiation for testing.

This document is intended to be applied to dosimetry systems that are capable of evaluating doses in the required quantity and unit (Sv) from readout signals in any quantity and unit. The only correction that may be applied to the evaluated dose (indicated value) is the one resulting from natural background radiation using extra dosimeters.

NOTE 5 The correction due to natural background can be made before or after the dose calculation.

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.

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 61000-4-11, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*