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Responsible committee: NCE/2 Radiation protection and measurement

Interested committees:

Title: BS EN IEC 61577-6 Radiation protection instrumentation - Radon and radon decay product measuring instruments

Part 6: Passive integrating radon measurement systems using solid-state nuclear track detectors

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

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- ii) affects other national standard(s)
- iii) requires additional national guidance or information

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

PROJECT NUMBER:

IEC 61577-6 ED1

DATE OF CIRCULATION:

2023-04-14

CLOSING DATE FOR COMMENTS:

2023-07-07

SUPERSEDES DOCUMENTS:

45B/990/NP, 45B/1001A/RVN

IEC SC 45B : RADIATION PROTECTION INSTRUMENTATION

SECRETARIAT:

France

SECRETARY:

Mr Miroslav Voytchev

OF INTEREST TO THE FOLLOWING COMMITTEES:

PROPOSED HORIZONTAL STANDARD:



Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC☐ ENVIRONMENT☐ QUALITY ASSURANCE☐ SAFETY

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (See [AC/22/2007](#) or [NEW GUIDANCE DOC](#)).

TITLE:

**Radiation protection instrumentation – Radon and radon decay product measuring instruments – Part 6:
Passive integrating radon measurement systems using solid-state nuclear track detectors**

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Radiation protection instrumentation –
Radon and radon decay product measuring instruments –
Part 6: passive integrating radon measurement systems
using solid-state nuclear track detectors**

FOREWORD

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

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

FDIS	Report on voting
45B/XX/FDIS	45B/XX/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 maintenance result date¹ 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.

¹ The National Committees are requested to note that for this publication the maintenance result date is

INTRODUCTION

Radon is a radioactive gas produced by the decay of ^{226}Ra , ^{223}Ra and ^{224}Ra , respectively decay products of ^{238}U , ^{235}U and ^{232}Th , which are present in the earth's crust. By decay, radon isotopes (i.e. ^{222}Rn , ^{219}Rn , ^{220}Rn) produce three decay chains ending in a stable lead isotope.

Note In normal conditions, due to the very short half-life of ^{219}Rn , its activity and the activity of its RnDP² are considered negligible compared to the activity of the two other series. Its health effects are therefore not important. Thus, in this standard ^{219}Rn and its decay products are not considered.

Radon isotopes and their corresponding short-lived Radon Decay Products (RnDP) (i.e. ^{218}Po , ^{214}Pb , ^{214}Bi , ^{214}Po for ^{222}Rn , and ^{216}Po , ^{212}Pb , ^{212}Bi , ^{212}Po , ^{208}Tl for ^{220}Rn) are of considerable importance, as they constitute the major part of the radiological exposure to natural radioactivity for the general public and workers. In some workplaces, for instance in underground mines, spas and waterworks, the workers are exposed to very significant levels of RnDP. These radionuclides are present in variable quantities in the air, in a gaseous form for the radon isotopes, and as very fine particles for the decay products. It is worthwhile for health physicists to be able to measure with a great accuracy the level of this kind of natural radioactivity in the atmosphere. Because of the very particular behaviour of these radioactive elements in the atmosphere and in the corresponding measuring instruments, it is necessary to formalize the way such instruments could be tested.

Remark:

In order to facilitate its use, the IEC 61577 series is divided into the following different parts:

IEC 61577-1: This emphasizes the terminology and units of the specific field of radon and radon decay products (RnDP) measurement techniques and presents briefly the concept of System for Test Atmospheres with Radon (STAR) used for test and calibration of radon and RnDP measuring devices.

IEC 61577-2: This part is dedicated to the tests of ^{222}Rn and ^{220}Rn measuring instruments.

IEC 61577-3: This part is dedicated to the tests of RnDP₂₂₂ and RnDP₂₂₀ measuring instruments.

IEC 61577-4: Details how a STAR is constructed and how it can be used for testing.

IEC TR 61577-5: This part provides basic data and technical information to support the design of measuring instruments for ^{222}Rn , ^{220}Rn and their decay products and practical application of the instruments for the measurement.

IEC 61577-6: This part is dedicated to the tests of passive integrating ^{222}Rn measurement systems.

² RnDP is the acronym of Radon Decay Products and it is equivalent to Radon Progeny (see [1] in the Bibliography).

**Radiation protection instrumentation –
Radon and radon decay product measuring instruments –
Part 6: Passive integrating radon measurement systems
using solid-state nuclear track detectors**

1 Scope

This part of IEC 61577 describes the specific requirements for instruments measuring the exposure to airborne radon (^{222}Rn) outdoors and indoors. The exposure is time-integrated activity concentration accumulated over the exposure period in those places.

This standard applies to most commonly used radon integrating measurement system using solid-state nuclear track detectors (SSNTD) incorporated in a close volume. The air containing ^{222}Rn enters the sensitive volume by diffusion.

2 Normative references

The following referenced documents are indispensable for the application 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 62706, *Radiation Protection Instrumentation – Environmental, electromagnetic and mechanical requirements*

IEC 61577-1, *Radiation protection instrumentation – Radon and radon decay product measuring instruments - Part 1: General principles*

IEC 61577-2, *Radiation protection instrumentation – Radon and radon decay product measuring instruments - Part 2: Specific requirements for ^{222}Rn and ^{220}Rn measuring instruments*

IEC 61577-4, *Radiation protection instrumentation – Radon and radon decay product measuring instruments - Part 4: Equipment for the production of reference atmospheres containing radon isotopes and their decay products (STAR)*

IEC TR 61577-5, *Radiation protection instrumentation – Radon and radon decay product measuring instruments - Part 5: General properties of radon and radon decay products and their measurement methods*

ISO/IEC Guide 98-3, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO 11665-1, *Measurement of radioactivity in the environment – Air: radon-222 - Part 1: Origins of radon and its short-lived decay products and associated measurement methods*

ISO 11665-4, *Measurement of radioactivity in the environment – Air: radon-222 - Part 4: Integrated measurement method for determining average activity concentration using passive sampling and delayed analysis*

75 ISO 16641, *Measurement of radioactivity in the environment – Air – radon-220: Integrated*
 76 *measurement methods for the determination of the average activity concentration using*
 77 *passive solid-state nuclear track detectors*

78 **3 Terms and definitions, abbreviations and symbols, quantities and units**

79 **3.1 Terms and definitions**

80 For the purposes of this document, the following terms and definitions, as well as those given
 81 in IEC 60050-395 apply.

82 **3.1.1**

83 **activity**

84 number dN of spontaneous nuclear transitions or nuclear disintegrations for a radionuclide of
 85 amount N produced during a short time interval dt , divided by this time interval

86 [SOURCE: IEC 60050-395]

87 **3.1.2**

88 **activity concentration**

89 activity per unit volume of the sample

90 [SOURCE: IEC 60050-395]

91 **3.1.3**

92 **calibration factor of passive detectors**

93 relation between the exposure to radon provided by measurement standard and the
 94 corresponding average indication of a batch of passive detectors processed under identical
 95 conditions

96 **3.1.4**

97 **characteristic diffusion time**

98 time required for a trace gas to enter a diffusion chamber and reach at least 90% of its
 99 external concentration within the chamber.

100 **3.1.5**

101 **coefficient of variation**

102 ratio V of the standard deviation s to the arithmetic mean x_m of a set of n measurements x_i
 103 given by the following formula:

$$104 \quad V = \frac{s}{x_m} = \frac{1}{x_m} \sqrt{\frac{\sum (x_i - x_m)^2}{n-1}},$$

105 Note 1 to entry: The coefficient of variation can be expressed in percent (%) of the arithmetic
 106 mean.

107 [SOURCE: IEC 61577-2].

108 **3.1.6**

109 **conventional true value of a quantity**

110 ν_c

111 value attributed to a particular quantity and accepted, sometimes by convention, as having an
 112 uncertainty appropriate for a given purpose.

113 Note 1 to entry: "Conventional true value of a quantity" is sometimes called assigned value,
 114 best estimate of the value, conventional value or reference value.