

Radiation protection instrumentation — Radon and radon decay product measuring instruments —

Part 1: General principles

ICS 13.280

National foreword

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Radon and radon decay product
measuring instruments –**

**Part 1:
General principles**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

RADIATION PROTECTION INSTRUMENTATION – RADON AND RADON DECAY PRODUCT MEASURING INSTRUMENTS –

Part 1: General principles

FOREWORD

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International Standard IEC 61577-1 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 published in 2000. This edition constitutes a technical revision.

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

- a) new structure of the series (see Annex A);
- b) proposal for classification of instruments used for measuring radon and RnDP.

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

FDIS	Report on voting
45B/496/FDIS	45B/508/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.

A list of all the parts of the IEC 61577 series, under the general title *Radiation protection instrumentation – Radon and radon decay product measuring instruments*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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- withdrawn;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.

INTRODUCTION

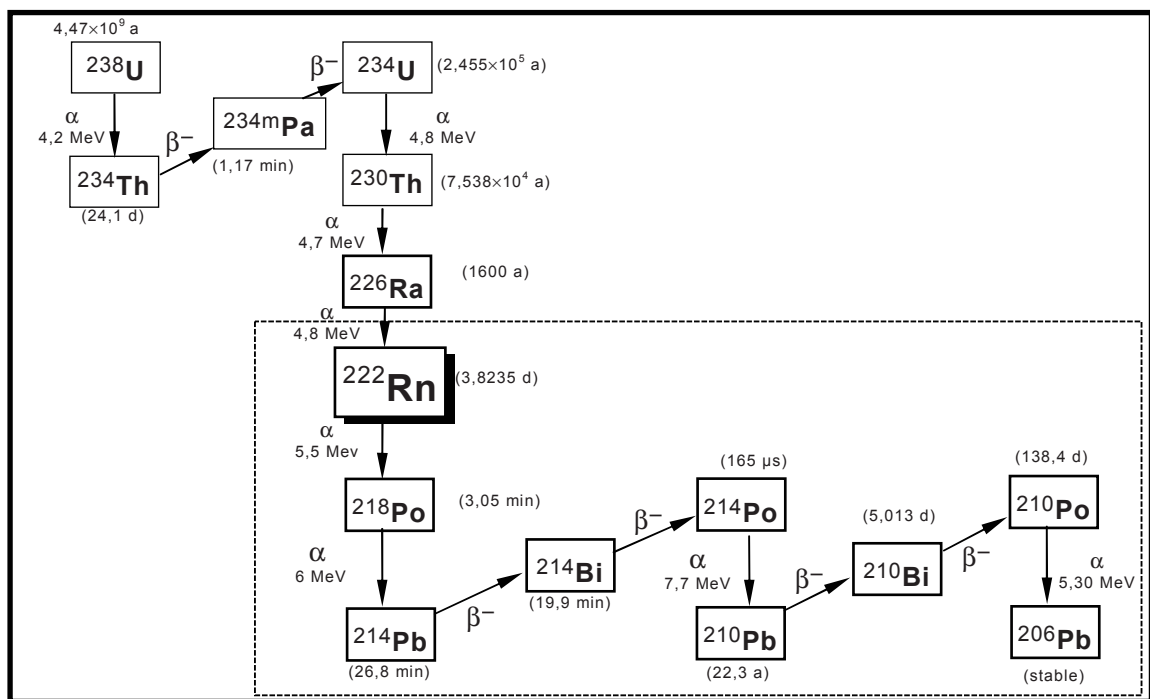
Radon is a radioactive gas produced by the decay of ^{226}Ra , ^{223}Ra and ^{224}Ra , respectively decay products of ^{238}U , ^{235}U and ^{232}Th , which are present in the earth's crust. By decay, radon isotopes (i.e. ^{222}Rn , ^{219}Rn , ^{220}Rn) produce three decay chains ending in a stable lead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

NOTE 1 In normal conditions, due to the very short half-life of ^{219}Rn , its activity and the activities of its RnDP are considered negligible compared to the activity of the other two series. Its health effects are therefore not important. Thus, in this standard, ^{219}Rn and its decay products are not considered.

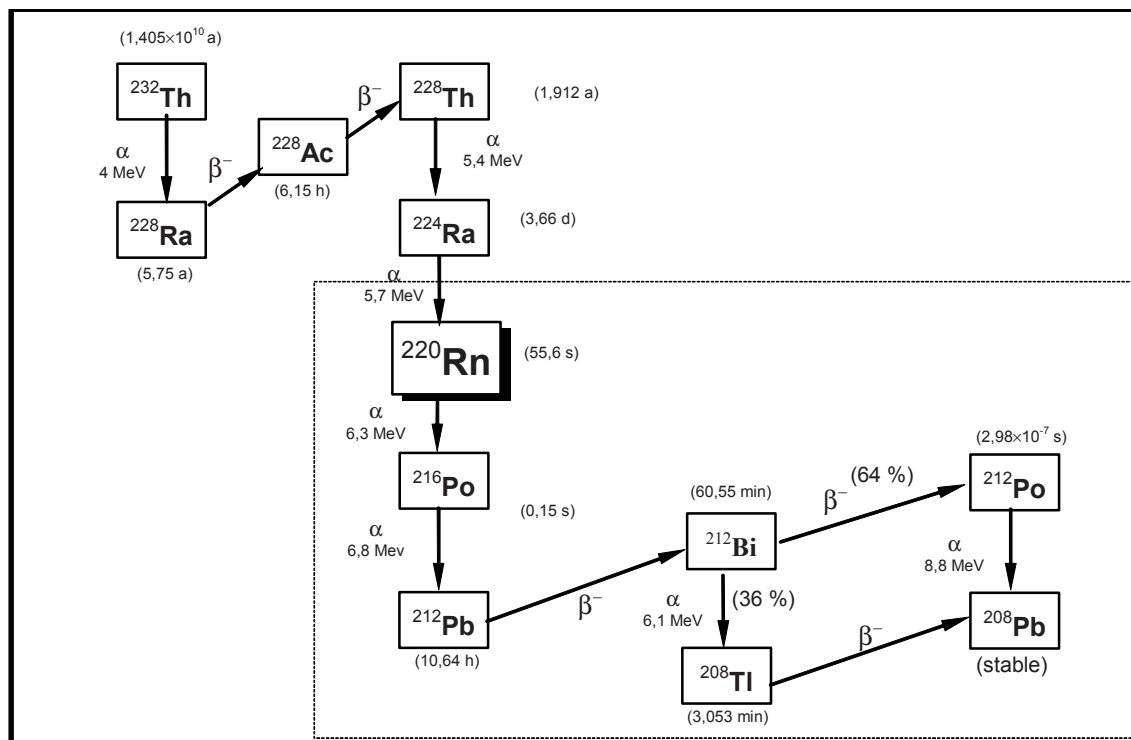
Radon isotopes and their corresponding short-lived radon decay products (RnDP) (i.e., ^{218}Po , ^{214}Pb , ^{214}Bi , ^{214}Po for ^{222}Rn , and ^{216}Po , ^{212}Pb , ^{212}Bi , ^{212}Po , ^{208}Tl for ^{220}Rn) (see Figures 1 and 2) are of considerable importance, as they constitute the major part 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 worth while for health physicists to be able to measure with 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 corresponding measuring instruments, it is necessary to regulate the way such instruments could be tested [1], [2]¹.

NOTE 2 The nuclear data of Figures 1 and 2 refer to ICRP 38, because this standard applies mainly to instruments used for radiation protection purposes.

¹ Figures in square brackets refer to the Bibliography.



IEC 1119/06

Figure 1 – ^{238}U decay chain

IEC 1120/06

Figure 2 – ^{232}Th decay chain

RADIATION PROTECTION INSTRUMENTATION – RADON AND RADON DECAY PRODUCT² MEASURING INSTRUMENTS –

Part 1: General principles

1 Scope and object

The IEC 61577 series covers the general features concerning test and calibration of radon and radon decay product measuring instruments.

This standard addresses only the instruments and associated methods for measuring isotopes 220 and 222 of radon and their subsequent short-lived decay products in gases.

Its object is to help to define type tests which have to be conducted in order to qualify these instruments.

NOTE These type tests will be described in the future IEC 61577-2-1, IEC 61577-2-2, IEC 61577-3-1 and IEC 61577-3-2 (see IEC 61577 structure in Annex A).

For the suitability of the document, this standard also proposes a classification of the instruments measuring radon or RnDP based on the duration of sampling.

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 61577 (all parts), *Radiation protection instrumentation – Radon and radon decay product measuring instruments*

3 Terms, definitions and units

For the purposes of this document, the following terms and definitions apply.

NOTE 1 Throughout the whole document, the term “radon” is used to denote all the radon isotopes which are concerned by this standard. When a particular isotope is to be referred to, it will be indicated by its chemical symbol preceded by its mass number (for example, ²²⁰Rn, ²²²Rn).

NOTE 2 The term “radon decay product” or its abbreviation (RnDP) denotes the whole set of short-lived decay products, which are concerned by this standard. A particular isotope is indicated by its chemical symbol preceded by its mass number. The subscripts ²²², ²²⁰ added to the symbol RnDP refer to the whole set of short-lived decay products of the corresponding radon isotope (²¹⁸Po, ²¹⁴Pb, ²¹⁴Bi, ²¹⁴Po), (²¹⁶Po, ²¹²Pb, ²¹²Bi, ²¹²Po, ²⁰⁸Tl).

NOTE 3 All the nuclear data used in this standard refer to ICRP 38, because this standard applies mainly for instruments used for radiation protection purposes.

² The term “decay product” is used in the whole document instead of “daughters” or “progeny” following the recommendation of K. Ph. HOPKE, in Health Physics, vol. 64, No. 5, May 1993, p. 459.