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 11665-1:2012)

EESTI STANDARDIKESKUS
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EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 11665-1:2015 sisaldab Euroopa standardi EN ISO 11665-1:2015 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 11665-1:2015 consists of the English text of the European standard EN ISO 11665-1:2015.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 16.09.2015.	Date of Availability of the European standard is 16.09.2015.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

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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 11665-1:2012)

Mesurage de la radioactivité dans l'environnement - Air: radon 222 - Partie 1: Origine du radon et de ses descendants à vie courte, et méthodes de mesure associées (ISO 11665-1:2012)

Ermittlung der Radioaktivität in der Umwelt - Luft: Radon-222 - Teil 1: Radon und seine kurzlebigen Folgeprodukte: Quellen und Messverfahren (ISO 11665-1:2012)

This European Standard was approved by CEN on 12 June 2015.

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European foreword

The text of ISO 11665-1:2012 has been prepared by Technical Committee ISO/TC 85 “Nuclear energy, nuclear technologies, and radiological protection” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 11665-1:2015 by Technical Committee CEN/TC 430 “Nuclear energy, nuclear technologies, and radiological protection” the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2016, and conflicting national standards shall be withdrawn at the latest by March 2016.

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Endorsement notice

The text of ISO 11665-1:2012 has been approved by CEN as EN ISO 11665-1:2015 without any modification.

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Introduction

Radon isotopes 222, 220 and 219 are radioactive gases produced by the disintegration of radium isotopes 226, 224 and 223, which are decay products of uranium-238, thorium-232 and uranium-235 respectively, and are all found in the earth's crust (see Annex A for further information). Solid elements, also radioactive, followed by stable lead are produced by radon disintegration[1].

Radon is considered a noble gas in the periodic table of elements, along with helium, argon, neon, krypton and xenon.

When disintegrating, radon emits alpha particles and generates solid decay products, which are also radioactive (polonium, bismuth, lead, etc.). The potential effects on human health of radon lie in its decay products rather than the gas itself. Whether or not they are attached to atmospheric aerosols, radon decay products can be inhaled and deposited in the bronchopulmonary tree to varying depths according to their size[2][3][4][5].

Radon is today considered to be the main source of human exposure to natural radiation. The UNSCEAR (2006) report[6] suggests that, at the worldwide level, radon accounts for around 52 % of global average exposure to natural radiation. The radiological impact of isotope 222 (48 %) is far more significant than isotope 220 (4 %), while isotope 219 is considered negligible (see Annex A). For this reason, references to radon in this part of ISO 11665 refer only to radon-222.

Radon activity concentration can vary by one to multiple orders of magnitude over time and space. Exposure to radon and its decay products varies tremendously from one area to another, as it depends firstly on the amount of radon emitted by the soil and the building materials in each area and, secondly, on the degree of containment and weather conditions in the areas where individuals are exposed.

The values usually found in the continental environment are normally between a few becquerels per cubic metre and several thousand becquerels per cubic metre. Activity concentrations of less than one becquerel per cubic metre may be observed in the oceanic environment. Radon activity concentrations vary inside houses from several tens of becquerels per cubic metre to several hundreds of becquerels per cubic metre[7]. Activity concentration can reach several thousands of becquerels per cubic metre in very confined spaces. Variations of a few nanojoules per cubic metre to several thousand nanojoules per cubic metre are observed for the potential alpha energy concentration of short-lived radon decay products.

ISO 11665 consists of 10 parts (see Figure 1) dealing with:

— measurement methods for radon-222 and its short-lived decay products (see ISO 11665-2, ISO 11665-3, ISO 11665-4, ISO 11665-5 and ISO 11665-6);

NOTE 1 There are many methods for measuring the radon-222 activity concentration and the potential alpha energy concentration of its short-lived decay products. The choice of measurement method will depend on the expected level of concentration and on the intended use of the data, such as scientific research and health-related assessments[8][9].

— measurement methods for the radon-222 exhalation rate (see ISO 11665-7 and ISO 11665-9);

NOTE 2 ISO 11665-7 refers back to ISO 11665-5 and ISO 11665-6.

— measurement methods for the radon-222 diffusion coefficient (see ISO 11665-10);

— methodologies for radon-222 measurements in buildings (see ISO 11665-8).

NOTE 3 ISO 11665-8 refers back to ISO 11665-4 for radon measurements for initial investigation purposes in a building and to ISO 11665-5, ISO 11665-6 and ISO 11665-7 for measurements for any additional investigation.

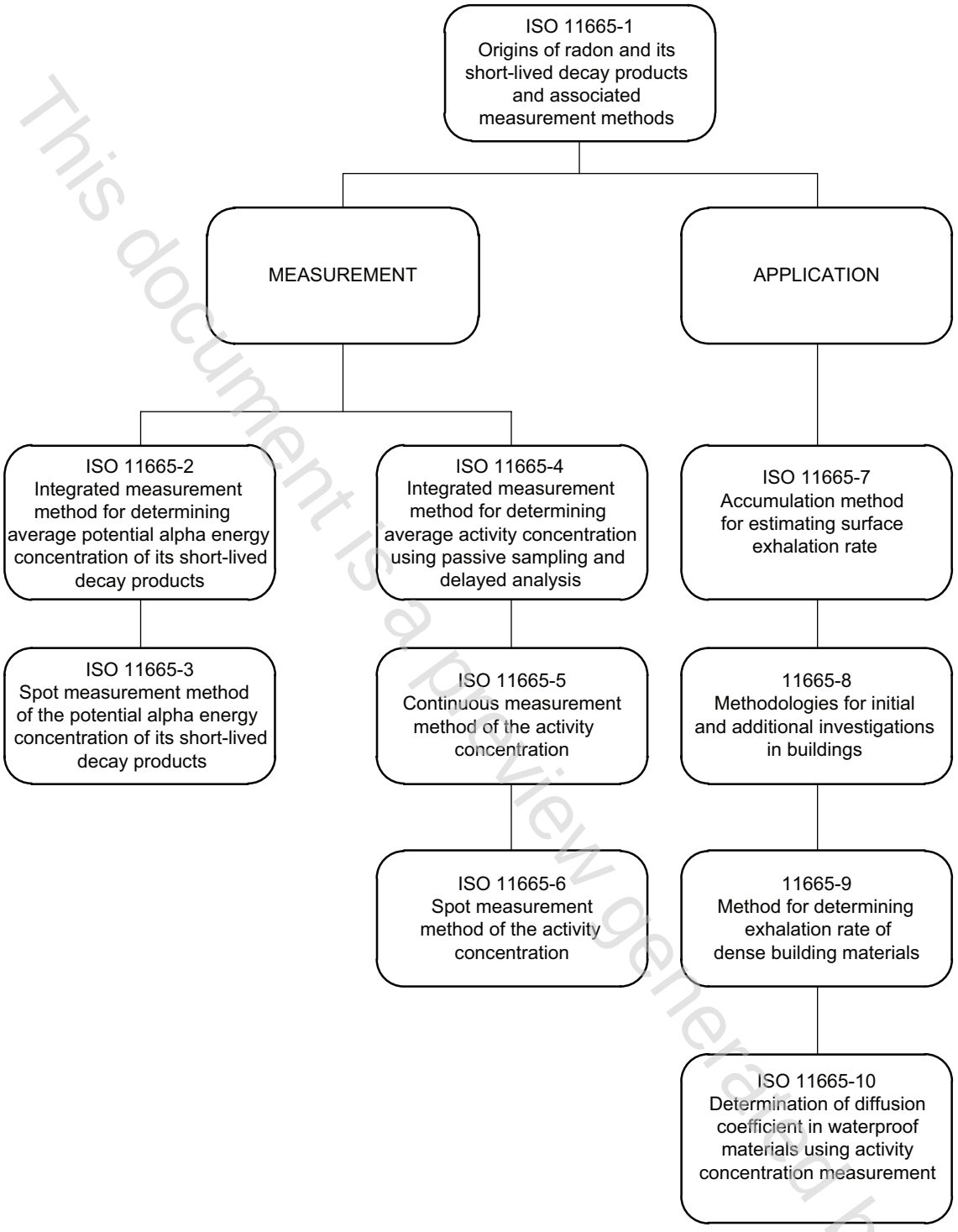

Figure 1 — Structure of the ISO 11665 series

Measurement of radioactivity in the environment — Air: radon-222 —

Part 1: Origins of radon and its short-lived decay products and associated measurement methods

1 Scope

This part of ISO 11665 outlines guidance for measuring radon-222 activity concentration and the potential alpha energy concentration of its short-lived decay products in the air.

The measurement methods fall into three categories:

a) spot measurement methods;

b) continuous measurement methods;

c) integrated measurement methods.

This part of ISO 11665 provides several methods commonly used for measuring radon-222 and its short-lived decay products in air.

This part of ISO 11665 also provides guidance on the determination of the inherent uncertainty linked to the measurement methods described in its different parts.

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.

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

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 radon measuring instruments*

IEC 61577-3, *Radiation protection instrumentation — Radon and radon decay product measuring instruments — Part 3: Specific requirements for radon decay product measuring instruments*

3 Terms, definitions and symbols

3.1 Terms and definitions

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

3.1.1
active sampling
sampling using active devices like pumps for sampling the atmosphere

[IEC 61577-1:2006]