

Measurement of radioactivity in the environment - Air: radon-222 - Part 3: Spot measurement method of the potential alpha energy concentration of its short-lived decay products (ISO 11665-3:2012)

## EESTI STANDARDI EESSÕNA

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English Version

Measurement of radioactivity in the environment - Air:  
radon-222 - Part 3: Spot measurement method of the  
potential alpha energy concentration of its short-lived  
decay products (ISO 11665-3:2012)

Mesurage de la radioactivité dans l'environnement -  
Air: radon 222 - Partie 3: Méthode de mesure  
ponctuelle de l'énergie alpha potentielle volumique de  
ses descendants à vie courte (ISO 11665-3:2012)

Ermittlung der Radioaktivität in der Umwelt - Luft:  
Radon-222 - Teil 3: Punktmessverfahren der  
potenziellen Alpha-Energiekonzentration der  
kurzlebigen Radon-Folgeprodukte (ISO 11665-3:2012)

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## European foreword

The text of ISO 11665-3:2012 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 11665-3:2015 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of an identical text or by endorsement, at the latest by March 2016, and conflicting national standards shall be withdrawn at the latest by March 2016.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 11665-3:2012 has been approved by CEN as EN ISO 11665-3:2015 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. Solid elements, also radioactive, followed by stable lead are produced by radon disintegration<sup>[1]</sup>.

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 solid 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.

Radon is today considered to be the main source of human exposure to natural radiation. The UNSCEAR (2006) report<sup>[2]</sup> 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. 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.

Variations of a few nanojoules per cubic metre to several thousand nanojoules per cubic metre are observed in the potential alpha energy concentration of short-lived radon decay products.

The potential alpha energy concentration of short-lived radon-222 decay products in the atmosphere can be measured by spot and integrated measurement methods (see ISO 11665-1 and ISO 11665-2). This part of ISO 11665 deals with spot measurement methods. A spot measurement of the potential alpha energy concentration relates to the time when the measurement is taken and has no significance in annual exposure. This type of measurement does not therefore apply when assessing the annual exposure.

**NOTE** The origin of radon-222 and its short-lived decay products in the atmospheric environment and other measurement methods are described generally in ISO 11665-1.

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

## Part 3: Spot measurement method of the potential alpha energy concentration of its short-lived decay products

### 1 Scope

This part of ISO 11665 describes spot measurement methods for determining the activity concentration of short-lived radon-222 decay products in the air and for calculating the potential alpha energy concentration.

This part of ISO 11665 gives indications for performing a spot measurement of the potential alpha energy concentration, after sampling at a given place for several minutes, and the conditions of use for the measuring devices.

This measurement method is applicable for a rapid assessment of the potential alpha energy concentration. The result obtained cannot be extrapolated to an annual estimate potential alpha energy concentration of short-lived radon-222 decay products. Thus, this type of measurement is not applicable for the assessment of annual exposure.

This measurement method is applicable to air samples with potential alpha energy concentration greater than 5 nJ/m<sup>3</sup>.

NOTE This part of ISO 11665 does not address the potential contribution of radon-220 decay products.

### 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 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/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 61577-3, *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 terms and definitions given in ISO 11665-1 apply.