INTERNATIONAL STANDARD

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Tritium and carbon-14 activity in gaseous effluents and gas discharges of nuclear installations —

Part 1: Sampling of tritium and carbon-14

Activité du tritium et du carbone 14 dans les effluents gazeux et les rejets gazeux des installations nucléaires —

Partie 1: Prélèvement du tritium et du carbone 14

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies, and radiological protection*, Subcommittee SC 2, *Radiological protection.*

A list of all parts in the ISO 20041 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Discharges from nuclear installations are subject to regulatory requirements established by various regulatory bodies. Rigorous control of the discharges is implemented by the facility operations within the framework of water and air discharge permits. This control is carried out from commissioning of the installation and throughout its entire lifetime. In particular, this involves making measurements of the physical, chemical and radioactivity characteristics in the gaseous and liquid effluents. The decommissioning of these nuclear installations also generates liquid and gaseous effluents that should be characterized and quantified before their discharge.

Tritium and carbon-14 are usually present in the gaseous effluents of nuclear power plants and other types of nuclear installations. ISO 2889 presents the methods and provisions for sampling airborne substances from the exhaust stacks of nuclear facilities. The provisions defined therein cover all physical forms of the materials present in gaseous effluents: aerosol particles, vapours and gases. These provisions are more restrictive for radioactive aerosol particle measurements, given greater possibilities of losses in the transport lines.

Therefore, ISO 20041 goes further by addressing, in detail, the provisions specific to sampling methods, and sample preparation and calculations for determining the tritium and carbon-14 emissions. ISO 20041-1 covers the sampling methods or techniques for tritium and carbon-14. The future ISO 20041-2 will cover activity analysis of tritium and carbon-14 sampled by the bubbling technique and the future ISO 20041-3 will cover the activity analysis of tritium and carbon-14 sampled by molecular sieve.

Tritium and carbon-14 activity in gaseous effluents and gas discharges of nuclear installations —

Part 1: Sampling of tritium and carbon-14

1 Scope

This document presents the methods and provisions for sampling tritium and carbon-14 in the gaseous effluents generated by nuclear facilities during operation and decommissioning. Specifically included are sample withdrawal location, extraction, transport flow measurement, and collection for later analysis.

This document doesn't address to real time measurements of tritium activity and carbon-14 activity in the effluent air of stacks and ducts. Information about real time measurements can be found in ISO 2889:2021, Annex H.

Sample processing, analysis and calculations of tritium and carbon-14 emissions will be addressed in future parts of ISO 20041.

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.

ISO 2889, *Sampling airborne radioactive materials from the stacks and ducts of nuclear facilities*

ISO 5667-3, *Water quality — Sampling — Part 3: Preservation and handling of water samples*

ISO 10780:1994, *Stationary source emissions — Measurement of velocity and volume flowrate of gas streams in ducts*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
absolute humidity
mass of water per unit volume of moist air

3.2
activity
average number of disintegrations per second of a radionuclide

Note 1 to entry: The activity *a* is expressed in Becquerels (Bq).