FINAL DRAFT International Standard

ISO/FDIS 19361

Measurement of radioactivity — Determination of beta emitters activities — Test method using liquid scintillation counting

Mesurage de la radioactivité — Détermination de l'activité des radionucléides émetteurs bêta — Méthode d'essai par comptage des scintillations en milieu liquide

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Foreword

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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).

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

This second edition cancels and replaces the first edition (ISO 19361:2017), which has been technically revised.

The main changes are as follows:

— those driven by the ISO 11929 series evolution for expressing results.

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

Everyone is exposed to natural radiation. The natural sources of radiation are cosmic rays and naturally occurring radioactive substances which exist in the earth and within the human body. Human activities involving the use of radiation and radioactive substances add to the radiation exposure from this natural exposure. Some of those activities, such as the mining and use of ores containing naturally-occurring radioactive materials (NORM) and the production of energy by burning coal that contains such substances, simply enhance the exposure from natural radiation sources. Nuclear power plants and other nuclear installations use radioactive materials and produce radioactive effluent and waste during operation and on their decommissioning. The use of radioactive materials in industry, agriculture and research is expanding around the globe.

All these human activities give rise to an average exposure to radiation that represents only a small fraction of the global average level of exposure, taking into account all contributions (natural, medical, radon, etc.). The medical use of radiation is the largest and a growing human-made source of radiation exposure in developed countries. It includes diagnostic radiology, radiotherapy, nuclear medicine and interventional radiology.

Radiation exposure also occurs as a result of occupational activities. It is incurred by workers in industry, medicine and research using radiation or radioactive substances, as well as by passengers and crew during air travel and by astronauts. The average level of occupational exposures is generally similar to the global average level of natural radiation exposure[1].

As uses of radiation increase, so do the potential health risk and the public's concerns. Thus, all these exposures are regularly assessed in order to

a) improve the understanding of global levels and temporal trends of public and worker exposure,

b) evaluate the components of exposure so as to provide a measure of their relative importance, and

c) identify emerging issues that may warrant more attention and study.

While doses to workers are mostly directly assessed, doses to the public are usually assessed by indirect methods using radioactivity measurements performed on waste, effluent and/or environmental samples.

To ensure that the data obtained from radioactivity monitoring programs support their intended use, it is essential that the stakeholders (for example, nuclear site operators, regulatory and local authorities) agree on appropriate methods and procedures for obtaining representative samples and then handling, storing, preparing and measuring the test samples. An assessment of the overall measurement uncertainty needs also to be carried out systematically. As reliable, comparable and 'fit for purpose' data are an essential requirement for any public health decision based on radioactivity measurements, international standards of tested and validated radionuclide test methods are an important tool for the production of such measurement results. The application of standards serves also to guarantee comparability over time of the test results and between different testing laboratories. Laboratories apply them to demonstrate their technical qualifications and to successfully complete proficiency tests during interlaboratory comparison, two prerequisites for obtaining national accreditation. Today, over a hundred international standards, prepared by Technical Committees of the International Standardization Organization (ISO), including those produced by ISO/TC 85, and the International Electrotechnical Commission (IEC), are available for application by testing laboratories to measure the main radionuclides.

Generic standards help testing laboratories to manage the measurement process by setting out the general requirements and methods to calibrate and validate techniques. These standards underpin specific standards which describe the test methods to be performed by staff, for example, for different types of samples. The specific standards cover test methods for:

— Naturally-occurring radionuclides (including ^{40}K, ^{3}H, ^{14}C and those originating from the thorium and uranium decay series, in particular ^{226}Ra, ^{228}Ra, ^{234}U, ^{238}U, ^{210}Pb) which can be found in materials from natural sources or can be released from technological processes involving naturally occurring radioactive materials (e.g. the mining and processing of mineral sands or phosphate fertilizer production and use);