



Requirements for the operation of gamma-ray spectrometry laboratories testing environmental samples: a proposal based on current international standards

F.C.A. Ribeiro¹, J.U. Delgado¹, S.S. Peres, W.O. Sousa¹ and
M.S. Grund²

¹*fribeiro@ird.gov.br, delgado@ird.gov.br, suelip@ird.gov.br, wander@ird.gov.br,*

*Instituto de Radioproteção e Dosimetria (IRD),
Comissão Nacional de Energia Nuclear (CNEN).
Av. Salvador Allende, 3773, Barra da Tijuca,
Rio de Janeiro, RJ, Brazil CEP 22783-127*

²*marcos.grund@cnen.gov.br,
Laboratório de Salvaguardas, Comissão
Nacional de Energia Nuclear (CNEN). Av.
Salvador Allende, 3773, Barra da Tijuca,
Rio de Janeiro, RJ, Brazil CEP 22783-127*

1. Introduction

Gamma-rays spectrometry is a well-know and established technique that can be used to determine natural and artificial radionuclides in samples from varied origins and constitution, including those from environment. Many institutions in Brazil have in their facilities a laboratory of gamma-ray spectrometry, mainly governmental research institutes, universities and few private organizations. In the country, the Institute of Radiation Protection and Dosimetry (IRD) of the Brazilian Commission on Nuclear Energy (CNEN) organized a group under the scope of the Testing and Calibration Service Evaluation Committee (CASEC) to organize the basic technical requirements to the safe and correct operation of a gamma ray spectrometry laboratory for the determination of radionuclides in environmental samples (eg soil, water, vegetation) and to obtain the certification by the CASEC/IRD/CNEN.

2. Methodology

The CASEC stted up a group of specialists, that selected several bibliographical references as international standards from ASTM [1-5] and ISO [6-8], related to gamma-ray spectrometry and to the competence of testing laboratories, mainly ISO/IEC 17025:2017 and ISO/IEAC 20042. This group scheduled regular reunions to carefully study and interpret these standards. Moreover, the group was charged to elaborate a document containing the requirements that a laboratory should contemplate to be certified by CASEC/IRD/CNEN. Many aspects were assessed, as general requirements for the laboratory management and staff, environmental conditions, documentation of the performed service, customer service, energy and efficiency calibration, participation of intercomparision and proficiency tests and quality assurance. The detection systems should operate in a energy range from 20 to 2000 keV and this standard CASEC/IRD/CNEN are related only to those laboratories that use semi-conductors detectors of high purity and scintillators as sodium iodine). Other types of detectors are not included in the standard.

3. Results and conclusion

With the document organized by this group of specialists, the CASEC should be capable to assess and process the request of certification of laboratories that conduct assays of environmental gamma-ray spectrometry in their installations, according to the criteria adopted and also evaluate requests for the renewal, suspension or cancellation of the certification, presenting evidences that justify its recommendation. The compliance with these requirements ensures that the Laboratory is able to present a high degree of performance in the analysis of environmental samples by gamma spectrometry.

References

- [1] ASTM D3648-14, Standard Practices for the Measurement of Radioactivity, ASTM International, West Conshohocken, PA, 2014.
- [2] ASTM D3649-06(2014), Standard Practice for High-Resolution Gamma-Ray Spectrometry of Water, ASTM International, West Conshohocken, PA, 2014.
- [3] ASTM D7282-14, Standard Practice for Set-up, Calibration, and Quality Control of Instruments Used for Radioactivity Measurements, ASTM International, West Conshohocken, PA, 2014.
- [4] ASTM D7784-20, Standard Practice for the Rapid Assessment of Gamma-ray Emitting Radionuclides in Environmental Media by Gamma Spectrometry, ASTM International, West Conshohocken, PA, 2020.
- [5] ASTM E181-17, Standard Test Methods for Detector Calibration and Analysis of Radionuclides, ASTM International, West Conshohocken, PA, 2017, www.astm.org
- [6] ISO 18589-2:2015. Measurement of radioactivity in the environment - Soil - Part 2: Guidance for the selection of the sampling strategy, sampling and pre-treatment of samples. International Organization for Standardization, Geneva, Switzerland, 2015. 25p.
- [7] ISO 18589-3:2015. Measurement of radioactivity in the environment - Soil - Part 3: Test method of gamma-emitting radionuclides using gamma-ray spectrometry. International Organization for Standardization, Geneva, Switzerland. 22p.
- [8] ISO 20042:2019. Measurement of radioactivity - Gamma-ray emitting radionuclides - Generic test method using gamma-ray spectrometry. International Organization for Standardization, Geneva, Switzerland. 50p.