ISO 18589-3:2023-07 (E)

Measurement of radioactivity in the environment - Soil - Part 3: Test method of gamma-emitting radionuclides using gamma-ray spectrometry

Contents

Page

Foreword v

Introduction vi

1 Scope 1

2 Normative references 1

3 Terms,definitionsandsymbols 2
3.1 Terms and definitions 2
3.2 Symbols 2

4 Principle 3

5 Reference sources 4
5.1 Source(s) for energy calibration 4
5.2 Reference source(s) for efficiency calibration 4
5.2.1 General 4
5.2.2 Reference sources for laboratory gamma spectrometry systems 4
5.2.3 Reference sources used with numerical methods 5

6 Gamma spectrometry equipment 5
6.1 General description 5
6.2 Detector types 5
6.3 High voltage power supply 6
6.4 Preamplifier 6
6.5 Cryostat or electric cooler 6
6.6 Shielding 6
6.7 Analogue or digital acquisition electronics 6
6.7.1 General 6
6.7.2 Analogue electronic 7
6.7.3 Digital electronic DSP 7
6.8 Computer, including peripherical devices and software 7

7 Nuclear decay data 8

8 Sample container 8

9 Procedure 8
9.1 Packaging of samples for measuring purposes 8
9.2 Laboratory background level 9
9.3 Calibration 9
9.3.1 Energy calibration 9
9.3.2 Efficiency calibration 10
9.4 Correction required for the measurements of natural radionuclides 11
9.5 Quality control 12

10 Expression of results 12
10.1 Calculation of the activity per unit of mass 12
10.1.1 General 12
10.1.2 Dead time and pile up corrections (see ISO 20042) 12

10.1.3 Decay corrections 13
10.1.4 Self-absorption correction 13
10.1.5 True coincidence summing 14
10.2 Standard uncertainty 15
10.3 Decision threshold 16
10.4 Detection limit 16
10.5 Limits of the coverage intervals 17
10.5.1 Limits of the probabilistically symmetric coverage interval 17
10.5.2 The shortest coverage interval 17
10.6 Corrections for contributions from other radionuclides and background 17

10.6.1 General 17
10.6.2 Contribution from other radionuclides 18
10.6.3 Contribution from background 19

11 Test report 19

Annex A (informative) Analysis of natural radionuclides in soil samples using gamma spectrometry 21

Annex B (informative) Self-attenuation correction[21][22] 27

Annex C (informative) True coincidence summing 30

Annex D (informative) Calculation of the activity per unit mass from a gamma spectrum usingalinearbackgroundsubtraction 32

Bibliography 34