

ISO 18589-7:2025-12 (E)

Measurement of radioactivity in the environment - Soil - Part 7: In situ measurement of gamma-emitting radionuclides

Contents		Page
Foreword		v
Introduction		vi
1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Symbols	3
5	Principles	6
5.1	Measurement method	6
5.2	Uncertainties of the measurement method	7
6	Equipment	7
6.1	Portable in situ spectrometry system	7
6.2	Detector system	7
6.2.1	General	7
6.2.2	Field-of-view	8
6.2.3	Special requirements	8
6.3	Pulse processing electronics	8
6.3.1	Components	8
6.3.2	Special requirements	9
6.3.3	Requirements for the evaluation program	9
6.4	Assembly jig for a detector system	10
6.5	Collimated detector	10
6.5.1	Construction	10
6.5.2	Collimator parameter	11
7	Procedure	12
7.1	Calibration	12
7.2	Method of combined calibrations	13
7.2.1	General	13
7.2.2	Intrinsic efficiency	14
7.2.3	Geometry factor	14
7.2.4	Angular correction factor	15
7.2.5	Numerical calibration procedure	16
8	Quality assurance and quality control program	17
8.1	General	17
8.2	Influencing variables	17
8.3	Instrument verification	17
8.4	Method verification	17
8.5	Quality control program	18
8.5.1	General	18
8.5.2	Description of periodical quality checks	18
8.5.3	Measurement verification	18
8.5.4	Qualification	18
8.5.5	Documentation of quality controls	19

8.6	Standard operating procedure	19
9	Expression of results	19
9.1	Calculation of activity per unit of surface area or unit of mass	19
9.2	Calculation of the characteristic limits and the best estimate of the measurand as well as its standard uncertainty	19
9.2.1	General	19
9.2.2	Standard uncertainty	20
9.2.3	Decision threshold and detection limit	20
9.2.4	Limits of coverage interval and best estimate of the measurand	21
9.3	Calculation of the radionuclide specific ambient dose rate	21
10	Test report	23
Annex A (informative)	Influence of radionuclides in air on the result of surface or mass activity measured by in situ gamma spectrometry	24
Annex B (informative)	Influence quantities	25
Annex C (informative)	Characteristics of germanium detectors	28
Annex D (informative)	Field-of-view of an in situ gamma spectrometer as a function of the photon energy for different radionuclide distributions in soil	30
Annex E (informative)	Methods for calculating geometry factors and angular correction factors	34
Annex F (informative)	Example for calculation of the characteristic limits as well as the best estimate of the measurand and its standard uncertainty	42
Annex G (informative)	Conversion factors for surface or mass activity to air kerma rate and ambient dose equivalent rate for different radionuclide distribution in soil	46
Annex H (informative)	Mass attenuation factors for soil and attenuation factors for air as a function of photon energy and deviation of G(E,V) for different soil compositions	52
Bibliography	54