

ISO 11929-4:2020 (E)

Determination of the characteristic limits (decision threshold, detection limit and limits of the coverage interval) for measurements of ionizing radiation — Fundamentals and application — Part 4: Guidelines to applications

Contents

	Foreword
	Introduction
1	Scope
2	Normative references
3	Terms and definitions
4	Quantities and symbols
5	Summary of this document
5.1	Procedures according to ISO 11929 (all parts)
5.2	Survey on the examples
5.3	General stipulations
6	Counting measurements with small or moderate uncertainties
6.1	Definition of the task and general aspects
6.2	Model of evaluation and standard uncertainty
6.3	Available information, input data, and specifications
6.4	Evaluation of the measurement and characteristic limits according to ISO 11929-1
6.4.1	Background effect
6.4.2	Primary result and its associated standard uncertainty
6.4.3	Standard uncertainty as a function of an assumed true value
6.4.4	Decision threshold
6.4.5	Detection limit
6.4.6	Limits of coverage intervals
6.4.7	The best estimate and its associated standard uncertainty
6.5	Documentation of the results obtained by ISO 11929-1 and ISO 11929-2
6.6	Assessment and explanations
7	Counting measurement with small count numbers
7.1	Definition of the task and general aspects
7.2	Model of evaluation and standard uncertainty
7.3	Available information, input data, and specifications
7.4	Evaluation of the measurement and characteristic limits according to ISO 11929-1
7.4.1	Background effect
7.4.2	Primary result and its associated standard uncertainty
7.4.3	Standard uncertainty as a function of an assumed true value
7.4.4	Decision threshold
7.4.5	Detection limit
7.4.6	Limits of coverage intervals
7.4.7	The best estimate and its associated standard uncertainty
7.5	Documentation of the results obtained by ISO 11929-1 and ISO 11929-2
7.6	Assessment and explanations
7.7	An alternative example of a measurement with small count numbers
7.7.1	General
7.7.2	Background effect
7.7.3	Primary result and its associated standard uncertainty
7.7.4	Standard uncertainty as a function of an assumed true value
7.7.5	Decision threshold

- 7.7.6 Detection limit
 - 7.7.7 Limits of coverage intervals
 - 7.7.8 The best estimate and its associated standard uncertainty
 - 7.8 Documentation of the results obtained by ISO 11929-1 and ISO 11929-2
 - 7.9 Assessment of the alternative example and explanations
- 8 Counting measurements with large uncertainties in the numerator of the calibration factor**
- 8.1 Definition of the task and general aspects
 - 8.2 Model of evaluation and standard uncertainty
 - 8.3 Available information, input data, and specifications
 - 8.4 Evaluation of the measurement and characteristic limits according to ISO 11929-1
 - 8.4.1 Background effect
 - 8.4.2 Primary result and its associated standard uncertainty
 - 8.4.3 Standard uncertainty as a function of an assumed true value
 - 8.4.4 Decision threshold
 - 8.4.5 Detection limit
 - 8.4.6 Limits of coverage intervals
 - 8.4.7 The best estimate and its associated standard uncertainty
 - 8.5 Documentation of the results obtained by ISO 11929-1 and ISO 11929-2
 - 8.6 Assessment and explanations
- 9 Counting measurements with large uncertainties in the denominator of the calibration factor**
- 9.1 Definition of the task and general aspects
 - 9.2 Model of evaluation and standard uncertainty
 - 9.3 Available information, input data, and specifications
 - 9.4 Evaluation of the measurement and characteristic limits according to ISO 11929-1
 - 9.4.1 Background effect
 - 9.4.2 Primary result and its associated standard uncertainty
 - 9.4.3 Standard uncertainty as a function of an assumed true value
 - 9.4.4 Decision threshold
 - 9.4.5 Detection limit
 - 9.4.6 Limits of coverage intervals
 - 9.4.7 The best estimate and its associated standard uncertainty
 - 9.5 Documentation of the results obtained by ISO 11929-1 and ISO 11929-2
 - 9.6 Assessment and explanations
- 10 Counting measurements with shielding of the background**
- 10.1 Definition of the task and general aspects
 - 10.2 Model of evaluation and standard uncertainty
 - 10.3 Available information, input data, and specifications
 - 10.4 Evaluation of the measurement and characteristic limits according to ISO 11929-1
 - 10.4.1 Background effect
 - 10.4.2 Primary result and its associated standard uncertainty
 - 10.4.3 Standard uncertainty as a function of an assumed true value
 - 10.4.4 Decision threshold
 - 10.4.5 Detection limit
 - 10.4.6 Limits of coverage intervals
 - 10.4.7 The best estimate and its associated standard uncertainty
 - 10.5 Documentation of the results obtained by ISO 11929-1 and ISO 11929-2
 - 10.6 Assessment and explanations
- 11 Counting clearance measurement**
- 11.1 Definition of the task and general aspects
 - 11.2 Model of evaluation and standard uncertainty
 - 11.3 Available information, input data, and specifications
 - 11.4 Evaluation of the measurement and characteristic limits according to ISO 11929-1
 - 11.4.1 Background effect
 - 11.4.2 Primary result and its associated standard uncertainty
 - 11.4.3 Standard uncertainty as a function of an assumed true value
 - 11.4.4 Decision threshold
 - 11.4.5 Detection limit
 - 11.4.6 Limits of coverage intervals
 - 11.4.7 The best estimate and its associated standard uncertainty
 - 11.5 Documentation of the results obtained by ISO 11929-1 and ISO 11929-2

- 11.6 **Assessment and explanations**
- 12 **Gamma-spectrometry of Uranium-235 with interference by Radium-226**
 - 12.1 **Definition of the task and general aspects**
 - 12.2 **Model of evaluation and standard uncertainty**
 - 12.3 **Available information, input data, and specifications**
 - 12.4 **Evaluation of the measurement and characteristic limits according to ISO 11929-1**
 - 12.4.1 **Background effect**
 - 12.4.2 **Primary result and its associated standard uncertainty**
 - 12.4.3 **Standard uncertainty as a function of an assumed true value**
 - 12.4.4 **Decision threshold**
 - 12.4.5 **Detection limit**
 - 12.4.6 **Limits of coverage intervals**
 - 12.4.7 **The best estimate and its associated standard uncertainty**
 - 12.5 **Documentation of the results obtained by ISO 11929-1 and ISO 11929-2**
 - 12.6 **Assessment and explanations**
- 13 **Black box measurements**
 - 13.1 **Definition of the task and general aspects**
 - 13.2 **Model of evaluation and standard uncertainty**
 - 13.3 **Available information, input data, and specifications**
 - 13.4 **Evaluation of the measurement and characteristic limits according to ISO 11929-1**
 - 13.4.1 **Background effect**
 - 13.4.2 **Primary result and its associated standard uncertainty**
 - 13.4.3 **Standard uncertainty as a function of an assumed true value**
 - 13.4.4 **Decision threshold**
 - 13.4.5 **Detection limit**
 - 13.4.6 **Limits of coverage intervals**
 - 13.4.7 **The best estimate and its associated standard uncertainty**
 - 13.5 **Documentation of the results obtained by ISO 11929-1 and ISO 11929-2**
 - 13.6 **Assessment and explanations**
- 14 **Counting measurements with unknown random influence of sample treatment**
 - 14.1 **Definition of the task and general aspects**
 - 14.2 **Model of evaluation and standard uncertainty**
 - 14.3 **Available information, input data, and specifications**
 - 14.4 **Evaluation of the measurement and characteristic limits according to ISO 11929-1**
 - 14.4.1 **Background effect**
 - 14.4.2 **Primary result and its associated standard uncertainty**
 - 14.4.3 **Standard uncertainty as a function of an assumed true value**
 - 14.4.4 **Decision threshold**
 - 14.4.5 **Detection limit**
 - 14.4.6 **Limits of coverage intervals**
 - 14.4.7 **The best estimate and its associated standard uncertainty**
 - 14.5 **Documentation of the results obtained by ISO 11929-1 and ISO 11929-2**
 - 14.6 **Assessment and explanations**
- 15 **Counting measurement with known influence of sample treatment**
 - 15.1 **Definition of the task and general aspects**
 - 15.2 **Model of evaluation and standard uncertainty**
 - 15.3 **Available information, input data, and specifications**
 - 15.4 **Evaluation of the measurement and characteristic limits according to ISO 11929-1**
 - 15.4.1 **Determination of the relative uncertainty of the sample treatment**
 - 15.4.2 **Background effect**
 - 15.4.3 **Primary result and its associated standard uncertainty**
 - 15.4.4 **Standard uncertainty as a function of an assumed true value**
 - 15.4.5 **Decision threshold**
 - 15.4.6 **Detection limit**
 - 15.4.7 **Limits of coverage intervals**
 - 15.4.8 **The best estimate and its associated standard uncertainty**
 - 15.5 **Documentation of the results obtained by ISO 11929-1 and ISO 11929-2**
 - 15.6 **Assessment and explanations**
- 16 **Dose measurement using an active personal dosimeter**

- 16.1 Definition of the task and general aspects
 - 16.2 Model of evaluation and standard uncertainty
 - 16.3 Available information, input data, and specifications
 - 16.4 Evaluation of the measurement and characteristic limits according to ISO 11929-1
 - 16.4.1 Background effect
 - 16.4.2 Primary result and its associated standard uncertainty
 - 16.4.3 Standard uncertainty as a function of an assumed true value
 - 16.4.4 Decision threshold
 - 16.4.5 Detection limit
 - 16.4.6 Limits of coverage intervals
 - 16.4.7 The best estimate and its associated standard uncertainty
 - 16.5 Assessment and explanations
- 17 Dose rate measurement using a neutron area monitor
- 17.1 Definition of the task and general aspects
 - 17.2 Model of evaluation and standard uncertainty
 - 17.3 Available information, input data, and specifications
 - 17.4 Evaluation of the measurement and characteristic limits
 - 17.4.1 Background effect
 - 17.4.2 Primary result and its associated standard uncertainty
 - 17.4.3 Standard uncertainty as a function of an assumed true value
 - 17.4.4 Decision threshold
 - 17.4.5 Detection limit
 - 17.4.6 Limits of coverage intervals
 - 17.4.7 The best estimate and its associated standard uncertainty
 - 17.5 Documentation of the results
 - 17.6 Assessment and explanations
- Annex A (informative) Determination of a calibration factor
- A.1 General aspects
 - A.2 Measurement of a calibration factor
 - A.3 Evaluation of the calibration factor according to ISO 11929-2:2019
 - A.3.1 General
 - A.3.2 Inverse probability density function
 - A.3.3 Normal versus inverse normal distributions
 - A.3.4 Rectangular versus inverse rectangular distributions
 - A.3.5 Beta distribution for the efficiency probability distribution function
 - A.3.6 Empirical probability distribution functions
- Annex B (informative) Calculations according to ISO 11929-2

Page count: 97