SLOVENSKI STANDARD
SIST-TP CLC IEC/TR 62461:2019

01-september-2019

Instrumenti za zaščito pred sevanjem - Določanje merilne negotovosti (IEC/TR 62461:2015)

Radiation protection instrumentation - Determination of uncertainty in measurement (IEC/TR 62461:2015)

Strahlenschutz-Messgeräte - Bestimmung der Unsicherheit beim Messen (IEC/TR 62461:2015)

Instrumentation pour la radioprotection - Détermination de l'incertitude de mesure (IEC/TR 62461:2015)

Ta slovenski standard je istoveten z: **CLC IEC/TR 62461:2019**

ICS:

13.280	Varstvo pred sevanjem	Radiation protection

SIST-TP CLC IEC/TR 62461:2019 **en**

TECHNICAL REPORT

RAPPORT TECHNIQUE

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CLC IEC/TR 62461

May 2019

ICS 13.280

English Version

Radiation protection instrumentation - Determination of uncertainty in measurement (IEC/TR 62461:2015)

Instrumentation pour la radioprotection - Détermination de l'incertitude de mesure (IEC/TR 62461:2015)

Strahlenschutz-Messgeräte - Bestimmung der Unsicherheit beim Messen (IEC/TR 62461:2015)

This Technical Report was approved by CENELEC on 2019-05-20.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. CLC IEC/TR 62461:2019 E

European foreword

This document (CLC IEC/TR 62461:2019) consists of the text of IEC/TR 62461:2015 prepared by SC 45B "Radiation protection instrumentation" of IEC/TC 45 "Nuclear instrumentation".

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC/TR 62461:2015 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61526:2010	NOTE	Harmonized as EN 61526:2013 (modified)
IEC 60846-1:2009	NOTE	Harmonized as EN 60846-1:2014 (modified)
IEC 62387:2012	NOTE	Harmonized as EN 62387:2016 (modified)
IEC 61005:2003	NOTE	Harmonized as EN 61005:2004 (modified)
IEC 61577-2:2014	NOTE	Harmonized as EN 61577-2:2017 (modified)
IEC 61577-3:2011	NOTE	Harmonized as EN 61577-3:2014 (modified)
IEC 60325:2002	NOTE	Harmonized as EN 60325:2004 (modified)

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60050	series	International Electrotechnical Vocabulary General Index	-	-
ISO/IEC Guide 98-3	2008	Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)	-	-
ISO/IEC Guide 98-3 Supplement 1	2008	Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995) - Supplement 1: Propagation of distributions using a Monte Carlo method	-	-

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TECHNICAL REPORT

colour inside

Radiation protection instrumentation – Determination of uncertainty in measurement

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 13.280

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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RADIATION PROTECTION INSTRUMENTATION – DETERMINATION OF UNCERTAINTY IN MEASUREMENT

FOREWORD

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IEC 62461, which is a technical report, has been prepared by subcommittee 45B: Radiation protection instrumentation, of IEC technical committee 45: Nuclear instrumentation.

This second edition of IEC TR 62461 cancels and replaces the first edition, published in 2006, and constitutes a technical revision. The main changes with respect to the previous edition are as follows:

– add to the analytical method for the determination of uncertainty the Monte Carlo method for the determination of uncertainty according to supplement 1 of the Guide to the Expression of uncertainty in measurement (GUM S1), and
– add a very simple method to judge whether a measured result is significantly different from zero or not based on ISO 11929.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
45B/783/DTR	45B/813/RVD

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The ISO/IEC Guide 98-3:2008, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)* as well as its Supplement 1:2008, *Propagation of distributions using a Monte Carlo method* (GUM S1), are general guides to assess the uncertainty in measurement. This Technical Report lays emphasis on their application in the area of radiation protection and serves as a practical introduction to the GUM and its supplement 1 (GUM S1).

The process of determining the uncertainty delivers not only a numerical value of the uncertainty; in addition it produces the best estimate of the quantity to be measured which may differ from the indication of the instrument. Thus, it can also improve the result of the measurement by using information beyond the indicated value of the instrument, e.g. the energy dependence of the instrument.

RADIATION PROTECTION INSTRUMENTATION – DETERMINATION OF UNCERTAINTY IN MEASUREMENT

1 Scope

This Technical Report gives guidelines for the application of the uncertainty analysis according to ISO/IEC Guide 98-3:2008 (GUM describing an analytical method for the uncertainty determination) and its Supplement 1:2008 (GUM S1 describing a Monte Carlo method for the uncertainty determination) for measurements covered by standards of IEC Subcommittee 45B. It does not include the uncertainty associated with the concept of the measuring quantity, e. g., the difference between $H_p(10)$ on the ISO water slab phantom and on the person.

This Technical Report explains the principles of the ISO/IEC Guide 98-3:2008 (GUM),its Supplement 1:2008 (GUM S1) and the special considerations necessary for radiation protection at an example taken from individual dosimetry of external radiation. In the informative annexes, several examples are given for the application on instruments, for which SC 45B has developed standards.

This Technical Report is supposed to assist the understanding of the ISO/IEC Guide 98-3:2008 (GUM), its Supplement 1: 2008 (GUM S1), and other papers on uncertainty analysis. It cannot replace these papers nor can it provide the background and justification of the arguments leading to the concept of the ISO/IEC Guide 98-3:2008 (GUM) and its Supplement 1:2008 (GUM S1).

Finally, this Technical Report gives a very simple method to judge whether a measured result is significantly different from zero or not based on ISO 11929.

For better readability the correct terms are not always used throughout this technical report. For example, instead of “random variables of a quantity” only the “quantity” itself is stated.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050 (all parts): *International Electrotechnical Vocabulary* (available at http://www.electropedia.org)

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ISO/IEC Guide 98-3, Supplement 1:2008, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995) – Propagation of distributions using a Monte Carlo method*

3 Terms and definitions

For the purposes of this document, the technical terms of IEC 60050-151 [1], and IEC 60050-311 [2] as well as the following definitions taken from the ISO/IEC Guide 98-3:2008 (GUM), and its Supplement 1:2008 (GUM S1) apply[1].

3.1
calibration factor
N
quotient of the true value of a quantity and the indicated value for a specified reference radiation under specified reference conditions

3.2
conformity test
test for conformity evaluation

[SOURCE: IEC 60050-151:2001,151-16-15]

3.3
complete result of a measurement
set of values attributed to a measurand, including a value, the corresponding uncertainty and the unit of measurement

Note 1 to entry: The central value of the whole (set of values) can be selected as *measured value* and a parameter characterising the dispersion as *uncertainty*.

Note 2 to entry: The result of a measurement is related to the *indication given by the instrument* and to the values of correction obtained by calibration and by the use of a *model*.

Note 3 to entry: In this Technical Report, the "measured value", see Note 1 above, is abbreviated by M.

Note 4 to entry: In this Technical Report, the "indication given by the instrument", see Note 2 above, is abbreviated by G, and called "indicated value".

Note 5 to entry: In this Technical Report, the "model", see Note 2 above, is called "model function", see 3.10 and 5.2.

[SOURCE: IEC 60050-311:2001, 311-01-01, modified]

3.4
correction factor
K
factor to the indicated value to correct for deviation of measurement conditions from calibration conditions

3.5
coverage factor
k_{cov}
numerical factor used as a multiplier of the (combined) standard uncertainty in order to obtain an expanded uncertainty

Note 1 to entry: A coverage factor k_{cov} is typically in the range of 2 to 3.

[SOURCE: GUM:2008, 2.3.6]

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1 Numbers in square brackets refer to the bibliography.