

Evaluation of measurement data — Guide to the
expression of uncertainty in measurement.
AMENDMENT 1: Nonlinearity in measurement models

Évaluation des données de mesure — Guide pour l'expression de
l'incertitude de mesure. AMENDEMENT 1: Non-linéarité dans les
modèles de mesure

JCGM 100:2008/Amd.1:2026

© JCGM 2024

Copyright of this JCGM guidance document is shared jointly by the JCGM member organizations (BIPM, IEC, IFCC, ILAC, ISO, IUPAC, IUPAP and OIML).

Copyright

Even if electronic versions are available free of charge on the website of one or more of the JCGM member organizations, economic and moral copyrights related to all JCGM publications are internationally protected. The JCGM does not, without its written authorisation, permit third parties to rewrite or re-brand issues, to sell copies to the public, or to broadcast or use on-line its publications. Equally, the JCGM also objects to distortion, augmentation or mutilation of its publications, including its titles, slogans and logos, and those of its member organizations.

Official versions and translations

The only official versions of documents are those published by the JCGM, in their original languages.

The JCGM's publications may be translated into languages other than those in which the documents were originally published by the JCGM. Permission must be obtained from the JCGM before a translation can be made. All translations should respect the original and official format of the formulae and units (without any conversion to other formulae or units), and contain the following statement (to be translated into the chosen language):

All JCGM's products are internationally protected by copyright. This translation of the original JCGM document has been produced with the permission of the JCGM. The JCGM retains full internationally protected copyright on the design and content of this document and on the JCGM's titles, slogan and logos. The member organizations of the JCGM also retain full internationally protected right on their titles, slogans and logos included in the JCGM's publications. The only official version is the document published by the JCGM, in the original languages.

The JCGM does not accept any liability for the relevance, accuracy, completeness or quality of the information and materials offered in any translation. A copy of the translation shall be provided to the JCGM at the time of publication.

Reproduction

The JCGM's publications may be reproduced, provided written permission has been granted by the JCGM. A sample of any reproduced document shall be provided to the JCGM at the time of reproduction and contain the following statement:

This document is reproduced with the permission of the JCGM, which retains full internationally protected copyright on the design and content of this document and on the JCGM's titles, slogans and logos. The member organizations of the JCGM also retain full internationally protected right on their titles, slogans and logos included in the JCGM's publications. The only official versions are the original versions of the documents published by the JCGM.

Disclaimer

The JCGM and its member organizations have published this document to enhance access to information about metrology. They endeavor to update it on a regular basis, but cannot guarantee the accuracy at all times and shall not be responsible for any direct or indirect damage that may result from its use. Any reference to products of any kind (including but not restricted to any software, data or hardware) or links to websites, over which the JCGM and its member organizations have no control and for which they assume no responsibility, does not imply any approval, endorsement or recommendation by the JCGM and its member organizations.

Evaluation of measurement data — Guide to the expression of uncertainty in measurement.

AMENDMENT 1: Nonlinearity in measurement models

Page 9, 4.1.4

Designate the existing NOTE as NOTE 2 and add the following new NOTE 1:

NOTE 1 When the nonlinearity of f is significant, a Monte Carlo method as described in JCGM 101:2008 [21] can be applied, or higher-order terms in a Taylor series expansion of $Y = f(X_1, X_2, \dots, X_N)$ must be included in the expression for y in Equation (2). When the input quantities X_i are independent and the distribution of each X_i is normal, the next higher-order terms to be added to the right-hand side of Equation (2) are

$$\frac{1}{2} \sum_{i=1}^N \frac{\partial^2 f}{\partial x_i^2} u^2(x_i).$$

Equation (H.10) provides a generalization for the case of non-independent, normally distributed X_i .

Page 85, **H.1.7 Second-order terms**

Change the first paragraph as follows:

Note 1 to 4.1.4 and the note to 5.1.2 point out that Equations (2) and (10), which are used in this example to obtain the estimate l of the measurand and the associated combined standard uncertainty $u_c(l)$, must be augmented when the nonlinearity of the function $Y = f(X_1, X_2, \dots, X_N)$ is so significant that the higher-order terms in the Taylor series expansion cannot be neglected. Such is the case in this example, and therefore both the calculation of l and the evaluation of $u_c(l)$ as presented up to this point are not complete. It is easily checked that the first expression given in note 1 to 4.1.4 is equal to zero, so that the estimate l is unaffected by higher-order terms. Instead, the application to Equation (H.3) of the expression given in the note to 5.1.2 yields in fact two distinct non-negligible second-order terms to be added to Equation (H.5). These terms, which arise from the quadratic term in the expression of the note, are

...

Page 115, **Bibliography**

After Reference [20], add

[21] BIPM, IEC, IFCC, ILAC, ISO, IUPAC, IUPAP, and OIML. Evaluation of measurement data — Supplement 1 to the “Guide to the expression of uncertainty in measurement” — Propagation of distributions using a Monte Carlo method. Joint Committee for Guides in Metrology, JCGM 101:2008. doi:10.59161/JCGM101-2008.

END OF THE AMENDMENT