**Joint Committee for Guides in Metrology (JCGM)**

**BIPM IEC IFCC ILAC ISO IUPAC IUPAP OIML**

**WG1, *Expression of Uncertainty in Measurement (GUM)***

# Summary report to the JCGM of the WG1 activity in the period from December 2018 to December 2020

### Walter Bich, JCGM-WG1 convener

**Meetings and workshop**

*Regular meetings*

Since the JCGM meeting in December 2018 to the date of writing this report, the WG1 had four regular meetings:

* 4 to 7 December 2018 (thus immediately after the JCGM meeting) at the BIPM,
* 14 to 17 May 2019 at the Mälardalen University in Västerås, Sweden,
* 3 to 6 December 2019 at the BIPM and
* 9 to 12 June 2020, online.

A fifth meeting will be held, online, immediately before this JCGM meeting, from 1 to 4 December 2020.

The minutes of the first two meetings are uploaded [here](https://www.bipm.org/wg/JCGM/JCGM-WG1/Restricted/welcome.jsp) (username **JCGM-WG1**, password **GUMtree!**). Those of the December 2019 meeting can be downloaded [here](https://www.bipm.org/wg/JCGM/JCGM-WG1/Restricted/meeting/WG1minutesDec2019WBcorr.pdf), and those of the June 2020 meeting will be available before the JCGM meeting [on the restricted access area](https://www.bipm.org/wg/JCGM/JCGM-WG1/Restricted/welcome.jsp) of WG1.

*Special meetings*

Three special meetings were held online on 15 September, 22 October and 18 November 2020. Informal notes were taken. The purpose of these meeting was to elaborate a set of definitions related to measurement uncertainty, such as measurement uncertainty, standard measurement uncertainty, expanded uncertainty, coverage interval. The definitions would then be offered to WG2 for their consideration and used in the GUM. The initiative followed several meetings of a WG2-WG1 joint Focus Group devoted to the same task, and its starting point was the outcome of the Focus Group. In this respect, the cooperation with WG2 increased considerably, in the constant effort to maximize consistency between the GUM and the VIM.

*Workshop*

A “JCGM WG1 [Workshop](https://www.bipm.org/wg/JCGM/JCGM-WG1/Restricted/archives/WG1-N19-29-Workshop_on_Type_A_uncertainty_2019_final_programme.pdf) on Type A evaluation of measurement uncertainty for a small set of observations” was held at the BIPM on 2 December 2019, on the occasion of the regular meeting. [Minutes](https://www.bipm.org/wg/JCGM/JCGM-WG1/Restricted/meeting/WG1-N19-34-Workshop_type_A_eval_standard_uncertainty-Minutes.docx) and (some of the) [presentations](https://www.bipm.org/wg/JCGM/JCGM-WG1/Restricted/meeting/WG1-N19-30-Workshop-type-A-presentations.zip) are available. The workshop was extremely fruitful for the developments of future related documents (see below about GUM-Part 12).

**Guidance documents**

The situation of JCGM guidance documents produced by JCGM**-**WG1 did not change since the JCGM meeting in December 2018. However, it will change soon, with publication of the GUM-Part 6 (see below).

The JCGM guidance documents produced by JCGM**-**WG1 have been published by some of the Member Organizations, namely, the BIPM, the OIML, the ISO and the IEC.

The BIPM and OIML publications of JCGM guidance documents are available for download from their web sites, [here](http://www.bipm.org/en/publications/guides/) and [here](http://www.oiml.org/en/publications/guides/publication_view?p_type=3&p_status=1), respectively.

ISO and IEC publish these documents as

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

 ISO/IEC Guide 98-3:2008/Suppl 1:2008, Propagation of distributions using a Monte Carlo method,

 ISO/IEC Guide 98-1:2009, Uncertainty of measurement — Part 1: Introduction to the expression of uncertainty in measurement,

 ISO/IEC Guide 98-3:2008/Suppl 2:2011, Extension to any number of output quantities,

ISO/IEC Guide 98-4:2012, Uncertainty of measurement — Part 4: The role of measurement uncertainty in conformity assessment**.**

Several of these documents have been translated into many languages.

As concerns the documents currently under development, the situation is as follows:

 JCGM GUM-6:202X Guide to the expression of uncertainty in measurement – Part 6: Developing and using measurement models (in previous documents denoted as JCGM 103 Supplement 3 to the GUM, etc.). The final draft of the document was approved by the JCGM Member Organisations, with minor editorial comments. These comments are being considered by WG1 and the document will be ready for publication soon after this JCGM meeting. This will be the first document published as a part of the “new” GUM, hopefully in the current year.

 JCGM GUM-1:202X Guide to the expression of uncertainty in measurement – Part 1: Introduction. This document will serve as an introduction to the whole suite of documents that collectively constitute the “new” GUM. It is based on and constitutes an evolution of JCGM 104:2009, taking into account the broadened scope of the GUM. A further draft has been circulated in September 2020 for discussion at the December WG1 meeting.

 **JCGM GUM-9:202X Guide to the expression of uncertainty in measurement – Part 9:** **Principles, Statistical Models, and Data Reductions for Key Comparisons**. An advanced draft is under discussion by WG1.

JCGM GUM-12: 202X Guide to the expression of uncertainty in measurement – Part 12: Title to be decided. A motivation and scope document has been drafted, and is under discussion. The basic idea is to give guidance on how to describe the state of knowledge about input quantities in a measurement model, with special attention to the case of Type A evaluations when the sample is small. This document will benefit not only from the outcome of the related workshop mentioned above, but especially from promising scientific developments. In due course, the related motivation and scope document will be submitted to the JCGM.

In the meantime, a progressive revision of published documents has been planned. The revision will regard first Supplement 1- Propagation of distributions using a Monte Carlo method and Supplement 2 - Extension to any number of output quantities, then JCGM 106 – Role of measurement uncertainty in conformity assessment.

**Miscellanea**.

* Several WG1 members from European NMIs are involved in the project EMPIR 17NRM05 EMUE "Advancing measurement uncertainty ̶ comprehensive examples for key international standards", led by Maurice Cox. Useful feedback is expected from this project as concerns examples to be included in GUM-5 (ex JCGM 110).
* Several members of JCGM-WG1 participate in [Mathmet](http://mathmet.org/), the European Metrology Network for Mathematics and Statistics.

Membership. There have been the following changes in membership of JCGM-WG1 since the December 2018 meeting of the JCGM:

 Rüdiger Kessel, IUPAC corresponding member, and Michael Krystek, ISO, left the WG.

 Olha Bodnar, IUPAC, and Eric Shirley, IUPAP, are new members.

A fruitful cooperation with [Anthony O’Hagan](http://www.tonyohagan.co.uk/), established some years ago thanks to Maurice Cox, is ongoing.

Finally, the WG remembers with gratitude [René Dybkaer](http://dmbj.org.rs/pdf/ifccenewsjune2019.pdf), member for many years, who passed away in April 2019.