

Joint Committee for Guides in Metrology

Minutes of the meeting held on Monday 3 December 2018
at the BIPM

Present:

Dr Walter Bich (WG1 Convenor, ISO)
 Dr Charles Ehrlich (WG2 Convenor, OIML)
 Dr Stephen Ellison (IUPAC)
 Ms Mercè Ferrés Hernández (ISO)
 Prof. Philippe Gillery (IFCC)
 Prof. Luca Mari (IEC)
 Dr Martin Milton (JCGM Chairman, BIPM)
 Mr Erik Oehlenschlaeger (ILAC)
 Mr Stephen Patoray (OIML)
 Mr Robert Sitton (JCGM Executive Secretary, BIPM)

1. Opening of the meeting and welcome by the Director of the BIPM

The Director of the BIPM, Dr Martin Milton, welcomed the participants. He noted that IUPAP was not represented.

2. Approval of the agenda

The provisional agenda dated 22 November 2018 (JCGM/18-00-Agenda) was approved.

3. Approval of the minutes of the meeting of 15 May 2017

The minutes of the previous JCGM meeting had been approved by correspondence.

4. Review of the decisions taken at the meeting of 15 May 2017

The decisions of the 2017 meeting were reviewed.

Decision 1

The JCGM decided to submit the principle of the “new perspective”, proposed by WG1, to the member organizations for their approval. The proposed principle is that a common title be applied to a suite of documents for each of which the motivation and scope have been agreed by the JCGM. These documents will include JCGM 100:2008, as well as an introduction and examples. The JCGM notes that the working title for this suite is currently “Guide to the Expression of Uncertainty in Measurement”. This approval is required from the member organizations by the end of July 2017.

This decision was covered in the report by the Convenor of WG1.

Decision 2

The proposed “revised motivation and scope for JCGM 104” (JCGM/17-07) will be considered by the member organizations of the JCGM, requesting comments in light of the “new perspective” by correspondence by the end of July 2017.

This decision was covered in the report by the Convenor of WG1.

Decision 3

The JCGM encouraged WG2 to develop a “committee draft” of the next edition of the VIM by the end of 2018 (before the next JCGM meeting) incorporating the VIM3 annotations and a small number of new entries related to nominal and ordinal properties of current relevance to metrology. The WG2 convenor will report on progress at the next JCGM meeting.

This decision was covered in the report by the Convenor of WG2.

Decision 4

The JCGM decided that the BIPM shall serve as its chair for the period 2017-2019.

Complete.

Decision 5

The JCGM decided that in future it will make its agenda and minutes open access.

Complete.

5. Report from Working Group 1 (GUM)

The report (JCGM/18-03) was presented by Dr Bich, Convenor of WG1.

Dr Bich said that WG1 had met twice since the last meeting of the JCGM in May 2017: 28 November to 1 December 2017 at the National Laboratory Association in Pretoria (South Africa) and 19 to 22 June 2018 at the BML, Paris. Two *interim* meetings had been held at INRIM (Italy) from 16 to 18 October 2017 and 19 to 21 March 2018. These meetings were attended by Maurice Cox, Adriaan van der Veen and Walter Bich, with Steve Ellison participating remotely. The *interim* meetings were aimed at progressing the drafting of JCGM 103, Developing and using measurement models.

Dr Bich gave the background to the development of the “GUM new perspective”, recalling that the revised GUM that had been circulated in 2014 had not been well received. The reasons for the poor reception have been analysed and are well documented. It was subsequently agreed that a new strategy was needed and a new perspective was subsequently developed.

GUM new perspective

The new structure of the documents, related to measurement uncertainty, was submitted for discussion at the previous JCGM meeting in May 2017 where Decision 1 was taken (see §4). The new approach was eventually approved by all JCGM member organizations in September 2017. Based on various considerations, primarily continuity with the past, WG1 confirmed the title “Guide to the expression of uncertainty in measurement” for the whole suite. Various practical aspects, such as rebranding and renumbering the existing documents, are under discussion by WG1. The situation regarding the documents under development is summarized below.

JCGM 103

The first Committee Draft (CD) of this document was circulated among JCGM member organizations and NMIs at the beginning of November 2018. Comments are expected by 30 March 2019. This document was originally planned as supplement 3 to the GUM, under the banner “Evaluation of measurement data”. In the spirit of the new perspective on the GUM, its title was changed to:

“Guide to the expression of uncertainty in measurement – Developing and using measurement models”

The new title reflects the evolution of the document since its earlier stages, when the traditional structure of the GUM and GUM-related documents was still in place, and its current status. The scope has been broadened well beyond that strictly relevant to JCGM 100:2008, and now includes statistical models and modelling of dynamic measurements. This document represents a bridge between the traditional structure of the GUM and the new perspective and is to be considered as the first document in the new structure.

Introductory document

The motivation and scope for this overarching document in the new structure was presented at the JCGM meeting in May 2017. The discussion led to Decision 2 (see §4) and to the approval of the planned document in September 2017. The document will serve as an introduction to the whole suite of documents that collectively constitute the “new” GUM. It will be based on JCGM 104:2009, taking into account the broadened scope of the GUM. A drafting team has been appointed and first ideas will be discussed at the next WG1 meeting in December 2018. Development of this document is in progress.

Statistical Models and Data Analysis for Inter-Laboratory Studies (with applications to Key Comparisons)

This document has been given lower priority with respect to JCGM 103 and the GUM introduction. A paper on this topic has been published in *Metrologia* by Antonio Possolo, one of the leaders of the drafting team. In addition, NIST has developed the NIST Consensus Builder, a web-based application intended “to reduce data from inter-laboratory studies, including key comparisons, and also to combine measurement results obtained by application of different measurement methods to the same measurand.” The original scope of the document, which also covered Proficiency Testing, has been narrowed following a request by the JCGM (Decision 2, 2015 “that its scope should not duplicate existing content in ISO 13528 and other standards used for proficiency testing.”) The JCGM therefore recommended that the document should focus on key comparisons within the meaning of the CIPM MRA. It was also considered that proficiency testing should not be included in the document, as this community had not been consulted during the drafting phase.

Dr Ellison commented that ISO/TC 69 has been reconvened to receive comments on ISO 13528 with a view towards a possible early revision if sufficient comments arise. Dr Bich added that Maurice Cox had commented that he is the JCGM WG1 liaison to ISO/TC 69, which has ISO 13528 as one of its projects. He had provided a detailed review to ISO/TC 69 in November 2018 regarding the revision of ISO 13528:2015 and could play a role in attempting to achieve compatibility across the documents. Dr Bich said that in the light of the broader scope of the new GUM, it is the opinion of WG1 that the JCGM decision that the document should focus on key comparisons should possibly be reconsidered. In addition, retaining a broader scope would allow the document to cover emerging needs such as assigning a value to properties that are not quantities: WG1 was persuaded that there is a need to complete such evaluations with a statement about uncertainties. Dr Bich added that having a broader scope would also allow the “new” GUM to be released earlier and it might be better harmonized with existing ISO standards.

Dr Bich said that a symposium on “Current developments and future direction of the Guide to the Expression of Uncertainty (GUM) and its Supplements” was held during the meeting in Pretoria (South Africa) in November 2017. Talks were given by several WG1 members to an audience of 140. In addition, several members of WG1 from European NMIs are involved in the EMPIR 17NRM05 EMUE project, “Advancing measurement uncertainty– comprehensive examples for key international standards”, which is led by Maurice Cox. It is expected that feedback from this project will provide examples that can be included in JCGM 110.

Dr Bich concluded by commenting that Hidetaka Imai (ILAC) had resigned from WG1 and Hideyuki Tanaka (OIML) has become a new member.

Dr Milton thanked Dr Bich and asked if there were any questions or comments, starting with the GUM new perspective. Mr Oehlenschlaeger cautioned against renumbering the documents in the GUM as they are quoted in many places. Dr Bich added that there is already some confusion with the same document in the GUM being referred to in different ways. In the BIPM and OIML context, the JCGM labels are used; however ISO and IEC use different labels. If renumbering would simply add to this confusion, it will be avoided and the existing numbering will be retained.

Dr Milton said that the first CD of JCGM 103 is out for comment and that a wide range of views had already been incorporated into the document. Mr Oehlenschlaeger asked for clarification as to who the document had been sent to in ILAC. It was confirmed that it had been sent to Ms Merih Malmqvist Nilsson: the document should have been sent to the ILAC Secretariat for circulation. Ms Ferrés Hernández said that the document has been widely circulated within ISO. Dr Milton confirmed that it has been sent to the NMIs and Mr Patoray said that it is being discussed within the OIML.

Dr Milton recalled that measures that have been taken during the development of the document on Statistical Models and Data Analysis for Inter-Laboratory Studies by WG1 to ensure that it remains in step with ISO 13528. Dr Bich added that Steve Sidney is the ILAC representative to WG1, so ILAC has an opportunity to be involved in the development of the document. Mr Oehlenschlaeger said that ISO 13528 is used widely by proficiency testing providers and that this community has had an opportunity to influence its development. He commented however that because the proficiency testing providers are not represented as a group at WG1, the proposed document should not address this area. He added that the document would be useful for proficiency testing within the scope of the CIPM MRA, as this is a specialist area where reference values are not provided by reference laboratories, but it should not be aimed at the wider proficiency testing community. Dr Bich commented that the document would only be of limited interest to the proficiency testing community; it would not be aimed at providing a way to assess individual performance, it is intended to provide a spectrum of techniques to form a reference or a consensus value from a set of uncertain data. A paper on the subject has been written by Antonio Possolo (Possolo A. Statistical models and computation to evaluate measurement uncertainty, *Metrologia*, 2014, **51**, S228). Mr Oehlenschlaeger reiterated that the document should be comprehensive and readable, without covering the same issues as ISO 13528. Dr Bich suggested that the document would have a wider scope and that the techniques mentioned in ISO 13528 would be referenced in the proposed document. Dr Ellison noted that there are two significant areas where the documents do not overlap: performance assessment for laboratories, which is covered by “scoring” in ISO 13528, and the fact that proficiency testing in ISO 13528 does not involve laboratory uncertainties, which are central to metrological comparisons. The area of overlap is where proficiency testing providers want to carry out a similar task to a metrological comparison, which may be of interest to ILAC in terms of calibration laboratories. However, this is dealt with in ISO 13528 by referencing document CCQM 13-22, *CCQM Guidance note: Estimation of a consensus KCRV and associated Degrees of Equivalence*. Dr Ellison concluded by saying that there is not as much overlap between ISO 13528 and the proposed JCGM document as thought, adding that this was a personal opinion and not the official line of IUPAC. It was suggested that Maurice Cox (JCGM WG1 liaison to ISO/TC 69) and Dr Ellison could ensure that a solution is found that involves minimal overlap for end-users between ISO 13528 and the proposed JCGM WG1 document, particularly considering that ISO 13528 may be revised in the future.

Dr Milton asked if the broadest scope of the proposed document on Statistical Models and Data Analysis for Inter-Laboratory Studies might reflect that of the NIST Consensus Builder. Dr Bich confirmed that this is the case. The NIST Consensus Builder includes the weighted mean, which applies in 80 % of cases, as well as a range of other statistical techniques; the difficulty is concerned with giving advice to users on which technique is most suitable for a specific purpose. Dr Milton proposed that WG1 could work within the scope of the NIST Consensus Builder when developing the document on Statistical Models and Data Analysis for Inter-Laboratory Studies. This would keep the scope of the document within that of the CIPM MRA. Following further discussions it was agreed that WG1 would continue with the development of the document but there was no need for a new decision. The text of Decision 2 (December 2015) “*The JCGM supports the proposal for the development of a guidance document with the working title “Statistical Models and Data Analysis for Inter-Laboratory and Inter-Method Studies”, noting that its scope should not duplicate existing content in ISO13528 and other standards used for proficiency testing*” was still valid. Dr Bich said that it was too early to predict when the document would be complete; the first draft will be given to the WG1 member organizations for opinions when it is ready, which could possibly take two years.

Dr Bich concluded his presentation on WG1 by saying that a representative from IUPAP is still being sought.

Mr Oehlenschlaeger gave a report on the drafting and revision of ILAC G8 on conformity with requirements for the JCGM (JCGM/18-05). ILAC G8:2009 has been revised in response to the publication of ISO/IEC 17025:2017. It was prepared to assist laboratories in the use of decision rules when declaring statements of conformity to a specification or standard as required by ISO/IEC 17025:2017. The revised ISO/IEC 17025:2017 recognizes that no single decision rule can cover all situations applicable to statements of conformity. Furthermore, a survey conducted by ILAC demonstrated that statements of conformity in the regulated area usually did not adopt the decision rules found in ILAC G8:2009 but instead to other rules. ILAC G8 provides overall guidance on how to select appropriate decision rules and guidance for required elements of a decision

rule if none of the standard published rules apply. Where further information is required regarding the mathematics of various decision rules covered in the document, the reader is referred to document JCGM 106:2012. Mr Oehlenschlaeger commented that the revised ILAC G8 document now includes “guard bands” in its terminology. He added that it should be considered that a measurement may result in a decision on conformity (acceptance) using one guard band and rejection if a larger guard band is used. Therefore, conformity with a requirement is inherently connected to the decision rule employed. It is therefore expected that the decision rule is agreed before the measurements are taken. A number of examples of decision rules in the regulated fields as well as cases where uncertainty is taken directly into account were given.

Mr Oehlenschlaeger presented a few examples of where VIM terminology is referred to in ISO/IEC 17011:2017 and ISO/IEC 17025:2017. He commented that “method” as used in ISO/IEC 17025:2017 can be considered synonymous with the term “measurement procedure” as defined in ISO/IEC Guide 99; “method” in ISO/IEC 17025 is therefore synonymous with “measurement procedure” in the VIM. There was a brief discussion on the use of the term “techniques [for testing]” in ISO/IEC 17011:2017, which is not defined in the VIM. He concluded by saying that the revised ILAC G8 document has been circulated within the Accreditation Committee (AIC) and is close to the 60-day circulation phase within ILAC. This will be followed by a 30-day voting phase.

6. Report from Working Group 2 (VIM)

The report (JCGM/18-02) was presented by Dr Ehrlich, Convenor of WG2.

Dr Ehrlich said that WG2 had met three times since the last meeting of the JCGM in May 2017 and five new members have joined during that period: Prof. Frey (IUPAC); Prof. Mester (IUPAC); Prof. Varela Magalhaes (IUPAP); Dr Chunovkina (OIML) and Mr Sidney (ILAC). In addition, two members have left WG2: Prof. Imai (ILAC) and Prof. Young (IFCC). Mr Sitton (BIPM) was appointed as the Executive Secretary to replace Dr Miles. He commented that all of the member organizations are now represented on WG2, with ISO, IEC and OIML each sending the full complement of three representatives. Dr Buzoianu is no longer a member of the CIPM, so the BIPM’s representation to WG2 will be discussed.

Dr Ehrlich gave a summary of the development of the VIM4. The VIM3 was published by the JCGM in 2008, and again with minor corrections in 2012. In 2009, IUPAC and the IFCC proposed to the JCGM the incorporation of more content on nominal and ordinal properties into the VIM4 than was in the VIM3. This proposal was accepted in 2010, when the JCGM decided that WG2 should “accept the consequences”, even if this meant a significant increase in the size of the VIM. In 2010 WG2 began evaluating the “Vocabulary on nominal property, nominal examination and related concepts for clinical laboratory sciences” (VIN), which was being developed by the joint IFCC-IUPAC Committee on Nomenclature, Properties and Units, with the option of its eventual incorporation into the VIM4. The VIN was first published in 2010, and then as an IFCC-IUPAC Recommendation in 2018.

In 2011 WG2 began receiving feedback that expressed some concerns about the complexity of the VIM3, in terms of both language and some definitions. As a result, WG2’s attention shifted from incorporating nominal and ordinal properties into the VIM4 to addressing this VIM3/VIM4 situation. In response, WG2 developed a set of Frequently Asked Questions (FAQs), and the first annotated version of the VIM3 (“VIM Definitions with Informative Annotations”) was developed in 2012-2013 as an electronic document; this has been expanded with new annotations through 2017.

As reported at the 15 May 2017 JCGM meeting, in parallel to developing the FAQs and annotations, WG2 began working to identify the best way to integrate nominal and ordinal properties into the VIM4.

In May 2017 the JCGM agreed Decision 3, the text of which was: *“The JCGM encouraged WG2 to develop a “committee draft” of the next edition of the VIM by the end of 2018 (before the next JCGM meeting) incorporating the VIM3 annotations and a small number of new entries related to nominal and ordinal properties of current relevance to metrology. The WG2 convenor will report on progress at the next JCGM*

meeting.” Within this context, WG2 began considering whether to include an expanded definition of ‘measurement’ in the VIM4 encompassing nominal and ordinal properties as well as quantities. A letter was sent from the WG2 Convenor to the JCGM Chairman in March 2018 asking for comments from JCGM Member Bodies on this matter. Reaction has been mixed, which has complicated how to proceed. In addition, it was discovered that expanding the definition of ‘measurement’ would require revising over twenty existing entries in a significant way.

In June 2018 WG2, in consultation with the JCGM Chairman, decided to proceed along two parallel paths:

Path 1 was to develop a new draft ‘minimum change’ document that starts from the VIM3 Chapters 1-5 and simplifies the language, incorporates the VIM3 Annotations and includes some agreed-upon content-related changes. In parallel, further entries on nominal properties were developed and put in a separate new chapter. The new ‘minimum change’ draft and the new chapter on nominal properties are now essentially ready for consultation, in fulfilment of Decision 3. WG2 has focused on developing the draft ‘minimum change’ document ready for the current JCGM meeting, according to the mandate from the JCGM.

Path 2 was to create a new ‘evolutionary’ document, which possibly incorporates the expanded definition of ‘measurement’, and also includes several other significant changes. WG2 has started down this second path as well, but it will take more time to complete a draft ready for circulation.

A copy of the minimum change “Committee Draft” document was circulated, which incorporated changes that were made at the WG2 meeting held on 26-30 November 2018. Dr Ehrlich presented the changes to the document that had been made at this meeting and commented that work on developing the chapter on nominal properties had continued. Dr Mari added that more than 60 comments had been received since the circulation of the first draft (within the committee and to Dr Bich and Dr Milton) and these comments had all been resolved. Dr Ehrlich commented that the feedback received from the circulation had indicated that the VIM4 is more “readable”.

Dr Ehrlich presented the highlights of Path 1. He commented that the new ‘minimum change’ draft (Chapters 1-5) incorporates: VIM3 Annotations; agreed-upon content-related changes to VIM3 entries; simplified language wherever practical, providing for easier reading; and updated references. The new chapter on nominal properties incorporates entries of current relevance to metrology on nominal properties, mainly taken from the VIN, and made consistent with Chapters 1-5. The chapter on nominal properties has been developed with considerable input from Dr Nordin (IFCC) and Dr Trapmann (ISO REMCO). Dr Ehrlich highlighted the term “examinational uncertainty”, which has been incorporated into the chapter on nominal properties. This term will be presented to WG1 to explain the thinking behind the definition. The style of language used is consistent with the definition of “measurement uncertainty” in the VIM3, rather than the definition in the VIN.

Dr Ehrlich presented a table of figures showing the type and number of changes made to the entries in chapters 1-5 of the “minimum change” draft (see document JCGM/18-06). One new entry had been added (primary measurement method) and the term “calibrator” has been moved to become an accepted entry for “measurement standard”. He said that WG2 is satisfied that the Committee Draft is ready to be circulated. There was a brief discussion on the improvement made to the term “value of a quantity/quantity value”. Dr Ehrlich confirmed that the preferred term is now “value of a quantity”; there had been no change to the definition.

The publishing considerations for the VIM4 were presented. Dr Ehrlich commented that based on the experience of using the Annotated VIM3, WG2 would prefer a web-based format for the VIM4. The official/master Word and PDF files of the VIM4 could be generated from this proposed web-based system, together with other versions, as required, customized to individual needs (for example, a version containing only the definitions relevant to nominal properties could be generated). Using a web-based format would also allow for more flexibility concerning the order of presentation of entries (for example, alphabetical ordering versus ordering based on concepts) and would facilitate the introduction of supplementary material (informative) such as explanatory texts and possibly incorporating versions in other languages in the same system.

Dr Ehrlich said that decisions were needed on how to proceed with the development of the new ‘minimum change’ draft (Chapters 1-5) and the chapter on nominal properties, which contains 16 new entries that are based on entries in the VIN. He presented options for how to proceed:

- S1) keep the new chapters 1-5 and the new chapter on nominal properties together as one document, or
 S2) treat them separately (for example, as two parts).

In addition, the JCGM will need to decide whether to:

- a) Keep the document as an internal WG2 document only;
- b) Publish the document with no consultation;
- c) Circulate the document to a restricted audience;
- d) Circulate the document to a wide audience.

He commented that circulating the document to a wide audience may not be a good idea at the moment as the Committee Draft of JCGM 103 is currently being circulated for consultation.

Dr Milton thanked Dr Ehrlich and opened the floor for comments. Dr Ehrlich was asked to explain the difference between circulation to a restricted audience and a wide audience. He clarified that the restricted audience would consist of those present at the meeting, whereas a wide audience would involve circulation among the JCGM member organizations and possibly beyond. It was noted that some of the members present at the meeting are not necessarily experts in terminology and wider consultation within their organizations and relevant committees may be required. Dr Bich recalled the JCGM charter and noted that option (b) is not covered by the charter. Option (c) would constitute an informal circulation to check for reaction (a working draft) and option (d) would be a formal circulation by the JCGM Chairman for approval (a Committee Draft). There was a discussion on the value of option (a), considering the amount of work that has gone into developing the draft VIM4. Dr Ehrlich said that, if this option were adopted, the discussions so far concerning the new ‘minimum change’ draft (Chapters 1-5) and the chapter on nominal properties will help with the development of the Evolutionary VIM, so the advantages of the work done so far would not be lost. He added that the Evolutionary VIM will be radically different to the proposed new ‘minimum change’ draft (Chapters 1 5) and the chapter on nominal properties.

Prof. Gillery (IFCC) recommended that both the new chapters 1-5 and the new chapter on nominal properties should be circulated together for consultation. Dr Ehrlich added that an introductory chapter or covering letter would still be required before any circulation is carried out to explain what principles were taken into account during the development of the proposed Committee Draft and what work has been done. This will be developed depending on the outcome of the current discussions.

Dr Milton recalled that the VIM3 had been published in 2008, so if option (d) were chosen, this would be the first time that the VIM will have been circulated for consultation in ten years, which is not an unreasonable period of time to go to the member organizations to ask for comments. Dr Ehrlich added that if the ‘minimum change’ draft is circulated, the member organizations could possibly be made aware that the Evolutionary VIM is under development. Mr Oehlschlaeger commented that the process for approving a document is not clear in the JCGM charter. He suggested that a structured process, similar to that used within ISO, should be followed.

A range of views were expressed on how to proceed with the development of the new ‘minimum change’ draft (Chapters 1-5) and the chapter on nominal properties. These views included circulating Chapter 6 on nominal properties as a Committee Draft for comment followed by a formal approval to incorporate it into the main document, through to circulating the complete document (option S1). Dr Ehrlich commented that he was concerned that if the whole document is circulated and there is an objection to certain elements (such as the chapter on nominal properties), the entire document could be rejected. Dr Ellison commented that if option S1 is pursued and there are objections to the chapter on nominal properties, it could simply be removed. He added that a covering letter could be added to give directions on which elements are to be commented on, such as whether the chapter on nominal properties is useful or not. Dr Milton said that comments on chapters 1-5 should be fairly limited; the question in the consultation should be limited to whether there is support for the revised notes and wording for the definitions. Ms Ferrés Hernández suggested that the covering letter could explain that the changes to chapters 1-5 have been kept to a minimum and that the chapter on nominal properties is included for context and that a more thorough revision will be carried out in the future. Dr Ellison noted that it could be made clear that certain definitions, such as “calibration” had received a significant number of comments in previous consultations and that further discussions on topics such as this will be deferred until a future revision.

Mr Oehlenschlaeger said that he would prefer a circulation of the full document (option S1) so that the chapter on nominal properties can be seen in context. He added that the definition of “calibration” may require further debate and proposed a solution. Dr Ehrlich commented that the proposal would represent a major change that could be considered for the evolutionary VIM4. He added that the issue of calibration highlights that the VIM is not necessarily general enough for all stakeholders. The definition of calibration has been available in the VIM for ten years and the circulation will determine if it needs to be further refined.

Dr Milton recalled that although there has been some criticism of the VIM3 over the last ten years, WG2 has responded by developing the annotated VIM and adding terminology for nominal properties in response to a request from the member organizations and the CIPM. Dr Milton said that WG2 has done what it has been asked to do and now is the time to get an endorsement for the work achieved so far, adding that it is not possible to solve every issue, such as calibration. Dr Ehrlich asked whether a vote was required on the committee draft (CD). It was suggested that the VIM4 CD could be circulated for comments, and then based on the comments received, a second CD could be circulated for a vote. Dr Ehrlich expressed a concern about voting and asked why there had been a formal negative vote on the GUM CD. Dr Bich clarified that there had not been a negative vote *per se*; the GUM CD had been withdrawn in response to the number of negative comments received. A brief discussion followed on the voting and approval process for documents in organizations such as ISO and the OIML. Dr Ehrlich summarized the discussions by saying that the consensus was for a full consultation in the member organizations for the minimum change document with the chapter (chapter 6) on nominal properties (option S1). It will be circulated as a CD for consultation (not for a vote). The next step to be taken after this exercise has been completed will be decided dependant on the comments received. The way to proceed with the evolutionary VIM4 requires discussion, as the consultation exercise will have an impact on the evolutionary VIM4.

Dr Mari suggested that the new chapter on nominal properties (chapter 6) should be circulated along with chapters 1-5 of the minimum change version of the VIM4. Alternatively, chapter 6 could be circulated separately for comment, particularly bearing in mind that it is completely new. Carrying out a preliminary circulation step for this chapter would allow WG2 to determine if the metrology community is ready for content on nominal properties. Ms Ferrés Hernández suggested that chapter 6 could be reviewed by the members of WG2, who could obtain informal feedback from the main stakeholders in their organizations (for example TC 12 and TC 69 in ISO). Any technical feedback relating to chapter 6 could then be acted on by WG2 before the chapter is circulated for comment with chapters 1-5. Dr Milton asked why there is uncertainty about the content of chapter 6, considering that the information it contains has already been published in the VIN. Dr Ehrlich clarified that the information is not exactly the same; terms such as “examinational uncertainty” have been changed. Dr Milton said that these are not major changes. Dr Ehrlich commented that he agreed with the proposal by Ms Ferrés Hernández and suggested that a brief consultation exercise should be carried out within the WG2 member organizations to obtain a final check on the text relating to nominal properties in chapter 6 of the working draft discussed at the December 2018 JCGM meeting. A complete draft of the “VIM4” (including the minimally revised versions of chapters 1-5 and the new chapter 6) will be circulated as a committee draft (CD) to the JCGM member organizations for their comments after the June 2019 WG2 meeting. This draft will incorporate feedback obtained from the consultation exercise on chapter 6.

The following decision was drafted.

Decision 1

JCGM requests WG2 to complete a consultation among its members in order to finalize the text relating to nominal properties in chapter 6 of the working draft discussed at the December 2018 JCGM meeting.

A complete draft of the “VIM4” (including the minimally revised versions of chapters 1-5 and the new chapter 6) will be circulated as a committee draft (CD) to the JCGM member organizations for their comments after the June 2019 WG2 meeting.

Dr Ehrlich presented three tactical decisions for consideration by the JCGM:

A decision is needed as to whether to use expanded definitions of ‘measurement’ and/or ‘metrology’ in the (evolutionary) VIM4. Should a formal inquiry be conducted among the JCGM member organizations into this

issue and should WG2 use expanded definitions of ‘measurement’ and/or ‘metrology’ only if a clear consensus can be achieved? He added that this would have a major impact on how WG2 proceeds with the evolutionary VIM4. There are twenty entries where there would be a major impact and this would affect how the entries in the chapter on nominal properties are harmonized with the other entries. If “measurement” were to be expanded, there would be clear path towards harmonization and a separate chapter on nominal properties would not be required. If the current definition of measurement is retained, applying only to quantities, a separate chapter on nominal and ordinal properties will be required in the VIM4.

A second decision is needed on how extensively to incorporate harmonized definitions about nominal and ordinal properties in the (evolutionary) VIM4. In particular, should the different parts be kept separate in the evolutionary VIM4 and should the language and style be coordinated between the parts?

A final decision is required on whether and how to use a web-based platform for the document(s). In particular, should a web-based format be used or a paper version; should functionality be included to create different ‘views’ of the entries (for example, alphabetical, contextual); and should provision be made for multiple languages.

Dr Ehrlich returned to the issue of whether a formal consultation on whether to use an expanded definition of ‘measurement’ is needed. Dr Milton replied that an informal consultation has already been carried out and it received a mixed response. He added that a formal consultation would not be useful at the moment as no further groundwork has been undertaken since the last exercise and the responses would probably be the same. Dr Ehrlich said that he agreed unless additional information could be brought to the exercise. The previous exercise had outlined what WG2 intended to do, with a one page background document. He said that it is difficult to know how to achieve consensus on this issue. Dr Mari commented that now that the minimum change version of the VIM has been “branded” as the VIM4 and it has been agreed that stability is required, there will be at least another five years before the “VIM5” will be produced. This version of the VIM might include an expanded definition of measurement. As such, there is no immediate need to take a decision on the expanded definition. He was of the opinion that the comments on chapter 6 may give an insight into how to proceed with the proposed expanded definition of ‘measurement’. Dr Ehrlich agreed that there may be a natural progression on this issue, depending on the comments received. Dr Milton agreed with this opinion and added that it could be further discussed at the November 2019 WG2 meeting.

Dr Mari said that in this perspective, coordination between WG1 and WG2 will be required to identify a concept of “examinational uncertainty”, which could be presented as a way to provide information on the quality of examination results, from a structural point of view, as measurement uncertainty is expected to provide information on the quality of measurement results. A major reason for possible objections to broadening the scope of measurement is because of the lack of clear ideas about whether uncertainty can be expressed in the case of examinations. Providing such information from a terminological and mathematical modelling perspective may be a major step forward. Dr Bich said that putting this issue on the table in WG1 is feasible although there is strong resistance in WG1 to the idea of an uncertainty being attached to something other than a number and a unit. Dr Milton added that there is also some support in WG1 for the concept. Dr Ehrlich noted that putting this issue on the agenda would at least start the debate in WG1.

Dr Ehrlich said that the discussion on how extensively to incorporate harmonized definitions about nominal and ordinal properties in the (evolutionary) VIM4 was not needed at the moment. Dr Mari asked for clarification that the evolutionary VIM was now being referred to as the VIM5. It was agreed that this is the case and that the development of the VIM5 will take at least five years due to the possible difficulties concerned with whether or not to use an expanded definition of ‘measurement’. Dr Ehrlich asked if a decision is needed on the development of the web-based platform before the next meeting of the JCGM in 18 months. The web-based platform was demonstrated and discussed later in the agenda (see §8).

Following the discussion, the following decision was drafted.

Decision 2

JCGM encourages WG2 to continue its work on a future revision of the VIM to address issues under discussion within WG2 that have not been incorporated in the CD mentioned in Decision 1 (for example, to develop consensus on the international acceptability of broadening the definition(s) of measurement and/or metrology to encompass nominal and ordinal properties).

Ms Ferrés Hernández suggested that for the sake of clarity the minutes should record that there will be a final approval and publication stage for the VIM4 CD, before the development of the VIM5 gets under way.

There was a long discussion on producing a French version of the VIM and whether the French version is the official version for consultation purposes. Dr Milton said that his understanding was that the French translation is not regarded as being the official version of the VIM. The JCGM charter mentions that the working language of the Joint Committee is English and that the Joint Committee shall take responsibility for maintaining and up-dating the International vocabulary of basic and general terms in metrology (VIM) and the Guide to the expression of uncertainty in measurement (GUM) in their two versions (English and French). It was noted that there are often problems associated with difficulties in translating certain concepts (such as magnitude) into languages other than English. Dr Bich recalled that the first version of the VIM was published in 1984, at a time when all publications from the Committees were in French. This situation has changed over time, to the extent that only English versions are now published. He suggested that the next VIM could follow the same course, with an English version being produced, which could subsequently be translated into French. Following further discussion it was agreed that the JCGM will return to this issue in the future. In particular the JCGM will need to take a decision on whether to add an element to the charter to clarify whether future versions of the VIM need to be produced jointly in both English and French.

7. Actions taken by Member Organizations since the last meeting

IUPAC

Dr Ellison said that IUPAC has been finalizing the Compendium of Analytical Technology, which has been undergoing a revision. Drafts for approval are expected in the near future. He noted that the compendium follows terminology in the VIM.

With regard to Eurachem, the Guide “Metrological Traceability in Chemical Measurement” is out for comment. In addition, Eurachem is working on guides for uncertainty of validation data and selection and use of reference materials. Eurachem is also undertaking a survey to investigate people’s understanding of metrological traceability as way of informing future guidance.

ILAC

Mr Oehlenschlaeger said that the standard ISO 20387:2018 (Biotechnology - Biobanking - General requirements for biobanking) was the subject of a resolution at the ILAC General Assembly (GA) which was held in Singapore in October 2018. He commented that biobanks have approached ILAC for accreditation of the activities that they undertake. This could be a significant area as it covers subjects as diverse as human and animal tissues, as well as other materials such as seeds; the size of this sector relevant to ILAC could potentially overtake reference materials and proficiency testing.

A second resolution at the GA agreed that level four and five documents will no longer be produced. These are sector specific guidance for level four (for example, the GUM or JCGM:106) and test procedures, methods and standards (level five) that are used for specific calibrations and tests. In future, level four and five documents will only be produced if a large stakeholder is involved, such as the World Anti-Doping Agency (WADA).

ISO

Ms Ferrés Hernández said that ISO/TC 12 - *Quantities and units* is finalizing the ISO 80000 series, which is being aligned with the revised SI. Parts 2 to 12 will be submitted for FDIS ballot in late 2018/early 2019. Progress is being made with Part 1, which is being handled separately. She commented that the enhanced cooperation with the BIPM in ISO/TC 12 is appreciated. ISO/TC 12 has expressed a range of opinions on the proposal to expand the definition of measurement and has decided that its priority is to complete the ISO 80000 series before this matter is addressed again. Opinions will then be sought from its member bodies. ISO/TC 69 - *Applications of statistical methods* has started work on “big data analytics”, with two technical reports being drafted.

Ms Ferrés Hernández recalled that ISO/REMCO had held a brainstorming session on terminology at its meeting in Ottawa (Canada) in July 2018; this session had been attended by Dr Ehrlich. ISO/REMCO is revising ISO Guide 30 (Reference materials -- Selected terms and definitions) to incorporate definitions for reference materials and certified reference materials that are harmonized with the VIM. Dr Ehrlich confirmed that the latest draft of the VIM reflects this harmonization.

Ms Ferrés Hernández thanked the BIPM for the considerable amount of work it had carried out towards the successful revision of the SI. Dr Milton thanked Ms Ferrés Hernández and said that it had been a global effort.

OIML

Mr Patoray said that the OIML is continuing with its review of JCGM 103 and that feedback will be sent to WG1. He added that the OIML has an ongoing commitment to send three representatives to both WG1 and WG2. Mr Patoray noted that he attends the JCGM plenary session as the OIML representative to allow Dr Ehrlich to focus on his attendance at the JCGM as the WG1 convenor. He commented that the incoming Director of the BIPM, Mr Donnellan, will be made aware of this arrangement.

Dr Ehrlich added that a consultation exercise has been carried out within the OIML on the expanded definition of measurement. The general consensus had been towards retaining the current definition.

IFCC

Prof. Gillery said that the IFCC has renewed its participation in WG1 and WG2 and is looking for a second representative for WG2. The IFCC is working towards greater interaction with the NMIs and the BIPM and discussions are ongoing at the scientific division and board levels within the IFCC. This interaction will establish a more global strategy for standardization of laboratory tests and may lead to the signing of a new MoU between the IFCC and the BIPM.

IEC

Prof. Mari commented that IEC TC 25 (*Quantities and units*) has set up a joint working group with ISO/TC 12 to develop and maintain the IEC parts of the ISO 80000 series.

The IEC has implemented an experimental open data policy that currently allows access to the Electropedia (the International Electrotechnical Vocabulary), which includes the VIM. The policy allows free access to the entries in the Electropedia as computer-defined text in Excel format.

BIPM

Dr Milton informed the JCGM that the CIPM had taken Decision CIPM/107-13 “*The CIPM agreed with the proposal from the CCU President to establish a Task Group to review further the issue concerning the*

definition of the term "unit" in the SI Brochure" at its meeting in June 2018. This group will discuss aspects of terminology.

Prof. Mari asked if a representative from the JCGM or WG2 will be proposed to attend this Task Group. Dr Milton replied that he will recommend this, particularly if this is a CIPM Task Group, to ensure wider consultation than simply within the CIPM. He added that the CIPM will be encouraged to reflect on the fact that it is only one of eight member organizations represented at the JCGM.

8. Any other business

Prof. Mari gave a demonstration of the prototype electronic (web-based) version of the VIM4. He noted that the JCGM charter currently states that official documents are prepared in LaTeX or Word, from which PDF versions, including hyperlinks, can be readily produced. If an electronic/web version of the VIM were to be adopted, the JCGM charter may need to be changed to reflect the fact that the electronic version is based on a database and not LaTeX or Word. A decision would be required from the JCGM as to whether the official versions of the VIM will remain as LaTeX or Word, with any electronic version being provided as an additional resource, or whether an electronic version could become the "official" format for the VIM, from which Word and PDF files can be readily produced. He added that the database facilitates the easy production of different language versions.

Ms Ferrés Hernández commented that the electronic version is very good but she had a number of concerns. Firstly, the VIM documents are subject to a consensus building exercise; currently documents are circulated as PDF files and this practice would have to be maintained. Secondly, ISO operates an Online Browsing Platform (OBP) and the IEC has the Electropedia, which contain terms and definitions from the VIM. A PDF file would be required to allow this to be maintained via existing XML/HTML models. Dr Ellison suggested that the primary working format for JCGM Working Groups will need to be discussed. Increasingly, stakeholders expect a starting format to be adopted that will allow the generation of multiple media files; whether it is a mark-up language or a Word file that can be converted, needs to be decided for both WG1 and WG2. He added that within WG1, the use of Pandoc had been suggested to convert LaTeX files into other formats. Prof. Mari added that a similar approach has been adopted by the OIML to allow the VIML to be published online. He reassured the JCGM that it will be possible to produce Word and LaTeX files from the web-based version of the VIM4; it will involve writing a program to produce files in the correct format. Dr Milton added that stakeholders will continue to receive printed documents for consultation exercises.

No decision was taken on the development of the web-based platform.

Mr Patoray said that he was retiring as Director of the BIML and that this would be his last involvement in JCGM meetings. He commented that the incoming Director, Mr Donnellan, will attend the next meeting.

9. Date and venue of the next meeting

The JCGM agreed to retain the 18 month schedule for its next meeting, which will be held at the BIPM in June 2020. Dr Milton added that the 18 month schedule will fit in well with the timetable for the WG1 and WG2 consultation exercises. Mr Oehlenschlaeger said that the third week of June should be avoided as it coincides with World Accreditation Day.