Joint Committee for Guides in Metrology

Minutes of the meeting held on Monday 15 May 2017
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)
Dr Hidetaka Imai (ILAC)
Prof. Luca Mari (IEC)
Dr Janet Miles (WG2 Executive Secretary, present for part of the meeting)
Dr Martin Milton (JCGM Chairman, BIPM)
Mr Erik Oehlenschlaeger (ILAC)
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 there were no representatives from the IFCC and IUPAP.

2. Approval of the agenda

The provisional agenda dated 30 March 2017 (JCGM/17-00-Agenda) was approved. Dr Milton added an item under 'Any other business' to appoint or reappoint a chairman for the JCGM.

3. Appointment of the Chairman and *rapporteur*

Dr Milton was appointed Chairman of the meeting and Mr Sitton as *rapporteur*.

4. Approval of the minutes of the meeting of 2 December 2015

The minutes of the previous JCGM meeting were approved, with three minor editorial corrections suggested by Dr Ehrlich.

5. Review of the decisions taken at the meeting of 2 December 2015

The decisions of the 2015 meeting were reviewed.

Decision 1
The JCGM endorsed the timetable proposed by WG1 for its progress towards revision of the GUM. It recommended delaying any decision on a "new perspective" for presentation of the GUM series of documents until after greater engagement has been carried out with stakeholders. It encouraged WG1 to proceed with the preparation of CD JCGM 103.

The "new perspective" will be discussed during the report from WG1 to be given by Dr Bich.

Decision 2
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.

This is also to be discussed during the report from WG1.

Decision 3
The JCGM requests WG2 to propose a revised "modified work programme" for circulation by the end of 2016.

This revised programme has been received and will be discussed.

Decision 4
The JCGM requests WG1 and WG2 to submit their annual reports in writing in May 2017. The next meeting of the JCGM will be held on 15 May 2017.

All reports had been received on time.

6. Report from Working Group 1 (GUM)

The report (JCGM/17-03) was presented by Dr Bich, Convenor of WG1.

Dr Bich said that WG1 had met three times since the last meeting of the JCGM, in May and November 2016, and in May 2017. In addition, two interim meetings held at INRIM, Turin, Italy, in July 2016 and February 2017, were attended by Dr Bich, Dr Ellison, Dr Maurice Cox (NPL) and Dr Adriaan van der Veen (VSL). These interim meetings had been held to finalize the document JCGM 103 "*Supplement 3 to the GUM, developing and using measurement models*". The JCGM had endorsed the development of this document at its meeting in December 2015 to give WG1 the opportunity to recover from the perceived loss of credibility it had suffered following the rejection of the revised GUM during its last circulation. Priority was given to the development of document JCGM 103 as it is expected to have a high probability of acceptance. A number of important comments on JCGM 103 have been received from within WG1. This will delay the first circulation of the committee draft (CD) by six months, although there remains a commitment to do so by the end of 2017.

Dr Bich recalled that, as mentioned above, the revised GUM (*CD of JCGM 100-revised: Guide to uncertainty in measurement, JCGM 100:201X CD*) had been negatively received. A paper analysing the reasons for the failure and the provisions being considered to overcome the situation has been published (*Metrologia*, 2016, **53**(5), S149-S159). He commented that more than 1000 comments had been received although with some overlap, the same comment occasionally being received from the same person via different routes, for example through their NMI and RMO. The Executive Secretary of WG1 collated the comments and WG1 has responded to all of them. Dr Bich stressed that although each comment has been responded to and taken into account, it does not imply that the existing document will simply be modified accordingly. The general views expressed on the document are such that a radical revamp, if not a complete rewrite, is needed.

An updated version of the "*Roadmap to a revised GUM*" (JCGM/15-04) will be available in late May/early June 2017. It had been discussed at the WG1 meeting held immediately before the current JCGM meeting.

Dr Bich recalled that a new perspective for presentation of the GUM series of documents had been introduced at the December 2015 meeting of the JCGM as a way forward following the failure of the revised GUM. The JCGM agreed, at its meeting in December 2015, to delay the final decision to proceed (Decision 1) until greater engagement had been carried out with stakeholders and the rationale for the new perspective was better articulated; these tasks have now been carried out by WG1. There is now a consensus within WG1 that the new perspective is the way forward following the failure of the circulated CD of the revised GUM.

Dr Bich gave a presentation on the new perspective and the rationale as to why it is needed. The current structure has JCGM 100 "*Evaluation of measurement data – Guide to the expression of uncertainty in measurement*" as the top level document with a descending hierarchy of supplements and supporting documents. This structure is no longer appropriate as some of the supplements cover a wider range of topics than those for which the GUM was originally intended. There are a growing number of users who use the Monte Carlo method as they need to evaluate coverage intervals in a way that, if carried out according to the current GUM, would be questionable. The GUM itself has a number of problems. There is an inconsistency between the content and scope of the GUM; the scope being much greater than the content. There is an internal inconsistency due to a coexistence of frequentist and Bayesian methods in the evaluation of type A and type B uncertainties. In addition, an external inconsistency exists between the results provided by the GUM and its supplements, whereby results can be different when applied to the same problem. Finally, document JCGM 100 does not include any information about statistical models, when they can be considered as measurement models, and guidance on type A methods is limited. However, the rationale for a new version of the GUM was not sufficiently articulated, particularly the reasons why users should change to a different way of evaluating uncertainties. Feedback from the circulation of the *CD of JCGM 100-revised* indicated that users would have to undertake considerable effort to implement the new procedures. Feedback also showed that there is a wish to preserve the legacy of the current GUM, which is reflected in the request for 'grandfathering'.

It is hoped that the new perspective will address these and other problems. All the documents outlined in the new perspective are considered as being parts of a 'suite', allowing new documents to be added without the need to establish a new hierarchy. In addition, there will no longer be supplements to the GUM; they will co-exist at the same level. Each document within the suite will cover a different method and application and it will be possible to write documents of different levels of complexity depending on the intended readership. An introductory, overarching document (see document JCGM/17-07) will give basic principles and will guide readers to the correct document for their particular use. This introductory document will be based on document JCGM 104:2009. Dr Bich displayed the structure proposed in the new perspective for the GUM. This structure, listing the documents, both published and planned, is shown in document JCGM/17-06.

He gave an update on progress with document JCGM 109 "*Statistical Models and Data Analysis for Inter-Laboratory and Inter-Method Studies*". Development of this document had been endorsed by the JCGM (Decision 2, December 2015) but with a narrower scope than originally intended by WG1. It will exclude topics that have already been covered in ISO 13528 and other standards used for proficiency testing. The development of JCGM 109 is being led by Dr Possolo (NIST and IEC) and Dr Elster (PTB and IUPAP), with participation from other WG1 members. A modified version of the 'motivation and scope' document, which takes into account the comments from the JCGM, was presented to WG1 during the May 2017 meeting. This updated document will be made available to the JCGM in June 2017.

Contributions to the BIPM Workshop on Measurement Uncertainty, held at the BIPM on 15-16 June 2015, have been published in a Focus Issue of *Metrologia*. The issue currently contains 15 papers.

Dr Bich recalled the collaboration between WG1, IUPAC and the Commission on Isotopic Abundances and Atomic Weights (CIAAW), which had been established to solicit the views of WG1 on whether the uncertainties declared for atomic weights had been given in an appropriate manner. The background to the collaboration was that some elements, for example carbon, display an intrinsic variability which is much larger than the measurement uncertainty. This study has now been concluded and two publications were written by WG1 and IUPAC members: "*Guidelines for the use of atomic weights*", which is being transformed into a Technical Report at the request of IUPAC; and the Technical Report on "*Interpreting and propagating the uncertainty of the standard atomic weights*".

Dr Bich concluded his report by commenting that there have been two resignations from WG1 since the last meeting of the JCGM: Prof. Hibbert (IUPAC) and Dr Wöger (IUPAP). Three new members have joined WG1: Dr Ellison and Dr Meija (IUPAC) and Dr Krystek (ISO).

The JCGM discussed the "new perspective" and agreed that a suite of documents and a defined strategy to address the issue of perceived loss of credibility following the circulation of the CD of *JCGM 100-revised: Guide to uncertainty in measurement* was a good way forward. It was suggested that there could be a perception

among users that the scope of the GUM may be changing from a guidance document to an 'encyclopaedia' of measurement uncertainty: it was recalled that the JCGM charter covers the production of guidance documents. It was clarified that in its charter, the JCGM's terms of reference include the following statement: "to develop and maintain, at the international level, guidance documents addressing the general metrological needs of science and technology, *and to consider arrangements for their dissemination*". This empowers the JCGM to continue with the "new perspective" to develop a suite of documents with a common title.

In terms of standardization requirements, particularly for the IEC, it was suggested that each part of the suite of documents should be readable as a standalone document. Dr Bich responded by noting that, in the proposed suite of documents, he is not in favour of duplicating information which can be found elsewhere. For example, definitions that can be found in the VIM have not been rewritten in document JCGM 103. He added that by using hyperlinks, there is less of a need to produce self-consistent documents. Dr Bich added that there had been strong arguments in favour of separating the examples into a separate document (JCGM 110) as this allows a more flexible way of updating the GUM if and when any new examples become available. He recalled that the JCGM meeting in December 2014 had decided that WG1 would not require formal approval, but simply communication to its Member Organizations, for future updates of JCGM 110 to include new examples. It was suggested that JCGM 110 may be ready for circulation in the first half of 2018. A brief timetable for the work on the suite of documents was described.

There was support among the JCGM for 'grandfathering' of the current GUM (JCGM 100:2008), which will be included in the suite of documents as proposed in the new perspective. There was a view among the JCGM that it should be made clear that under the "new perspective" the GUM will refer to a suite of documents and not simply to a single document such as the current JCGM 100:2008. Dr Bich stated that documents produced by WG1 for the suite will be submitted to the JCGM, thus allowing checks to ensure that there is no duplication of material with existing ISO and the IEC standards.

It was asked if there was a need to request more examples for document JCGM 110. Dr Milton commented that this could be raised at the next meeting of the Consultative Committee Presidents if it is considered necessary. Dr Bich said that if many examples are submitted, WG1 will select those that are most appropriate to illustrate particular technical issues. There was consensus that the principle of the "new perspective" is the way to proceed but that the member organizations will need to be consulted over some of the details. This is particularly the case considering that some documents were only made available immediately before the current meeting. It was noted that ISO TC69 will need to be consulted for feedback at its meeting in June 2017. Concerns had been expressed by a resolution of the ISO/TMB (Technical Management Board) over separating the examples from the main body of the GUM. The rationale for separating document JCGM 110 will be communicated to the TMB by Ms Ferrés Hernández for their endorsement.

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.

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.

7. Report from Working Group 2 (VIM)

The report (JCGM/17-01) was presented by Dr Ehrlich, Convenor of WG2.

Dr Miles, the WG2 Executive Secretary, joined the meeting. Dr Ehrlich began by reviewing changes to the membership of WG2. Two members of WG2, Prof. Paul De Bièvre (IUPAC) and Mr Willem Kool (OIML), had died since the last meeting of the JCGM and four members had retired from WG2: Dr Karshenboim (IUPAP); Dr Priel (ISO); Prof. Mueller (IFCC); and Dr Wöger (IUPAP). Two new members have joined: Prof. Young (IFCC) and Ms Desenfant (ISO). WG2 currently has 12 members out of a possible 24 and there are no representatives from IUPAC or IUPAP.

Dr Ehrlich reported on the status of development of the VIM4. A key activity in 2016 has been to identify the terms from nominal and ordinal properties application fields that could be included in the VIM4 and to incorporate them into a Draft VIM4 Outline for circulation to the JCGM Member Organizations for comment. Following consultation with the JCGM Chairman, WG2 agreed that circulating an outline that does not also include proposed definitions would not generate the desired level of feedback. As a result, WG2 has decided to proceed directly to the development of a Draft VIM4, which will contain draft terms and definitions.

In 2016, WG2 began investigating possible sources of terms and concepts on nominal and ordinal properties to incorporate into the Draft VIM4. Input is being considered from the IFCC and IUPAC (the "International Vocabulary of Nominal Properties and Examinations" (VIN)) and from ISO/REMCO/WG 13 (ISO/TR 79 "Reference materials for qualitative analysis – Examples of reference materials certified for nominal properties", which is a compendium of examples of state-of-the-art in six areas). Other international vocabulary activities pertaining to nominal and ordinal properties are also under investigation. The individual members of WG2 have also been asked to canvas their communities for further examples. The WG2 review of the VIN and ISO/TR 79 has resulted in a significant number of entries (terms and definitions) that will be considered for inclusion in the VIM4.

WG2 also began to consider for which terms on quantities that were included in the Draft VIM4 Outline there were analogous terms pertaining to nominal and ordinal properties. The idea was to investigate how such analogies might best be exploited to structure the VIM4. WG2 has been looking into two different approaches to incorporate nominal and ordinal properties into the VIM4: a harmonized approach and an independent approach. Dr Ehrlich gave examples of both approaches then paused for questions and comments.

It was suggested that some of the terms are very complex and WG2 should consult a terminologist for advice. Ms Ferrés Hernández proposed Mrs Joanna Goodwin, the Technical Officer of IEC TC 1 (Terminology), as a possible candidate.

Dr Ehrlich continued with his presentation. He noted that the harmonization activity has proven to be more difficult and time consuming than originally envisaged. Pursuing the harmonized route would result in a VIM4 very different from the current version. WG2 is carrying out a parallel approach to further consult with nominal and ordinal properties experts to acquire written examples of metrological principles that are being used in their work. These examples will then be used to identify key terms and concepts that will be considered for inclusion in the VIM4, without trying to harmonize these entries with the entries pertaining to quantities. It is thought that this parallel (independent) approach, rather than the harmonized approach, could lead more quickly to a Draft VIM4. WG2 will also investigate using both approaches in a limited fashion, for example for a few entries such as "value". WG2 estimates that if the independent approach is taken, the Draft VIM4 could be available to circulate to JCGM Member Organizations for their comment by the end of 2019. This Draft would include terms and definitions for nominal properties, ordinal properties and quantities. Dr Ehrlich commented that the definition of measurement (process of experimentally obtaining one or more quantity values that can reasonably be attributed to a quantity) in the VIM3 does not apply to nominal properties and whether the definition of metrology (science of measurement and its application) applies to nominal properties or not depending on what is meant by "application". He added that there have been discussions within the metrology community to broaden the definition of measurement to encompass nominal and ordinal properties. There was a brief discussion on the possible uses of the term "measurement". Dr Ehrlich expressed the opinion that if the title of the VIM4 were to be "International Vocabulary of Metrology" and if it were to be decided that metrology

pertains only to measurement in the sense of quantities, if nominal properties are included this would be inconsistent.

Dr Ehrlich gave an overview of the structure of WG2 (Task Groups). WG2 maintains four Task Groups (TGs) to help progress its work between meetings. TG1 and TG2 focus on the consistency and relationships among the VIM4 entries, TG3 works on VIM3 annotations, and TG4 focuses on aspects relating to nominal and ordinal properties.

He continued by outlining the publishing considerations for the VIM4. The growing popularity of the web-based "Annotated VIM3" has prompted WG2 towards using a web-based format for the VIM4. This could be used to generate customized PDF files. For example, a version that only contains definitions relevant to nominal properties could be generated. The use of a web-based format would also give more flexibility concerning the order of presentation of entries (for example alphabetical ordering versus ordering based on concepts). Finally, it would also allow the introduction of supplementary material (informative) such as explanatory texts and possibly translation into other languages.

Work has continued on the VIM Definitions with Informative Annotations, "Annotated VIM3". There are currently 65 annotations of VIM3 entries in the online "Annotated VIM3". Forty-four (68 %) of the annotations pertain to simplifying complexity of language, while 21 (32 %) pertain to more substantive matters. The intention is that these annotations will be rephrased so that they can be included into the normative part of the VIM4.

Dr Ehrlich completed his report by presenting a proposed plan of work for WG2. By late 2017 to mid-2018, the text (terms and definitions) pertaining to nominal and ordinal properties that are proposed to be included in the VIM4 will be sent to the JCGM for circulation to its Member Organizations for feedback. One or more published papers on the subject are expected, in order to clarify the underlying strategy. Prof. Mari is preparing a paper in this context. The feedback from JCGM Member Organizations on the "harmonized approach" will be taken into account and an assessment will be made as to the extent to which this approach is practicable. Publication of the informative annotations in the Annotated VIM3 will continue, and the annotations will be taken into account in the development of the VIM4. A Draft VIM4 will be circulated to the JCGM by the end of 2019.

Ms Ferrés Hernández commented that even if the VIM4 is produced as a web-based format, ISO will still require either PDF or Word files and is investigating how to accept documents in Latex format for use in its internal systems. Ms Ferrés Hernández asked if annotations relating to substantive matters would be discussed by WG2. Dr Ehrlich clarified that WG2 will discuss annotations and how to modify and possibly add notes to the VIM3 definitions for the VIM4. Ms Ferrés Hernández expressed the opinion that some of the annotations may be useful for WG2 but may be too complicated for users, with the annotation for "measurement method" being given as an example. Dr Miles added that for some important terms not defined in the VIM3 the only way to include a definition for them in the immediate term was to add the definition in an annotation. Dr Milton recalled that the annotated VIM3 was developed by WG2 in response to criticism, among other things, that "primary method" had been deliberately omitted. The term still exists and the compromise was for the annotated VIM3 to bring this back in. Dr Ehrlich added that the VIM4 will not have these annotations. WG2 will look into the background as to why annotations were added and will address how to remedy the problem, so that the VIM4 definitions and notes will not lead to further criticism. He commented that he could envisage a note in the VIM4 stating that these terms are generally used but they are not defined. Mr Oehlenschlaeger commented that the annotation "primary reference measurement procedure", instead of "primary reference measurement method" had caused confusion in the medical community because "procedures" are referenced in standard ISO 15189 *Medical laboratories – Particular requirements for quality and competence* for the accreditation of medical laboratories. Dr Ehrlich agreed that certain annotations are problematic due to the different meaning of certain terms in different communities. He recalled that the VIM is a vocabulary and not a dictionary and commented that for certain terms, notes may be required for clarification. It was asked if the VIM4 will include references to the hierarchy of standards and their associated special terms. Dr Ehrlich commented that issues such as this will need to be discussed by WG2, particularly whether or not the terms are required for existing

users, for the sake of traceability. He reiterated that addressing issues such as this, and pursuing the harmonized approach, will take a considerable amount of time.

Dr Ellison recalled that WG2 is looking for examples of written language in relation to ordinal and nominal properties. He urged WG2 to ensure that such examples are independent because there are small but active groups in IUPAC and IFCC that are developing terminology and it is important to determine if written references have come from these groups or from the wider community. The terminology being developed by such groups is potentially restricted to their own communities and not widely used. Dr Ehrlich replied that this will be taken into account and new terms will not be introduced into the VIM4 without due consideration. He added that receiving feedback on new terms is difficult until they are disseminated to the wider metrology community. It was suggested that between 10 and 20 of the most general terms used in the nominal and ordinal properties communities would be identified by WG2. These terms could then have their definitions fully-developed for circulation to member organizations for feedback.

Prof. Mari proposed introducing explanations to describe the rationale behind the ideas for the VIM4, possibly in the form of position papers, before the draft of the VIM4 is developed. This approach could possibly generate early feedback. He commented that it would be better to have a position paper rejected rather than the draft of the VIM4 and proposed *Metrologia* as the forum for any position papers. He cautioned that WG2 and the JCGM should do their utmost to avoid a draft of the VIM4 being rejected. Dr Ehrlich replied that although this is a good suggestion, the proposed timescale needs to be taken into account. He asked Prof. Mari for an estimate of how long it would take to draft position papers and to wait for feedback. He replied that any position papers would formally request feedback and a period of six months would be reasonable to receive comments.

Prof. Mari said that the harmonized approach to incorporating nominal and ordinal properties into the VIM4 may be rejected because the scope of the VIM, and the number of member organizations involved has increased. The fully-harmonized approach would imply that a single concept system is able to embed everything. This may not be the case at the moment as different NMIs may have their own terminology, which may differ from the VIM. Ms Ferrés Hernández proposed taking a pragmatic approach that would not attempt to incorporate all terminology. She suggested consulting a terminologist and defining the terms for different contexts. Mr Oehlenschlaeger added that the VIM4 could focus on a "core" set of terms rather than trying to include all terms. He added that organizations such as the OIML and IFCC will produce their own vocabularies as they have specific terms that they need to define. If these terms are included in the VIM, it may become too large and difficult to use. He also warned against removing too many terms from the VIM, which may influence its perceived usefulness. Dr Ellison commented that he would encourage a consultation exercise on a specific number of terms and definitions that are proposed for inclusion in the VIM4, providing there is the time to carry out the exercise.

Dr Ehrlich asked Dr Ellison for his opinion on the harmonized approach. Dr Ellison replied that consideration should be given to what is needed in the VIM4, particularly with regard to ordinal and nominal properties. ISO REMCO has not achieved rapid development of guidance on reference materials for qualitative and ordinal properties because there is no active research in this area. The chemistry community, for example, has no strong impetus to move towards nominal and ordinal properties because quantitative properties are more relevant. In analytical chemistry, there is no need for a set of terms that relate specifically to qualitative analysis. The situation is different in the clinical community, where examinations require qualitative analysis for diagnoses, and its documentation has been written to reflect this. He concluded that in the communities he interacts with there is no urgent need for a significant expansion of terms in the VIM4, although there may be a need for additional terms for other communities. He queried whether a central and general VIM is needed when the communities using the concepts often have their own vocabularies, such as the IUPAC/IFCC International Vocabulary of Nominal Properties and Examinations (VIN), which is structured on the VIM, using analogous terminology. Dr Ehrlich added that the VIN is in its fifth committee draft.

Dr Milton asked if a decision is needed from the JCGM on how to proceed with the VIM. Dr Ehrlich replied that WG2 requires input from the JCGM as to whether there is any urgency in publishing "something" with regard to the VIM4, and if so what that may be. Dr Milton said that his view was that there does not seem to be a perceived urgency within the JCGM. He added that the CIPM position is to advocate a small number of

additions to the VIM4 to address ordinal and nominal properties and it regards the work as important rather than urgent. Dr Ehrlich mentioned the CIPM document JCGM/17-05 *The CIPM position on the VIM – Draft*, which suggests that the VIM4 does not have to be self-consistent and which appears to favour the independent approach to incorporating nominal and ordinal properties into the VIM4.

Ms Ferrés Hernández commented that WG2 could proceed by incorporating the annotations and rephrasing the definitions as required. A few new definitions could be included in the VIM4. Dr Ehrlich added that WG2 could focus on this approach, while continuing to pursue harmonization and following the evolving work in IUPAC, ISO REMCO and the VIN.

Dr Miles asked for clarification over the timescale for publishing the VIM4. Dr Milton commented that getting the VIM4 right is more important than getting it quickly. Dr Ellison added that experience from ISO REMCO suggests that there is not a state-of-the-art in the qualitative assignment of values for reference materials at the moment. This is reflected in analytical chemistry in general. This makes the qualitative part seem non-urgent. IUPAC would however welcome improved language in a modest revision of the VIM in response to comments about the convoluted language in the latest VIM. An early, but limited revision with improved terminology would be welcome, rather than waiting for a comprehensive and harmonized VIM. Mr Oehlenschlaeger added that chapters 3, 4 and 5 of the VIM3 had previously been proposed as requiring limited revision. He commented that the VIM3 definition of 'calibration' could be interpreted to mean that scientists involved in calibrations should be doing more than they actually are.

Dr Ehrlich summarized the discussion by suggesting that WG2 should adopt a faster approach by incorporating annotations and adding a few new terms to produce a "committee draft" of the VIM4. This committee draft could then be developed by the end of 2018. It will be presented to the next meeting of the JCGM and then, if approved, circulated to the member organizations for comment. Dr Bich commented that there should be consistency between the GUM and the VIM, with close collaboration between WG1 and WG2.

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.

Dr Milton presented document JCGM/17-05 *The CIPM position on the VIM – Draft*. The document gives the background to the development of the VIM from its first publication in 1984 and an overview of what it is for. The document includes various principles, developed by the CIPM, that it recommends should be adopted in the development of the VIM4. The key principles are that the VIM should be compact, understandable and stable. The terms listed in the VIM should match as closely as possible those in current use, the definitions should be more understandable (than in the VIM3), with no need to look up the meanings of several other terms for clarification, and a limited number of terms for nominal properties should be introduced. The draft document has the support of the CIPM, and will be voted on in October 2017.

Prof. Mari commented that the draft document can be interpreted to suggest that the CIPM does not support WG2 adopting a "harmonized approach" to the development of the VIM, particularly considering the reference to a compact document and definitions that should be more understandable (than in the VIM3), without the need to look up meanings of other terms. He gave the opinion that developing a compact document with definitions that can be read and understood without reference to other terms would be very difficult, particularly considering the suggestion to use superordinate concepts. He commented that following the general principles in the CIPM position on the VIM, WG2 may have to avoid trying to harmonize definitions, instead to simply list them. Prof. Mari further suggested that the CIPM document could be interpreted as the VIM becoming a dictionary rather than a vocabulary. Dr Ellison added that his interpretation of the phrase "*the meanings of terms should correspond to their meanings in normal scientific language*" in the CIPM position document was that the VIM should harmonize its terminology with commonly used terminology. Dr Milton recalled Mr Oehlenschlaeger's earlier comments on calibrations and the importance of harmonizing terminology.

He added that the term “calibration” can mean either an adjustment or establishing a relationship to define standards. It is not the role of the JCGM to decide which definition to use. He concluded the discussion by recalling the success of the VIM3 in achieving consensus for its definition of “metrological traceability”.

Dr Miles left the meeting.

8. Actions taken by Member Organizations since the last meeting

ISO

Ms Ferrés Hernández said that ISO/TC12 – *Quantities and units* will soon complete the revision of ISO/IEC 80000. The two remaining parts (space and time, and acoustics) have been reviewed by the project leaders and will now become draft international standards. A harmonization exercise will be carried out for the cross-references and a final draft international standard is expected to be submitted in mid-2018. ISO/TC69 – *Applications of statistical methods* is about to initiate exploratory work on “big data”. This has been discussed in an advisory group and a working group may be established in June 2017. ISO/TC12 had previously included a project on *quantities and units in eHealth*. This project had been missing medical expertise and had been cancelled. ISO/TC215 – *Health informatics* has now become involved and the project is being re-examined.

IEC

Prof. Mari said that the IEC is working closely with the ISO and recently joined the ISO/IEC JTC 1 (joint technical committee on information technology) and created a new sub-committee on “*the internet of things*” by upgrading an existing working group. This is of interest to the JCGM as its applications are concerned with measurement science, for example in the area of sensor networks. The work of IEC TC1 *Terminology* is ongoing with the “*Electropedia*”, an online version of the International Electrotechnical Vocabulary.

ILAC

Mr Oehlenschlaeger commented that the majority of the work in ILAC is focused on the revisions of ISO/IEC 17011 and ISO/IEC 17025. These revisions will result in changes to ten ILAC documents over the next few years.

9. Any other business

Dr Milton said that the charter of the JCGM requires that “*the Chair of the Joint Committee shall be appointed by the Joint Committee from amongst its members for an initial term not exceeding three years, with unlimited possibility for three-year extensions of the appointment*.” He commented that there had been an oversight and the last extension had been in 2013 for the period 2014-2016. He offered to serve as the Chair for the period 2017-2019. This was agreed by the JCGM.

Decision 4

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

Dr Milton raised the issue of open access and suggested that the JCGM agenda, at least, should be made open access and possibly the minutes. There was a brief discussion and it was agreed that both the agenda and minutes should be made open access. The reports from WG1 and WG2 will not be made open access.

Decision 5

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

10. Date and venue of the next meeting

The JCGM agreed to retain the 18 month schedule for its next meeting. The meeting will be held at the BIPM on Monday 3 December 2018.

Decision 6

The JCGM decided to meet at the BIPM on 3 December 2018.