

Bureau International des Poids et Mesures

Consultative Committee for Amount of Substance: metrology in chemistry (CCQM)

Report of the 19th meeting
(18-19 April 2013)
to the International Committee for Weights and Measures



Comité international des poids et mesures

Note:

Following a decision of the International Committee for Weights and Measures at its 92nd meeting (October 2003), reports of meetings of the Consultative Committees are now published only on the BIPM website and in the form presented here.

Full bilingual versions in French and English are no longer published.

M. Milton
Director BIPM

**LIST OF MEMBERS OF THE
CONSULTATIVE COMMITTEE FOR AMOUNT OF SUBSTANCE:
METROLOGY IN CHEMISTRY**

as of 19 April 2013

President

Dr W. May, member of the International Committee for Weights and Measures also
National Institute of Standards and Technology, NIST, Gaithersburg.

Executive Secretary

Dr R. Wielgosz, International Bureau of Weights and Measures [BIPM], Sèvres.

Members

Centro Nacional de Metrología [CENAM], Querétaro.
D.I. Mendeleev Institute for Metrology, Rosstandart [VNIIM], St Petersburg.
Danish Fundamental Metrology Ltd [DFM], Lyngby.
Federal Institute for Materials Research and Testing/Bundesanstalt für Material-forschung
und -prüfung [BAM], Berlin.
Federal Institute of Metrology [METAS], Bern-Wabern.
Institute for Reference Materials and Measurements [IRMM].
International Atomic Energy Agency [IAEA].
International Federation of Clinical Chemistry and Laboratory Medicine [IFCC].
International Organization for Standardization, Committee on Reference Materials [ISO REMCO].
International Union of Pure and Applied Chemistry [IUPAC].
Istituto Nazionale di Ricerca Metrologica [INRIM], Turin.
Korea Research Institute of Standards and Science [KRISS], Daejeon.
Laboratoire National de Métrologie et d'Essais [LNE], Paris.
National Institute of Metrology [NIM], Beijing.
National Institute of Metrology, Standardization and Industrial Quality [INMETRO], Rio de
Janeiro.
National Institute of Standards and Technology [NIST], Gaithersburg.
National Measurement Institute, Australia [NMIA], Lindfield.
National Metrology Institute of Japan, National Institute of Advanced Industrial Science and
Technology [NMIJ/AIST], Tsukuba.
National Metrology Institute of South Africa [NMISA], Pretoria.
National Metrology Institute of Turkey/Ülusal Metroloji Enstitüsü [UME], Gebze-Kocaeli.
National Physical Laboratory [NPL]/Laboratory of the Government Chemist [LGC Ltd], Teddington.
National Research Council of Canada [NRC], Ottawa.

Physikalisch-Technische Bundesanstalt [PTB]/Bundesanstalt für Material-forschung und -prüfung [BAM]/Federal Institute for Materials Research and Testing, Braunschweig and Berlin.

Slovak Institute of Metrology/Slovenský Metrologický Ústav [SMU], Bratislava.

State Laboratory [SL], Co. Kildare.

Technical Research Institute of Sweden [SP], Borås.

VSL [VSL], Delft.

The Director of the International Bureau of Weights and Measures [BIPM], Sèvres.

Observers

Agency for Science, Technology and Research [A*STAR], Singapore.

Bulgarian Institute of Metrology, General Directorate "National Centre of Metrology" [BIM], Sofia.

Central Office of Measures/Główny Urząd Miar [GUM], Warsaw.

Centro Español de Metrología [CEM], Madrid.

Cooperation on International Traceability in Analytical Chemistry [CITAC], Trappes.

Hong Kong Government Laboratory [GLHK], Kowloon.

Hungarian Trade Licensing Office [MKEH], Budapest.

Instituto Português da Qualidade [IPQ], Caparica.

National Institute of Metrology [NIMT], Pathumthani.

National Physical Laboratory of India [NPLI], New Delhi.

National Physical Laboratory of Israel [INPL], Jerusalem.

1. OPENING OF THE MEETING AND COMMENTS FROM THE NEW PRESIDENT

The Consultative Committee for Amount of Substance: metrology in chemistry (CCQM)* held its nineteenth meeting at the International Bureau of Weights and Measures (BIPM), at Sèvres on 18-19 April 2013.

The following were present: H. Andres (METAS), A. Botha (NMISA), P. Brewer (NPL), R.J.C. Brown (NPL), G. Carroll (SL), V.S. Da Cunha (INMETRO), S. Ellison (LGC Ltd), H. Emons (IRMM, ISO REMCO), A. Fajgelj (IAEA and IUPAC), P. Fisicaro (LNE), T. Fujimoto (NMIJ/AIST), A.C. Gören (UME), B. Güttler (PTB), M. Hennecke (BAM), A. Hioki (NMIJ/AIST), H.D. Jensen (DFM), E. Hwang (KRISS), J.S. Kim (KRISS), Y. Kustikov (VNIIM), H. Li (NIM), W. Louw (NMISA, also CITAC), L. Mackay (NMIA), B. Magnusson (SP), M. Máriássy (SMU), R. Marquardt (ICTNS/IUPAC), W. May (President of the CCQM), Z. Mester (NRC), M.J.T. Milton (Director of the BIPM), Y. Mitani (CENAM), J. Morrow (NIST), U. Panne (BAM), S.-R. Park (KRISS), H. Parkes (LGC Ltd), M. Sargent (LGC Ltd), M.P. Sassi (INRIM), M. Sega (INRIM), R. Sturgeon (NRC), W. Unger (BAM), A. van der Veen (VSL), S. Vaslin-Reimann (LNE), R.L. Watters (NIST), S. Wise (NIST).

Observers: F. Dias (IPQ), P.K. Gupta (NPLI), W. Kozłowski (GUM), D. Wai Mei Sin (GLHK), Z. N. Szilágyi (MKEH).

Invited: M. Buzoianu (INM), M. Cox (NPL), P.A. Gatti (INTI), C. Gonzalez (NIST), J. Kang'iri Njeri (KEBS), M. Khan (DRCiM), G. Muriira Karau (KEBS), T.K. Lee (HSA), R. Parris (NIST), G. Ticona Canaza (INDECOPI), O. Zakaria (NML-SIRIM).

Also present: A. Daireaux (BIPM), E. Flores Jardines (BIPM), R. Josephs (BIPM), R. Kaarls (CIPM, CCQM Past President), S Maniguet (BIPM), P. Moussay, (BIPM), N. Stoppacher (BIPM), C. Thomas (BIPM), J. Viallon (BIPM), S. Westwood (BIPM), R. Wielgosz (Executive Secretary of the CCQM, BIPM).

Sent regrets: M. Fernández Vicente (CEM), I. Kuselman (INPL), L. Locascio (NIST), L. Siekmann (IFCC).

Dr W. May, the President of the CCQM, having taken over the role from Dr R. Kaarls at the beginning of 2013, officially opened the 19th meeting of the CCQM on the morning of 18 April 2013, and a round table self-introduction by all participants and observers was completed.

Dr W. May stated that it was an honour to succeed Dr R. Kaarls as the CCQM President, and the Workshop on “20 Years of the CCQM: Progress Made, Impact Provided, Lessons Learned, and Future Challenges” held yesterday highlighted the remarkable progress in chemical metrology that had occurred during Dr R. Kaarls leadership of the CCQM.

Looking forward, Dr W. May stated that the CCQM was now the largest of the CIPM's consultative committees, and was not only dealing with metrology in chemistry but also in biology. He would, therefore, be proposing to the CIPM that the name of the CCQM be modified to include references to both metrology in chemistry and biology. He stated that the strategic planning exercise undertaken over the last year following a request by the CIPM, had been valuable to the CCQM, and would be used in shaping future activities of the Committee. He noted that the CIPM was currently reviewing

* For the list of acronyms, [click here](#).

its election processes and those of CC Presidents and he also expected this to be extended to processes within the Consultative Committees in the future.

2. APPOINTMENT OF A RAPPORTEUR

Dr W. May proposed Dr R. Brown as rapporteur for the meeting. Dr R. Brown agreed.

3. APPROVAL OF THE AGENDA

Dr W. May ran through the proposed agenda to ensure that all participants agreed with its composition, and outlined the discussion points where he expected the most time to be taken up. He also noted that item 17 (presentation from the VAMAS) would not be taken in 2013, but would be arranged for 2014 instead. The edited agenda was approved.

4. REPORT ON THE EIGHTEENTH MEETING OF THE CCQM

Dr W. May thanked Dr R. Sturgeon, rapporteur for the eighteenth meeting of the CCQM, for producing the meeting report. He noted the addition of an actions and decisions section at the end of the report which would continue in 2013. Dr R. Wielgosz reviewed the actions from the report of the eighteenth meeting of the CCQM and confirmed that these had all been completed.

With respect to action 5 concerning the BIPM's policy on the publication of contact details for members of CCs, Dr R. Wielgosz stated that the BIPM has put in place a system so that individuals may opt-out of having their details listed on the BIPM's system. Currently, however, there is no change to the BIPM's password policy, although this is under review. The new Director of the BIPM, Dr M. Milton, observing that a recent CCM workshop had made all of its material open access, suggested that the CCQM might be protecting more information than it needs to, and suggested that in future the CCQM consider making more information open access.

In the absence of further oral comments on the report, Dr W. May declared the report approved.

5. LEADERSHIP OF CCQM WORKING GROUPS

5.1. Gas analysis WG (GAWG) chair

Dr M. Milton had stepped down as chair of the GAWG following his appointment as Director of the BIPM, and Dr J. Kim had filled the role of acting chair for the GAWG. Dr J. Kim's CV was

distributed to the Members of the CCQM, and he was proposed as the permanent chair by Dr W. May, which was approved unanimously.

5.2. Process for Selection/appointment of WG Chairs

Dr W. May observed that a more documented process for appointing WG chairs would be developed in the future. Dr R. Wielgosz elaborated that document CIPM-D-01 is well established and gives guidelines for the membership of CCs, and the authority for appointment of WG chairs lies with the CC President with the agreement of the CC, but does not define a process for this. Dr W. May remarked that, when selecting WG chairs, greater account needs to be taken of global diversity, whilst still maintaining a set of chairmen that are acknowledged experts with leadership skills. Dr W. Louw asked whether there are official terms of reference to describe the duties and responsibilities of WG chairs. Dr W. Louw went on to note that this is also a requirement for the new role of vice-chairman where the responsibilities of the position are even less clear. Dr R. Wielgosz replied that CIPM-D-01 only briefly mentions some of the responsibilities of WG chairs related to meetings, and therefore some updating of the document is required to clarify the situation. Further discussion then explored the mechanisms which could be used to make appointments for these positions. Dr S. Ellison proposed a procedure where nominations could come from all WG members. Dr B. Guettler discussed the requirement, from whatever process was to be implemented, to be common across all CCs, whilst Prof. H. Emons made the point that it is important to first list the technical competencies required by the role and then to consider these along with any non-technical requirements for the position. Dr W. May responded that the appointment of vice-chairs is to some extent intended to help meet the requirement for these positions to be filled by representatives from a distribution of geographical locations, and to ensure that potential candidates for WG Chair positions are exposed to and develop the skills required to lead WG activities. Dr W. May went on to remark that the CIPM is preparing a document to describe the process of selecting CC chairs and this could be extended to WG Chairs. Dr R. Wielgosz commented that under the current CC rules, the four-year term appointments of a number of CCQM WG Chairs would come to an end in April 2014, and the CCQM would ideally need to have its rules in place by April 2014. Dr R. Kaarls thought that this timescale should be achievable and Dr W. May and Dr R. Kaarls stated that they would produce a draft procedure for election of WG chairs and WG vice-chairs in time for the November CCQM WG meetings, with a view to having this finalized for approval by the CCQM in April 2014. Ms H. Parkes asked whether a vote would be required to appoint WG chairs; Dr W. May stated that he thought this was unnecessary and instead a simpler vetting procedure would suffice. Dr M Milton reminded everyone that there was no requirement to make processes over bureaucratic.

5.3. Selection/appointment of WG Vice-Chairs

This point was not discussed separately but was combined with the discussion noted in agenda item 5.2.

6. UPDATE ON THE CCQM STRATEGIC PLANNING DOCUMENT

Dr R. Wielgosz presented the current status of the CCQM strategic planning document. He outlined the development timeline of the document and stated that the aim of this item was to develop an approved version of the document which could be considered as version 1.0. Version 0.5 of the document (CCQM/13-04) had been distributed to the CCQM on 26 February 2013, and comments on this version returned to the CCQM Strategic Planning Working Group (SPWG) by 28 March 2013. The SPWG had considered all the comments received and had developed a response to these which is summarized in document CCQM/13-38. There was a general discussion on the Terms of Reference of the CCQM, but it was concluded that these would remain unchanged for now since the structure of these for all CCs was due to be discussed by the CIPM. Dr R. Wielgosz outlined the background to the document and the key points presented in the strategy. He stated that the CCQM Strategic Planning Working Group had agreed to bring together the individual WG strategies into an overarching CCQM document. This would also include a spread sheet which described the future comparison plans of each of the CCQM WGs. Dr R. Wielgosz noted that as of December 2012 there were 5360 Chemistry CMCs which comprised 3049 different analyte-matrix combinations, and 830 individual analytes. It was also notable that the median number of NMIs or DIs providing a service in each of the service category areas was 16. Dr R. Wielgosz emphasized the importance of the CCQM case studies as a strength of the strategy document. Following consultation with the CCQM on the draft document a further three case studies (on health care, water quality, and the Avogadro project) had been proposed for inclusion in the next version. Having outlined how the CCQM had adapted to changes and challenges from 1999 to 2012, Dr R. Wielgosz then mentioned the envisioned future activities for the CCQM which included the more efficient and effective underpinning of CMCs, and the need to meet new sectorial and technological requirements. He gave a summary of the expected future key comparison and pilot studies which would be run by the CCQM and the resources which would be required to do this, before drawing some general conclusions. The total number of key comparisons and stand-alone pilot studies will remain constant (an estimated 19 per year for 2013-2023 compared to 18 to 19 per year in 1999-2012). There will be a stabilization in the number of key comparisons for the OAWG, the IAWG and the GAWG due to the core capability comparison scheme, a reduction in pilot studies required in the OAWG and the IAWG, an increase in the number of comparisons and pilot studies required in the SAWG area and an increase in the estimated number of pilot studies required in the EAWG.

Dr W. May stated that the document was as good snapshot of where the CCQM was and where it wanted to go and that the case studies were very strong and of great benefit to the document. Dr R. Brown wondered whether the large differences in the estimates by each WG of the resources required to run comparisons was as a result of different interpretations of the question posed. Dr M. Máriássy concurred and stated that the EAWG may wish to increase the stated resources required. Dr M. Milton reminded everyone that this information was very important for NMI Directors who were responsible for allocating resources at the national level. Dr Y. Mitani agreed, stating that this was especially the case for the CCQM as metrology in chemistry was not viewed as a traditional area for metrology.

Dr R. Wielgosz then went through the comments received on the draft strategy document (CCQM/13-38) detailing which comments the SPWG had recommended to be accepted and which ones it did not. In particular, of the three case studies proposed for inclusion in the next version of the document, those on Health Care and the Avogadro project were recommended for inclusion, whilst

the proposal for a case study on the Water Framework Directive was not recommended because of the existing presence of sufficient case studies in this area of impact. Furthermore, in response to a comment that the “CCQM strategy and in particular the rationale for various activities should be clearly separated from the BIPM laboratory programme” a new document approved by the SPWG, CCQM/13-23 (SPWG/13-03), was circulated and presented. This summarized the references to BIPM laboratory activities contained in the CCQM strategic plan, as well as the future BIPM activities required to meet the strategic plan. The SPWG had proposed that this document be added as an appendix to the CCQM strategy document. The CCQM agreed this unanimously, along with the approval of the responses of the SPWG to the comments on the draft strategy in CCQM/13-38, with the agreement that an updated CCQM strategy document would be produced as version 1.0. Dr W. May asked for extra help to review the text of the document in addition to the SPWG: Prof. H. Emons and Ms H. Li volunteered to assist.

Dr Y. Mitani commented that perhaps ‘measurand’ should be used throughout the document instead of ‘analyte’ or ‘component’. Dr R. Brown welcomed the proposal stating that analyte and component did not have a suitable use in pH or electrolytic conductivity measurement, whereas measurand was a universal term. A protracted discussion ensued on the correct term to use and whether this was more a question of the document’s audience than of scientific rigour. Dr R. Wielgosz agreed to re-examine the use of these terms throughout the document to check they were correct. In response to a question from Dr H. Andres, Dr R. Wielgosz confirmed that version 1.0 of the strategy document would be published on the BIPM website when it was available.

7. BIPM PROGRAMME ON METROLOGY IN CHEMISTRY (2016-2019)

Dr R. Wielgosz presented current progress with the BIPM Programme on Metrology in Chemistry including activities described in the CCQM strategy document. First some general information on the BIPM Chemistry Department was given. Following its establishment in May 2000, the Department now comprised nine permanent full time equivalent staff, one post-doc, and on average approximately 0.25 of a person through NMI secondments. It has organized five Key Comparisons and seven Pilot Studies between 2000 and 2012. Dr R. Wielgosz emphasized that the main programme of work was in three areas: international equivalence of gas standards for air quality and climate change monitoring, international equivalence for organic primary calibrators, and support of CCQM, JCTLM and international liaison activities. The publications of the Chemistry Department over the last 12 years were presented and Dr R. Wielgosz commented that the department averaged one peer reviewed publication in scientific journals a year, in addition to comparison reports and publications. The input of the Chemistry Department into relevant documentary standards activities was then presented, followed by the ongoing collaborations with other NMIs and also the list of NMI guest workers that have contributed to the BIPM Chemistry Department work programme in the past.

Dr R. Wielgosz went on to describe the more recent outputs of the BIPM Chemistry Department, including current and ongoing KCs on ozone, nitrogen dioxide, methane and formaldehyde in the gas metrology area, and in the organic analysis purity area for estradiol, aldrin and valine. The development of a facility for greenhouse gas measurement at ambient levels was also discussed and the importance of isotope ratio measurements for these gases was also considered as a high priority. Work to develop analysis methods for assessing angiotensin and insulin purity was also presented. Dr R. Wielgosz then highlighted the references to BIPM comparison coordination activities in the

CCQM strategy document in both the gas analysis and small and large organic molecule purity areas including peptide purity and the NIM-BIPM collaborative project and comparison on C-peptide. The CCQM strategy document foresees the BIPM coordinating CCQM comparisons for a) primary calibrators for prioritized greenhouse gases and air quality gases, and b) purity assessment capabilities for primary reference materials for small and large organic molecules. Furthermore, the CCQM strategy document concludes that the ongoing requirement for these comparisons can be best met through BIPM coordination of the comparisons, since: a) the comparisons are fundamental to a broad range of NMI services and require a long-term commitment to their coordination that can be met by the BIPM; and b) comparability at the smallest levels of uncertainty need to be demonstrated for high impact measurands on a continued basis; this is best met with a long-term comparison programme, as established and demonstrated at the BIPM. It is envisaged that 10 to 15 CCQM key comparisons are to be coordinated by the BIPM out of a total of 126 foreseen for the period 2013-2023.

Dr W. May restated the key role of the BIPM in the future work of the CCQM and emphasized the need to include document CCQM/13-23 on the relationship between the CCQM and the work of the BIPM as an appendix to the updated CCQM strategy document. Dr W. May also observed that the requirement for smaller uncertainties and the need to demonstrate trends on a long-term basis required an ongoing and sustained programme of key comparisons which the BIPM was in an excellent position to deliver. The CCQM approved document CCQM/13-23 and its incorporation into the CCQM Strategy Document.

Dr Y. Mitani asked whether there was a plan for the BIPM to produce CMCs. Dr C. Thomas observed that, since the BIPM is not a signatory to the CIPM MRA, formally it is not in a position to obtain CMCs. Dr R. Wielgosz added that information on BIPM measurement services that were calibrations could be accessed through the BIPM website. In the area of metrology in chemistry, currently the only calibrations provided by the BIPM were in the area of ozone measurements (for which the relevant webpage describing the service was shown: http://www.bipm.org/en/bipm/calibrations/cms_qm.html). The BIPM did not disseminate traceability through its other measurement services, which were used to provide either the key comparison reference value for comparisons or measurements that were included in the calculation of the KCRV. Currently, these measurement services were validated from participation in the relevant CCQM WG, covered by the BIPM's quality system and also underwent regular peer review. Dr M. Milton added that the services provided by the BIPM are regularly discussed in the relevant CCs and that the BIPM quality system is reported to the JCRB in significant detail. Dr W. Louw confirmed that this was the case and that the JRCB has made an ongoing commitment to review the BIPM quality system. A discussion followed on the appropriate mechanism for peer review of the BIPM measurement services and whether this is best done by a visiting panel or via a series of visits from individual experts. Dr M. Milton cautioned that the BIPM is under the exclusive control of the CIPM and any suggestions for a change to current procedures would therefore need to be raised with the CIPM. Dr W. May stated that he would raise the issue at the CIPM. Dr Z. Mester asked what the breakdown of time spent on each activity within the BIPM Chemistry Department was. Dr R. Wielgosz responded that about 3.5 man years per year of scientific effort were spent in the gas analysis area, about four man years per year in the organic analysis area, and an additional post-doc provided a further one man year per year.

8. REPORTS FROM CCQM WORKING GROUPS

8.1. Key comparisons and CMC quality

Dr D. Sin reported on the recent meeting of the CCQM Working Group on Key Comparisons and CMC Quality (KCWG). First the membership of the group was outlined. Dr D. Sin stated that a change in the membership would be required since Dr Gabriela Massiff (Fundacion Chile) had stepped down as the SIM representative, and would be replaced by Dr Steve Wise (NIST). Dr D. Sin then provided a breakdown of the 5382 current CMCs in Chemistry by service type and showed that the number of CMCs in Chemistry continued to increase at a rate of about 300 per year. The process for review of existing CMC was explained. In 2013 all CMCs relating to food were reviewed. Dr D. Sin explained the significant effort involved in the process and in 2013 there were 290 new CMCs and 440 existing CMCs to review. The 2013 review also saw the first CMCs in Chemistry submitted by the NIS, Egypt; the GCSL, Greece; the KEBS, Kenya; and the INDECOPI, Peru.

Dr D. Sin went on to discuss claims in the BAWG area. There are issues with ensuring the measurands can fit within the current CMC template requirements and traceability issues. An additional review step was established to ensure effective review in this area: a face-to-face review meeting held at the BAWG mid-year meeting. In addition, a sub-group of the BAWG meet and discuss each CMC that is submitted. In spite of this, issues were raised for three BAWG CMCs in Cycle XIV concerning the route of traceability (which might represent a traceability exception to the CIPM guidelines in CIPM/2009-24) and also whether the matrix, as defined, would result in a scope which was too broad. Dr W. May stated that he expected both issues to be raised again later in the meeting.

Dr D. Sin then discussed future approaches to CMC review where the core comparisons and core competency tables being developed by the IAWG, GAWG and OAWG should reduce the workload by assessing the generic competencies required to underpin a range of services. There was some speculation that in future, because of this approach, it would be less common to have a one-to-one link between Key Comparisons and CMCs. Dr D. Sin posed a question on how to make the review process for CMCs more efficient in future and wondered whether a 30 minute session on CMCs at each WG meeting would help the process. Dr D. Sin also commented that some members were not sticking to the deadlines associated with the CMC submission and review procedure and this was unnecessarily complicating the process. If strict deadlines were maintained this would not only help the process run more smoothly but would also expedite the discussions at the KCWG. Dr M. Sargent commented that for elemental calibration solutions he would still expect there to be a one-to-one relationship between KCs and CMCs. For matrix materials supported by the core capability approach a one-to-one KC would still be required every four years. Dr R. Wielgosz asked whether the processes within the KCWG meeting could be further streamlined so that CMCs that had been signed off by a number of RMOs would not require further discussion in the meeting.

At this point Dr W. May interjected, stating that the current CMC review process is unsustainable and could not continue in its current form. He reminded the CCQM that the intention of the CIPM MRA was to demonstrate the global comparability of measurements, but that in many cases the comparison of capabilities was not equitable because of the difference in the breadth of the claims between members. Dr W. May further stated that sometimes CMCs represented standalone capabilities and sometimes capabilities that deliver services. He therefore suggested that the CCQM consider whether

to implement a temporary moratorium on CMCs until the review process had been revised. An extensive discussion on possible ways forward then occurred. Dr M. Sargent thought that putting on hold the re-review of existing CMCs may help reduce the workload, but Dr R. Kaarls thought that the re-review was important because it addressed many original CMCs that were not supported by KCs. Prof. H Emons stated that he was in favour of a critical review of the process, explaining that limitations were being raised with the process that were hampering the progress of the WGs. He also suggested that a policy statement was required on how broad the CMC claims could be. Dr S. Ellison agreed with earlier comments that the KCWG should really act as a moderator of the decisions made by RMOs, possibly only reviewing a few CMCs to check for consistency and to ensure that the review by each RMO had been performed to the same quality. Dr M. Milton commented that any significant change in the short term has to be in the RMO domain. There was general agreement that these CMC issues should be raised at the CIPM level, and Dr W. May confirmed that such a discussion was planned for the next CIPM meeting. Dr R. Wielgosz observed that the CCQM CMC numbers will continue to increase unless the range and scope covered by each CMC is significantly broadened. Dr A. van der Veen drew a comparison with the area of mass metrology where CMCs are more important to customers than accreditation to ISO 17025, whereas in gas metrology accreditation to ISO 17025 is more important than CMCs. Dr R. Watters raised the issue of the need to understand the customer base and the user community for the KCDB. Dr W. May responded that the customer base varies by area and service type and Dr C. Thomas stated that it was difficult to get detailed information on who visits the KCDB. Dr M. Milton stated that he was not in favour of any blanket moratorium on CMC submission since this would be contrary to the CIPM MRA, that the problem in some other CCs was actually greater than in the CCQM, and that the CCQM had the situation relatively well under control. However, he recommended that the CCQM continue to input strongly into this debate in advance of future discussions of these topics at the CIPM.

8.2. ***Ad hoc* steering group on microbial measurements**

Dr J. Morrow introduced the work of the *ad hoc* Steering Group on Microbial Measurements (MBSG), its formation following the successful CCQM Workshop on Metrology and the Need for Traceable Microbiological Measurements to Ensure Food Quality and Safety, and outlined the objectives and functions of the MBSG. It was noted that the Steering Group has functioned with two sub-working groups: a Quantitative Working Group and an Identity Working Group. Together, the groups' key work is in defining: the key properties of microbial quantity and microbial strain identity (both traditional and emerging techniques) and how to establish traceability and measurement uncertainty for these key properties, and when this might be appropriate.

Dr J. Morrow then reported the results of two studies. The first, a microbial identity investigative study, aimed to establish comparability between laboratories' measurements of 16S rRNA sequence. There were six participating laboratories (four NMIs, one DI and one stakeholder laboratory). The results of the study showed clearly differentiated sequences from *L. monocytogenes* and *E. coli* datasets. In addition individual laboratory consensus sequences were identical to overall consensus when false positive variant calls and biologically variant positions are excluded. The second, a microbial quantity investigative study, aimed to establish comparability for cell counts by the plate count method for *Listeria monocytogenes*, a food safety and public health relevant organism. There was participation from four NMIs. The study demonstrated comparable results and measurement uncertainty between participants although, as expected, the uncertainty became very large at low

number counts. Dr J. Morrow then concluded by addressing the way forward for the Steering Group. The MBSG was keen to receive feedback about what services from NMIs in the field of microbiology currently exist and what is likely in future, what measurement capabilities are currently utilized to support those services, and what CMCs are envisaged in the next 5 years. This information would help the MBSG direct its future work. Dr J. Morrow also noted that the MBSG had recommended merging the WGs to become members of the MBSG going forward and this was agreed by the CCQM.

Prof. H. Emons complimented Dr J. Morrow on the impressive work of the MBSG. He went on to enquire that, given the work of the WG on identity is clearly an investigation of a nominal property, did this mean the CCQM was now intending to get involved in nominal property analysis in other areas. Dr R. Kaarls reiterated the clear stakeholder requirement for nominal property measurement in the food area, but was not sure whether the same requirement existed in other areas. Prof. H. Emons requested that the policy in this area be clarified since the analysis of nominal properties is also of relevance in other areas of chemical measurement. Ms H. Parkes supported the broadening of the MBSG scope to include microbes but requested close coordination with the BAWG to ensure no overlap of work (for instance in the area of sequencing).

8.3. Surface analysis

Dr W. Unger introduced the work of the CCQM Working Group on Surface Analysis (SAWG) and its current membership, before highlighting the current portfolio of analytical methods covered by the WG. The results of CCQM-P130, an Electron Microprobe Micro Analysis (EPMA) comparison piloted by the BAM and the NIST, were presented. The comparison required the measurement of *k*-ratios (the primary result of an EPMA measurement) on AuCu alloy, pure Cu and pure Au CRMs. Nine NMIs and DIs took part with 17 different instruments, along with two companies using three different instruments. The impact of this work on ISO TC 202 standardization work and related industrial applications was emphasized. The results of the comparison were presented with good comparability of the *k*-ratio demonstrated at the 95 % confidence level across the majority of laboratories. Dr W. Unger drew a comparison with the earlier CCQM-P80 study where the result of similar measurements had not shown such good comparability. The publication of both a report on CCQM-P130 and a scientific paper were planned by the end of 2013. Dr W. Unger stated the intention to hold a KC in 2014 on the measurement of *k*-ratios and amount fractions of an Au-Cu alloy sample. A report was then given on CCQM-P140, piloted by the KRISS, which was aimed at measuring CuInGaSe₂ (CIGS) alloy film composition – a high performance material used in thin film solar cell production. A number of surface analysis methods could be employed, but traceability came ultimately from ICP-MS measurement of the acid-digested film. However, the first batch of sample produced showed significant ageing effects, so a new set of samples has been prepared and these are due to be distributed in May 2013. Nine NMIs and DIs and six expert laboratories will take part. Dr W. Unger also mentioned the technical presentation on isotope dilution surface enhanced Raman spectroscopy (ID-SERS) as a traceable method for quantitative analysis on surfaces given at the SAWG by Rainer Stosch from the PTB. The SAWG approach to core competencies was also discussed by Dr W. Unger who intends to gather feedback from SAWG members prior to generating a draft document in July 2013 which will outline the SAWG strategy in this area.

Dr R. Wielgosz remarked that the number of CMCs related to SAWG activities currently listed in the CCQM Strategy Document was relatively small, and asked how this might change in the future.

Dr W. Unger responded by suggesting that the core competencies approach when implemented would allow a greater number of SAWG CMCs to be claimed in future. Dr W. May emphasized there is no point in having CMCs if they are not used to underpin the delivery of services. There was some discussion about the presence of a non-NMI, non-DI guest laboratory as part of the SAWG. Dr W. May suggested that while a guest laboratory could participate in studies on a case by case basis they should not be a permanent member of the WG. Dr M. Milton was concerned that when non-NMI and non-DI participants take part in studies they must sign up to certain conditions to ensure that they understand their responsibilities and obligations. Dr M. Sargent raised the issue of two laboratories using neutron activation analysis which have been invited by their NMIs to participate as expert laboratories in the IAWG. The BIPM is in the process of drafting a letter detailing responsibilities and obligations which, it is intending in future, all non-NMI and non-DI participants in CC studies will be required to sign. Dr W. May requested that Dr S. Vaslin-Reimann seek clarification of the status of the SAWG guest laboratory within the French metrology structure.

8.4. Bioanalysis

Ms H. Parkes described the activities of the CCQM Working Group on Bioanalysis (BAWG) over the last year. Approximately 35 participants from about 20 organizations had participated in meetings during the year, and there was sustained and growing participation from developing economies. Reference was also made to the BAWG workshops held during the year. Ms H. Parkes then gave further details on the KCs and PSs being organized by the group. Following on from the APMP pilot study on the relative quantification of Bt63 in GM rice matrix sample, a KC ([CCQM-K110/P113.2](#)) was proposed. This study was intended to extend the scope of the matrix and underpin a broader range of CMCs. Unfortunately, because of serious sample shipping issues the study had to be postponed to a later date. In response to these shipping problems Dr R. Sturgeon asked whether the BIPM had made any progress with the International Postal Union to progress a coding that would allow the more efficient transportation of samples. Dr R. Wielgosz replied that no progress had been made. The next stage in the CCQM-P55 series of studies on peptide and protein measurements was then described. It was proposed that [CCQM-K115/CCQM-P55.2](#) on the purity of human C-peptide, using a material characterized by the NIM and the BIPM, be conducted during 2014. Ms H. Parkes encouraged the BIPM to bring forward the release of the material to facilitate this study. Dr R. Wielgosz replied that the material preparation activities on this comparison would start in May 2013, with the secondment of Dr Ming Li from the NIM to the BIPM, and so the 2014 timeframe for the comparison was realistic. At this stage the issue of one institute using multiple techniques to participate in a comparison was discussed, since this had previously been discussed in a BAWG context by Ms H. Parkes and Dr R. Kaarls. Dr W. May advised use of an institute's best technique in the comparison and then the institute could perform some internal benchmarking of other techniques of interest. Dr B. Guettler noted that this was relevant to a discussion in the IAWG earlier in the week about how best to support the core competency approach. Dr M. Sargent agreed, adding that the general principle in the IAWG was that one laboratory should produce one measurement result. However, the core competencies approach may allow the use of more than one technique, but that the results of the KC must reflect the CMCs claimed and the services delivered. All results submitted from a given laboratory in IAWG comparisons appear in the comparison report, but only one value from each laboratory would be used in the calculation of the KCRV and that will be the one with the smallest uncertainty. Ms H. Parkes continued the report on the work of the BAWG, expounding on current studies CCQM-P102 on the quantification of cells with specific

phenotypic characteristics, CCQM-P123 on the measurement of the number and geometrical properties of cells adhered to a solid substrate, and a further investigative study on cell viability measurement. New studies on the absolute quantification of DNA and on multiple cancer cell biomarker measurement were then presented. Dr W. May commented that if NMIs are providing services in these areas, then in future there should be more KCs being proposed by the BAWG and fewer PSs. Ms H. Parkes concluded with a brief discussion of problems with CMC claims in the BAWG and, in particular, highlighted some inconsistency in the approvals procedure: some CMCs of identical type were approved one year, but declined the next. One of the problems is the complex nature of the claims and the limited expertise within the RMOs to review these. Ms H. Parkes commented that in order to address these issues a BAWG CMC review item would be included at each BAWG meeting in future, with input from the KCWG where necessary, to help progress the issues.

8.5. Electrochemical Analysis

Dr M. Máriássy summarized the recent activities of the CCQM Working Group on Electrochemical Analysis (EAWG). The results of [CCQM-K96](#) Dichromate Assay, run jointly with the IAWG, were presented first. The agreement of participants was good in absolute terms, although it seemed that in general, uncertainties had been underestimated. However, Dr M. Máriássy elaborated that there was a significant difference between the chromate assay found by coulometry as compared to that determined using a mass balance approach based on the sum of impurities measured. Evidence was presented to suggest that this was due to the presence of water in the sample, even after drying procedures, and this would need to be considered in more detail in future studies. [CCQM-K105](#) is a follow up comparison to CCQM-P111 and is designed to demonstrate the measurement capabilities of the participating institutes with respect to the conductivity of multi-component aqueous salt solutions. There is strong interest on the part of the oceanographic community to establish SI traceability for conductivity measurements in order to determine practical salinity values. The comparison was conducted at 15 °C and 25 °C. The agreement was at the 0.2 % level, although with some evidence of a negative bias among a subset of participants. CCQM-P142 examined the conductivity ratios of seawater solutions and involved a number of oceanographic laboratories. The results were generally good and any inconsistency was observed to decrease with temperature but increase with conductivity. Dr M. Máriássy commented that the dependence on temperature, conductivity and the instrument used may be larger than previously expected; nevertheless the performance of oceanographic laboratories using salinometers was extraordinarily good. The results of [COOMET.QM-K36](#), an RMO comparison linking to CCQM-K36, were then presented. Agreement of participants was at the 0.4 % level. Dr M. Máriássy raised two issues with respect to the comparison. First, there were two laboratories participating from the same country. This should not present a problem as long as the CMC claims of the institutes do not overlap. Second, Dr M. Máriássy questioned whether the procedure used to link [COOMET.QM-K36](#) with CCQM-K36 was correct. In reply Dr Y. Kustikov stated that the linking used the COOMET R14 document, but that every case of linking seemed to have different properties and some standard CCQM guidelines on linking would be welcome. Dr W. May asked Dr M. Máriássy to come up with an improved proposal for linking these studies, to be agreed with the CCQM. Dr M. Máriássy then presented the results of the CCQM-P37.2 study, piloted by the NPL, which compared the properties of NMIs' Ag/AgCl reference electrodes. The ensemble of electrodes showed good agreement of standard potential in 0.01 mol dm⁻³ HCl. When the electrode slopes were compared the agreement was less

good with a few outliers. Since the slope is important in the Harned Cell procedure this may be a source of remaining bias in comparisons. Finally, the electrode impedance data was presented, showing some significant differences depending on the electrode manufacturing process, although more analysis is required to fully understand these data. After mentioning the technical presentations given to the EAWG during its meeting on pH_T measurement in synthetic seawater and conductivity measurement in ultra-pure water, Dr M. Máriássy addressed a CMC issue in the EAWG area where it was agreed that salinity could be a valid measurand provided there was sufficient proof of the uncertainty claims. Dr M. Máriássy concluded by presenting plans for new studies and the EAWG medium term comparison plan.

Opening questions on the presentation, Dr W. May asked why there were so many PSs rather than KCs. Dr M. Máriássy replied that a number of new matrices are being explored (such as seawater and bioethanol) where the science of the measurement is not fully understood and these generally need a PS prior to moving onto a KC. Dr M. Milton added that there seemed to be an excessive number of repeat exercises and also questioned whether the current investigative PSs (such as CCQM-P37.2) are advancing the science in the area such that future comparability will be improved. Dr M. Máriássy replied that he hoped the PSs would advance the science and the EAWG strategy was being developed to be as efficient as possible in carrying out work in the future. He also stated that some repeats were required as a function of the EAWG's core comparisons approach. Dr R. Brown added that the number of comparisons in each matrix is decreasing but that the number of matrices being addressed is increasing. Dr W. May concluded the discussions by emphasizing that a plan for future comparisons must be based on what you should do, not what you could do, and that the aims must relate to improving measurement science and supporting the delivery of services.

8.6. Organic analysis

Dr L. Mackay presented the outcomes from the recent CCQM Working Group on Organic Analysis (OAWG) meeting and other activities throughout the last year. The results of [CCQM-K55.c](#), coordinated by the BIPM, on the purity of L-valine were presented. The comparison covered the high polarity, low molecular weight region in the OAWG analysis space for organic primary calibrators. A KCRV based on results using predominantly mass balance approach values was proposed. It was noted that in the calculation of the KCRV some outliers for water content had been excluded because of excessive heating. It was notable that the L-valine mass fraction result obtained directly by qNMR showed a greater spread to those obtained by the mass balance approach, and the WG had undertaken additional studies to understand this effect. Furthermore, it was noted that the spread of data obtained from 'in-house' qNMR was slightly smaller than that obtained from contracted out qNMR analysis. Dr L. Mackay further noted that no correlation was observed between the choice of NMR internal reference standard used and the purity value of L-valine determined. The choice of integration range and baseline corrections used appeared to be the cause of the dispersion of results. Two participants integrated within the confines of the ^{13}C satellites (and did not apply any correction) and reported low purity values. Other participants used integration ranges sufficiently wide to ensure no significant impact on the determined purity value. It was noted that integration of the benzoic acid internal standard gave most variation with participants either integrating the ortho doublet or the entire aromatic envelope. On any instrument of < 600 MHz, the ^{13}C satellites of the benzoic acid signals are not generally resolved to allow clean integration of the ortho signal and its ^{13}C satellites alone. Furthermore, with integration ranges of over 1 ppm employed in some cases, and broad exchangeable

signals compromising baseline correction, participants who used manual baseline correction on individual spectral regions gave a more consistent set of purity values. Dr L. Mackay stated that these issues have prompted the OAWG to initiate CCQM-P150 on qNMR for purity assessment to resolve some of these technical challenges. The key points to be addressed by the study were on sample preparation (accurate weighing), acquisition (relaxation delay, excitation pulse width and angle *etc.*) and processing (window function, integration range and baseline collection *etc.*). The intention was for free induction decay data to be analysed by the participants and at the NMIJ. The study was expected to result in optimization of the parameters for purity analysis and also the identification of major sources of inaccuracy in the measurement. Dr L. Mackay then elaborated on a proposed Track C KC on the purity of avermectin, coordinated by the NIM, which would provide a KC in the low polarity, high molecular weight analysis space for organic primary calibrators. The results of the first Track A 'Matrix' KC were presented. The comparison was coordinated by the GLHK and the NIM and mid-polarity pesticides in tea were measured. The initial results for beta-endosulfan showed a spread in results between 800 µg/kg and 450 µg/kg and those for endosulfan sulphate showed a spread from about 550 µg/kg to 250 µg/kg. Following these results the OAWG have planned a follow-up study to measure polycyclic aromatic hydrocarbons in tea. This comparison should not suffer the extraction issues as was observed in [CCQM-K95](#) and which was responsible for the large spread in results. Dr L. Mackay then showed results for [CCQM-K103](#) and APMP.QM-P19.1, again coordinated jointly by the GLHK and the NIM, and concerning the measurement of melamine in milk powder. The results in general showed extremely good agreement. The presentation of comparison results was concluded with [CCQM-K6.2](#), [CCQM-K11.2](#) and [CCQM-K12.2](#): cholesterol, glucose and creatinine in human serum, respectively. The cholesterol results were satisfactory but for glucose and creatinine there were significant discrepancies between participants' data and the reference value proposed by the NIST. Dr L. Mackay noted this is an area for concern since services are offered in this area with uncertainties of 3 % whilst this comparison has shown deviations of up to 100 %. Following a brief summary of proposed future comparisons in the OAWG area Dr L. Mackay raised the issue of whether sub-contracted NMR services should represent a traceability exception with respect to CIPM document CIPM/2009-24. Dr R. Wielgosz replied that this was not a traceability exception but should instead be covered by CIPM document CIPM/2005-09 concerning the subcontracting of measurements under the CIPM MRA. Dr M. Sargent commented that the same is true for neutron activation analysis measurement in the IAWG. Dr Z. Mester remarked that if qNMR is going to be an important analysis tool in the future, NMIs should start investing in this technology themselves rather than subcontracting analyses.

8.7. Inorganic analysis

Dr M. Sargent gave an overview of CCQM Working Group on Inorganic Analysis (IAWG) activities during 2012-2013, including current progress with KCs and PSs and then moved on to present the results of recent KCs and PSs: [CCQM-K72](#) and P107.1: Purity of Zinc (coordinated by BAM), [CCQM-K97](#) and P133: Arsenobetaine in solution and fish (coordinated by NMIJ and NIM), [CCQM-K100](#): Copper in bioethanol (coordinated by the INMETRO) and CCQM-P135: Purity of salts (bromide, nitrate, sulfate in NaCl) (coordinated by the PTB). The results of [CCQM-K72](#) were presented as the mean of the six impurities measured and very good agreement was shown across the laboratories with only one outlier. The results of [CCQM-K97](#) were also very encouraging with all laboratories showing good agreement, and the KCRV being calculated as the arithmetic mean. Dr M. Sargent explained that the original intention had been to use a material produced during a

European FP7 project on biofuels for the [CCQM-K100](#) exercise but that the timing had not been convenient so the INMETRO had prepared a new sample. Some results had been excluded because of technical issues, and further explanation and discussion was required to finalize the set of results to be excluded and agree on the KCRV. The results from CCQM-P135 had shown a satisfactory demonstration of agreement for bromide and sulfate but the nitrate amount had been too low for a meaningful comparison and the results have shown a large dispersion. Dr M. Sargent commented that it was likely that a further PS on nitrate would be required before moving to a KC.

Dr M. Sargent described the new KCs and PSs planned by the IAWG and also the IAWG sample and CMC database which had been organized by Dr C. Quétel of the IRMM. This database holds details of candidate reference materials available for CCQM-IAWG activities and has been extended to include plans for future CRMs. This initiative was deemed to have been very successful and Dr M. Sargent signalled the intention to continue this activity in the future. The categories of materials and the numbers in each category were then presented and it was demonstrated how these mapped closely onto the IAWG rolling programme of comparison activities.

Proposed traceability exceptions were then discussed. It was agreed that this would be covered instead under the relevant agenda point on traceability exceptions.

Dr M. Sargent reiterated the requirement for a formal agreement to be put in place for expert laboratories participating in CCQM studies to agree to, prior to participation. Dr M. Milton confirmed again that this task was in hand (see agenda item 8.3) and the document would take the form of a letter signed by the participating expert laboratory. Dr M. Sargent requested that this agreement should cover both the terms of participation in the study and also rules on how the results may be used after the study. Dr W. May reiterated the requirement for an overarching policy statement on expert laboratory participation in CCQM studies.

Dr Z. Mester enquired as to where the major gaps in KC coverage of inorganic CMCs were. Dr M Sargent replied that most of the examples where suitable evidence is missing are for fuels. One of the reasons for this is that few candidate materials exist already and these would have to be prepared specially for a comparison.

Prior to the next agenda item, and on opening the second day of the meeting, Dr W. May reflected on the development of the CCQM and expressed a desire to have an official document which described the history of the CC. Dr W. May and Dr R. Kaarls committed to produce the first draft of such a document in time for the 20th meeting of the CCQM in April 2014.

8.8. Gas analysis

Dr J. Kim, the new chair of the CCQM Working Group on Gas Analysis (GAWG), gave an update of recent activities. There are currently six ongoing comparisons and four new comparisons agreed for 2014. The results of [CCQM-K84](#) on halocarbons in real air were presented. This comparison was piloted by the NIST and five laboratories took part in total, although only the NIST and the KRISS are NMIs or DIs for these species. Considering the amount fractions measured were of the order of 100 pmol/mol the agreement was extremely good: within 2 % apart from a couple of values, across the six gases measured. Dr W. May remarked that in reality this was a bilateral KC between two NMIs with the remaining laboratories participating in a PS and the results should be presented as

such. Dr J. Kim agreed and confirmed that only the NIST and the KRISS results would be used to calculate the KCRV, and the other results would be presented in a separate pilot study report. The results of [CCQM-K93](#), ethanol in nitrogen, coordinated by the NPL, were then presented. The GAWG meeting earlier in the week had discussed that the original calculation of the KCRV had not included consideration of adsorption and buoyancy effects. The KCRV would now be recalculated to take these into account. Dr J. Kim then presented new KC proposals from the VSL on the composition of biogases and from the KRISS on noble gas mixtures. Dr J. Kim then elaborated on arrangements for a proposed core KC for propane in nitrogen. This would involve a CC level comparison with eight participants, and then satellite RMO comparisons to include a further 11 laboratories. Moving on to discuss the re-review of natural gas CMCs in Cycle XV Dr J. Kim stated that the GAWG had agreed that the core mixtures approach allows the scope of CMCs to be broadened for selected mixtures with a separate document being produced to describe this approach. It was also reported that the GAWG had committed to produce new guidelines for accepting CMCs for purity claims because of current problems with assigning uncertainties to measurements below the detection limit. Dr J. Kim then reported an interesting presentation given to the GAWG by Dr A. van der Veen and Dr R. Brown concerning the impact on gas analysis of changes in the IUPAC Atomic Weights of the Elements. As a result, the GAWG had made a statement of how best to assign atomic weight data without a good knowledge of the isotopic composition of the gas: this was to assume that the range of atomic weights given in the most recent IUPAC document is a rectangular distribution and then use this assumption to propagate uncertainties accordingly. Dr J. Kim concluded his presentation by highlighting upcoming meetings and workshops relevant to the GAWG. Of particular interest were the BIPM-IAEA workshop at the VSL in June 2013 on stable isotope standards for CO₂ and CH₄, a possible Gas Metrology Workshop during the CCQM meetings in South Africa in November 2013, and a proposed joint IAWG-GAWG workshop on isotope ratio measurements sometime in the future. Dr A. Fajgelj concurred that this was a key topic which needed to be addressed.

Opening the discussions, Dr W. May recognized that workshops held within CCQM meetings are an excellent way to advance scientific understanding in critical areas, but reminded participants that, whilst not relevant to the workshops mentioned by Dr J. Kim, it was important to properly manage CCQM workshops and that any such meetings held outside formal CCQM meetings would need to be officially sanctioned. Dr W. May suggested the use of a template to officially record proposals for proposed meetings which would enable the expectations and the objectives for the meeting to be made clear in advance and would allow an official decision to be made on the approval of the meeting.

Returning to the proposed core comparison on propane in nitrogen, Dr W. May expressed his concern that, whilst this efficient KC approach makes sense when samples are limited, what was described here would result in an increase in work for the linking laboratories. Dr A. van der Veen made it clear that the laboratories involved as links have all agreed to act in this capability. Dr P. Brewer emphasized that, in fact, the burden on the coordinating laboratories is not that much greater because the cylinders involved are just recirculated to the RMO participants.

Addressing the issue of atomic weights Dr M. Milton stated that he did not favour the proposal made by the GAWG because in future there is the possibility for these atomic weight ranges to continue to grow, and would favour instead a special set of values to be used for gas metrology, perhaps based on the ranges for specific sources given in the IUPAC atomic weights document. Dr R. Brown stated that, although he agreed with Dr M. Milton's point of view as a long-term objective, the statement by the GAWG was designed to address the problem in the short term, whilst at the same time raising the

issue with the IUPAC and asking them to provide a better solution in future. Dr R. Brown also stated that it was not necessarily possible to use the ranges given in the IUPAC atomic weights document for specific sources because the isotopic composition of gases produced by industry would differ from those natural sources. Dr A. van der Veen added that the solution was pragmatic because many documentary standards referred to the use of the latest IUPAC data. Prof. M. Cox informed participants that the JCGM Working Group on the Expression of Uncertainty in Measurement was aware of this issue and is currently formulating a solution to address the problem. Dr R. Wielgosz added that it is always possible to make an isotope ratio measurement of the gases in question. Dr A. van der Veen countered that this was only practical for simple binary mixtures since for multi-component standards this would be prohibitively expensive. Dr R. Brown added that any solution must be universally relevant to all producers of gas mixtures and not just applicable to NMIs and DIs. Dr A. Fajgelj was of the opinion that the CCQM should recommend to the IUPAC that a way is found to deal with this problem. Dr M. Milton stated that he had been in e-mail contact with the Commission on Isotopic Abundances and Atomic Weights (CIAAW) on this topic but that this had not progressed substantially. He emphasized the need for the CIAAW to progress this as a matter of urgency otherwise individual scientific communities would begin to use their own rules in the absence of any other guidance.

9. TOWARDS PROPOSALS FOR A NEW WAY OF PRESENTING CHEMICAL CMCS IN THE BIPM KCDB

Following the CCQM SPWG held in December 2012, Dr W. May had asked Dr R. Wielgosz to prepare a presentation summarizing the discussions that had taken place regarding the presentation of chemical CMCs in the BIPM key comparison database. Dr R. Wielgosz gave a presentation framing the current challenges and opportunities to potentially consider when formulating new ways to present and manage chemical CMCs in the future. The number of chemical CMCs continues to increase at a rate of between 250 and 300 per year. The current database used to assess and manage these claims may be approaching the end of its working life and this presents a good opportunity to reconsider the current approach. Dr R. Wielgosz also outlined extra parts of the CMC template for chemical and biological claims which are not used for the submissions from other CCs. It was highlighted that NMIs/DIs currently disseminate their measurement capabilities via services described as a) CRMs or b) either calibration services, or value assignment for proficiency testing scheme samples. Currently 51 % of CMCs are delivered through CRMs, 24 % of CMCs are delivered as both calibrations and CRMs and 25 % are delivered only as calibrations. Dr R. Wielgosz then showed the 67 service categories for chemical CMCs and posed the question as to whether these were still fit for purpose. The total number of chemical and biological CMCs (5360) compared to the total number of analyte-matrix combinations (3049) and the number of unique analytes (830) showed that there was less duplication in the chemistry area than there was in physics. Dr R. Wielgosz mentioned that the KCDB has its own search engine for chemistry and biological CMCs but wondered whether customers would prefer the data to be presented in an alternative format. Dr R. Wielgosz reminded participants that, whilst the CIPM MRA was designed for NMIs and DIs, the KCDB was originally designed with customers in mind – whoever they may be. He listed the principles that had been used in establishing the chemistry and biology CMCs in 2000/2001: 1) A database of capabilities; not a database of service catalogue entries, 2) Not a database of CRMs (but CRMs listed as a mechanism for service delivery), 3) Having the intention to list capabilities that underpinned the delivery of

services to customers, 4) Understanding that these were to be services offered by the NMI to customers, and 5) Listing specific analytes in CMCs.

Some issues raised at the March 2013 JCRB meeting were then reported: Does the database list available capabilities or available services; and is the presentation format readily understood by customers? In terms of the CCQM CMC service categories, as the number of bioanalysis CMCs increase and other new areas like microbiology become involved, will the format of the CMC template need to be reviewed? There were also questions raised at the JCRB meeting about how broad a CMC claim could be. Dr R. Wielgosz then posed the rhetorical question: Can we sustain the efforts required to publish and review 500 CMCs per year?

At this point there was an extensive discussion on the issues raised by the presentation thus far. Dr H. Emons opened the discussion by stating that he felt there was currently not a strategic approach to the CMC process and that it was important to decide who the CMCs were for and then adjust the process to meet the needs of these customers. Dr M. Sargent felt that the original intention of the database was largely academic. He theorized that most customers are interested in CRMs and this needs to be reflected since, in most cases, measurement capabilities are not relevant. Dr W. May retorted that the KCDB has to be more than just a CRM database – its job is not to market CRMs but to demonstrate the quality of the values assigned to measurements by NMIs. Dr B. Guettler countered that services are also disseminated via measurement capabilities and that legislation, especially in the clinical area, discusses analyte measurements in certain concentration ranges. The database must reflect the fact that not all services are delivered via CRMs. Dr Y. Mitani added that the requirements driving much of the work have changed so it is also sensible to consider how methods to deal with and represent the data might also change. Dr R. Kaarls cautioned that the CIPM MRA was originally set up at the request of the outside world so information on comparability and traceability could be obtained. This was especially the case from the accreditation community, from where the CMC principle comes. However, Dr R. Kaarls did not rule out that improvements to the current database may be beneficial. Dr W. Louw stated that in some parts of the world it was very clear who the customers for services were and perhaps it was important for others to first identify who their customers were. Dr W. May thought that much of the current confusion stemmed from each participant knowing their own customer base, but that this was not clear to others; indeed perhaps the term customer was too broad and needed a narrower definition. Ms H. Parkes added that the breadth of a CMC claim is likely to vary according to service area but that it was important that the breadth of a CMC matched that of the service provided to customers.

Dr R. Wielgosz then continued the presentation by comparing and contrasting the presentation of data in the JCTLM database and the KCDB. The JCTLM database had been set up after the KCDB, and was specifically designed to meet the needs of the laboratory medicine and IVD industry communities. He gave an example of the same CRM presented in both the KCDB and the JCTLM database and then the same measurement service on both databases to exemplify the differences in presentation of essentially the same information. Dr R. Wielgosz stated that the JCTLM database is based on clear customer requirements and service delivery, and its review process is much more focused on meeting normative standards and requirements. Dr S. Ellison commented that currently the JCTLM database is not a way of finding a CRM but rather a method of checking whether the JCTLM had approved it. It does not cover a whole range of services and it is not intended to. Dr W. May reminded participants that the services are what we are prepared to deliver and the capability is the means of delivery – we must ensure we focus on what is actually delivered. Prof. H. Emons agreed, stating that in a competitive world, metrological endeavour must add value otherwise customers will use other providers. He went on to remark that the JCTLM database would be a good

template for a revision of the KCDB. Dr Y. Kustikov remarked that sometimes customers are interested not only in measurement of the highest order and would often like more information on lower order measurements than is currently available.

Dr R. Wielgosz concluded the presentation by posing some final questions about the way forward. In particular he emphasized concerns to reduce effort to a manageable level (by speeding up the process and introducing broader based CMC claims), the requirement to consider what a broad-based CMC claim might look like (based on HFTLS, or on core competencies, or similar to a flexible accreditation scope), and how broad-based CMCs might be implemented (define limits and structure of broad-based CMC claims, possibly covering a number of services, maybe to be introduced with a re-review cycle in the first instance). Dr R. Brown then asked how these suggestions would be taken forward. Dr W. May was of the opinion that currently there was too much emphasis on those reviewing the claim and not enough burden of proof on the laboratory submitting the claim. Dr W. May stated that in future he would like to see the institute submitting the claim doing work to provide a convincing argument that the claim should be accepted – especially since there are not enough comparisons to underpin all current claims. Dr W. May was also of the opinion that strategic peer review panels would be useful in reviewing broader scope CMCs claims in the future. Dr Z. Mester concurred and stated that the CIPM MRA already mentions the use of peer review, although this approach is not applied uniformly over all regions currently. Dr M. Sega raised the issue that in some cases peer reviews had been performed but that the relevant documents were not sent to the KCWG. Dr W. Louw questioned whether the peer reviews intended were paper based or on-site visits, since on-site visits would require more resources and justification. Prof. H. Emons drew parallels with fixed and flexible scope in the field of accreditation and stated that in these cases it is very important to make clear in advance the criteria which any submitted claim will have to satisfy. He also cautioned that peer reviews must not duplicate existing processes or cause an unsustainable burden. Dr B. Guettler felt that transparency of the process was extremely important, especially with the possible move towards broader CMCs. He was supportive of giving the customers as much information as possible and allowing them to make informed decisions about the quality of services. Prof. M. Hennecke added that CMCs are also used on occasions to demonstrate the quality of a laboratory and judge the value of a large national investment in metrology. He cautioned against CMCs becoming too much of an internal metrology issue.

At this point Dr R. Kaarls interjected that the current debate was very timely since in 2015 there will be a review of the CIPM MRA. Dr W. May concluded that change would be a long process and that there may be value in a smaller group being formed to push forward these ideas. He asked Dr R. Kaarls to chair such a group with a remit to look at how the process of CMC generation and review could be improved in a CCQM context.

10. TRACEABILITY IN THE CIPM MRA (AND CCQM LIST OF EXCEPTIONS)

Dr D. Sin introduced the proposed traceability exceptions to the CIPM guidelines in CIPM/2009-24 (contained in CCQM/13-11). The reasons for these being considered were because CMCs had either been rejected, or were likely to be rejected, on the basis of the issues presented. All three were proposed by the IAWG and were specifically:

1. “Source of traceability is an elemental calibration solution prepared in-house as calibrant for services such as certification of matrix RMs or provision of reference values for PT schemes.

The calibration solution is not a direct service to customers and hence there is no CMC for its preparation. Traceability is attained by use of commercial high purity metals or other materials for which a purity assessment is performed, appropriate to the uncertainty requirement of the service (CMC) provided to customers.”

2. “Source of traceability is another NMI’s measurement service and/or standard that is accepted as fit for purpose by the IAWG although not supported by a CMC. This is a temporary exception which will be resolved in due course.”
3. “Delta value isotope ratio measurements cannot presently be made traceable to the SI but to materials recognized as International Standards. These are based on consensus values and are not in the BIPM database. Therefore, they cannot be used for CMC claims. This exception is unlikely to be resolved in the near future.”

Dr D. Sin explained that according to CIPM/2009-24 for an NMI/DI publishing CMCs on the KCDB there were two choices for establishing its traceability route to the SI: 1) via a primary realization or representation of the unit of measurement concerned, in which case traceability must be declared to its own demonstrable realization of the SI; or 2) via another NMI or DI having relevant CMCs with appropriate uncertainty published in the KCDB or through calibration and measurement services offered by the BIPM, in which case traceability must be declared through the laboratory providing the service. Further, Dr D. Sin elaborated that the document stated that “where neither of these two routes can be strictly applied, alternative paths for establishing the traceability to recognized standards may be proposed to the CIPM through the corresponding Consultative Committee.” In respect of the first two cases Dr D. Sin also pointed to Note 4 in the document: “Traceability route 1 includes the case of NMIs or DIs using certified reference materials (CRMs) or high-purity primary chemical reference materials that have been value-assigned by applying their own measurement capabilities as described and recognized within published CMCs.” Dr D. Sin stated that these cases were initially submitted to the KCWG which agreed in principle to the proposed exceptions and forwarded comments to the IAWG on the text. Following this the IAWG revised the text of the proposed exception and sent these to CCQM for discussion.

An extensive discussion about these proposed exceptions then ensued. Dr Z. Mester asked for clarification about what was intended by the first case. Dr W. May interpreted this as meaning that if an NMI does its own in-house purity assessment in order to prepare calibration solutions, which are subsequently used to certify matrix RMs, and the purity assessment is not covered by CMCs then the purity assessment may not be offered as a service. Dr M. Sargent added that in the vast majority of cases the commercial materials are extremely pure and do not add significantly to the uncertainty of the final result. He elaborated that purity checks on commercial materials are currently done in a number of ways and the IAWG is undertaking a PS which will look at the best way of taking this forward. Prof. H. Emons questioned whether this exception was required since the primary realization of the unit is by the purity assessment process. Dr M. Sargent explained that the crux of the problem was that in most cases the NMI/DI did not hold a separate CMC for value assigning the purity of the material. Dr W. May stated that in such cases where these have no consequence for the services provided or their uncertainty, this issue was not relevant. Dr R. Brown observed that the situation was quite closely related to Note 3 of the CIPM document 2009/24 where reference is made for allowing accredited services where the uncertainty can be shown only to make a minor contribution to the total combined uncertainty. However, Dr R. Brown went on to observe that Note 3 only applied to auxiliary influence quantities not part of the main traceability path; for purity assessment this was hard to justify. Dr R. Kaarls indicated that one of the problems was inconsistency in the text of CIPM document 2009/24, but advised that prior to any revision of the text the CCQM needs to find a way to

move forward. Dr M. Sargent condensed the debate down to two options: 1) approval by the CCQM of a traceability exception, or 2) approval by the CCQM and the KCWG that CMC claims falling under case 1 will be accepted when they reach review. Dr W. May agreed that the second option was the preferable way forward and urged a common sense approach to future CMC reviewing, stating as well that an appeals procedure for CMC claims that are denied may be useful in the future. The CCQM agreed that case 1 was not an exception but the scenario should instead be described as having been 'adopted as working practice in CCQM'. Dr M. Sargent noted that it was also important to ensure the RMOs were aware of this decision when performing their CMC reviews.

Discussion then moved on to the second proposed exception. Dr W. May asked why this was being raised if, as suggested in the text, it will be resolved in the near future. Ms. H. Parkes informed participants that all three BAWG CMCs in this cycle were rejected on these grounds: an IRMM material was used for traceability, but the material does not yet have CMCs. Dr A. Fajgelj commented that, in the same way as the first case, this common sense approach was appropriate for now, but was of the opinion that in the long term a proper approach would be needed. Dr A. Fajgelj referred to the current EMRP SIB09 ELEMENTS project as a first step in solving this problem. Dr R. Sturgeon felt that the first two cases would constitute necessary exceptions. He commented that those NMIs that invest in the required infrastructure will be able to provide a full traceability chain. Dr R. Kaarls again noted that the CIPM MRA text was inconsistent in this respect: on one hand requiring a service to be delivered regularly, but on the other hand requiring CMCs for something that is not delivered as a service. Dr W. May commented that the common sense approach would be to broaden the uncertainty statement to deal with the problem being considered. Prof. U. Panne questioned why, when pure materials with associated CMCs which would deal with this problem are available at the BAM and the NRC, for example, these are not being purchased by NMIs/DIs. Dr B. Guettler agreed that the traceability of some PTB elemental solutions is to BAM pure materials. Prof. H. Emons argued that it would not be possible to put in place this SI traceability approach for all compounds on the CAS registry. Dr R. Wielgosz countered that the OAWG organizes its KCs to cover as much of the analysis space for organic primary calibrators as possible. Dr W. May proposed that case 2 was therefore also not an exception but should instead be described as having been 'adopted as working practice in CCQM'. Dr W. May also suggested that the KCWG unblock these CMCs and similar claims in future, and that the issues raised by note 4 of CIPM document 2009/24 should be brought to the attention of the CIPM. He also asked Dr M. Sargent to draft note for Dr W. May and Dr R. Kaarls, which they would send to the RMOs for their use in intraregional CMC review regarding the issues and CCQM interpretation/agreements regarding the first two items in CCQM/13-11.

Discussion then moved on to the third proposed traceability exception for isotope ratio measurements relative to the delta scale. Much of the discussion focused around the definition of the term 'recognized standards' in CIPM 2009/24 and the phraseology 'material recognized as International Standards' in the text of the proposed traceability exception. Dr A. Fajgelj noted that in the case of the delta scale traceability was to artefact-based standards and not fully to the SI. Dr R. Sturgeon suggested that the problem is actually much broader than the lighter elements referred to in the traceability exception and would cover heavy metallic elements as well. Dr R. Watters stated that he saw no difference in terms of traceability between the delta scale and the current definition of pH. He was of the opinion that if delta scale measurements represented an exception then so should pH measurements. Dr W. May summarized the discussion by stating that the CCQM agreed with the traceability exception related to delta scale isotope ratio measurements, and that a list of certified reference materials that constitute accepted references for traceability statements is agreed and

maintained by the IAWG. He asked Dr M. Sargent to reformulate the text of the third case accordingly ready for discussion and action by the SPWG.

11. JCRB AND OUTCOMES OF THE WORKSHOP ON CMC REVIEW PROCESS

It was agreed that this item was largely covered in the discussions above and by the presentations given by Dr R. Kaarls to individual WGs during the week, and that the meeting should progress to the next item.

12. REPORT FROM THE *AD HOC* WORKING GROUP ON THE KCRV

Prof. M. Cox, chairman of the *ad hoc* KCRV WG, presented a progress report. He reminded the CCQM of the Terms of Reference of the KCRV WG, and then listed the work done by the WG and summarized the reports and guidance documents produced. Prof. M. Cox reported that activities during the last year had included a more detailed look at the DerSimonian-Laird (excess-variance estimator) and its inclusion in a CCQM guidance note, and production of a final version of the CCQM guidance note on calculation of the KCRV as CCQM/13-22. Prof. M. Cox then discussed some modelling approaches for the KCRV and $u(\text{KCRV})$ that the WG had examined and that this work was ongoing. Prof. M. Cox then introduced some possibilities for further KCRV WG work items. Further, he reminded the CCQM of some important points agreed by a joint meeting of the KCRV and EET EGs in 2008 that the CCQM should continue to bear in mind, and most notably that $u(\text{KCRV})$ is standard uncertainty associated with KCRV, rather than a measure of dispersion of results.

Prof. H. Emons commented that the new work item proposed on homogeneity and stability studies for KC materials may also be of interest to CRM producers, but that this should not be an issue for KC studies since it is the responsibility of the coordinator to establish that the materials used are homogenous and stable prior to dispatch. Dr S. Ellison agreed but stated that the work item was primarily aimed at what to do with this information once one has it – for instance how it might contribute to $u(\text{KCRV})$. Dr W. May concluded the discussion by thanking the KCRV WG for their efforts. He considered that their work was now complete and the WG should be disbanded. Dr W. May added that, of course, advice may still be sought from members of the group on a case by case basis. Further, the CCQM agreed that final KCRV WG document CCQM/13-22 ‘Guidance note: Estimation of a consensus KCRV and associated Degrees of Equivalence’ should be made public. It was agreed that its use in CCQM studies is not obligatory.

13. UPDATE ON THE REDEFINITION OF THE MOLE AND THE DRAFT *MISE-EN-PRATIQUE*

Dr M. Milton referred to the meeting note of the *ad hoc* WG on the redefinition of the mole (CCQM/12-37) and to the *mise-en-pratique* which had been produced (CCQM/12-38). Dr M. Milton

stated that timescales for comments and changes to the text are not pressing since the next CGPM will not discuss redefinition of the SI base units. The next CCU meeting in June 2013 would also cover the topic of enumeration and Prof. B. Phillips (NIST) had been asked to give a presentation to the CCU on this topic. Dr C. Thomas confirmed that the item on enumeration to be discussed at the CCU was as a result of a request by the CCQM. Ms H. Parkes added that the enumeration topic was also relevant to the BAWG. Dr R. Wielgosz invited Ms H. Parkes to produce a document considering current measurement issues associated with enumeration and copy number in the bio-measurement area for submission to the forthcoming CCU meeting.

Dr M. Milton briefly described the current proposal for a *mise-en-pratique* for the mole. Dr R. Wielgosz added there had been some additional comments from Dr M. Máriássy (CCQM/13-15). Dr M. Máriássy explained that his comments related to the example of realizing the mole by gravimetric preparation. His contention was that this example gave the impression that the measurement of amount of substance can easily be performed to parts in 10^6 (the accuracy of the mass measurement) whereas in actually realizing the mole, stoichiometry and purity are very important concepts, and currently this is not given enough attention. Furthermore, Dr M. Máriássy stated that purity is also a poorly defined term currently and would need to be more accurately explained in any *mise-en-pratique* for the mole. Dr M. Máriássy also noted that amount-of substance is the quantity of choice for macro-world, and particle count for micro-world. He stated that any *mise-en-pratique* should be practical and useful. He concluded by stating that a silicon artifact can be realized, but the unit is not easy to transfer from such a standard. Dr M. Milton agreed that Dr M. Máriássy's comments would be taken into account when producing the next version of the document.

Dr M. Milton then presented a new proposal from Dr B. Guettler to include a description of the current Avogadro project as part of the *mise-en-pratique* for the mole and in particular the counting of ^{28}Si atoms. Dr B. Guettler added that he would welcome greater interaction between the CCQM and the CCM on this issue because the proposal for redefinition of the mole and the kilogram are clearly closely linked. The general consensus was that the new text from Dr B. Guettler was an interesting addition to the *mise-en-pratique* for the mole and should be included in future drafts of the document as it would stimulate wider debate in the metrology community and was a very elegant way to teach the definitions.

Dr W. May then opened up the discussion on the redefinition of the mole to consider debate in the chemical community outside CCQM. He was of the opinion that the voice of the wider chemical community – which has previously expressed itself, sometimes in opposition to the redefinition, via articles submitted to the journal '*Accreditation and Quality Assurance*' – should be given an opportunity to debate the issues with the CCQM. For this purpose a future CCQM workshop on the redefinition of the mole to which external guests would be invited was proposed by Dr W. May. The timing, scope and effectiveness of such a workshop was debated at some length with some suggestions that this could be held at the CCQM meetings in South Africa in November 2013 or alternatively at the CCQM meetings in Paris in April 2014. No firm conclusion was reached and it was agreed that extra time was needed to reflect. Dr W. May would make a proposal to CCQM in due course.

Prof. R. Marquardt said that IUPAC should be kept informed of the planned workshop and it should be represented at the discussions taking place during the workshop. He reiterated that the current position of IUPAC is to support the current recommendation by the CCU of the CIPM on the definition of the mole. This position is documented in the minutes of the IUPAC Executive Committee meeting of 3-4 October 2009.

14. CC DIRECTORY AND MEMBERSHIP OF CCQM WORKING GROUPS

Dr R. Wielgosz presented the Directory of Consultative Committees maintained by the BIPM. He stated that in 2012 it was decided to ask for specific contact persons for WGs to be identified, however, in some cases these are not the people participating in the meetings. This situation was under review, including how this list would be maintained in the future. Dr W. May stated that because of finite space at the BIPM and expanding WG membership, WG chairs will be asked to review the membership of their WGs. Furthermore, he wished future April meetings of WGs be organized to allow all WGs to meet at the BIPM's facilities. He asked Dr R. Wielgosz to consult with the CCQM WG chairs to develop proposals to enable all WGs to meet at the BIPM and not require the use of external meeting spaces. Dr A. Fajgelj asked what the term 'contact person' actually meant. Dr W. May responded that the intention was to ensure there was an official point of contact for each organization that could pass information and invitations onto others in the organization as appropriate.

15. COMMENTS ON WRITTEN REPORTS FROM RMOS

No comments were forthcoming.

16. COMMENTS ON WRITTEN REPORT FROM THE JCTLM

Dr R. Wielgosz commented that there would be a JCTLM Stakeholders and Members meeting in December 2013 at the BIPM which would include a half day workshop on commutability and another half day workshop on reference systems and their impact of clinical medicine.

17. COMMENTS ON WRITTEN REPORTS FROM INTERNATIONAL ORGANIZATIONS IN LIAISON WITH THE CCQM

No comments were forthcoming.

18. CCQM WORKSHOPS

There was no further discussion of this topic. Dr W. May would make a proposal to CCQM in due course concerning the proposals reported under agenda item 13.

19. CCQM RESOLUTIONS

The 19th Meeting of the CCQM produced no resolutions.

20. ANY OTHER BUSINESS

Dr W. Louw informed participants that Dr L. Samuel had recently taken over from him as chair of CITAC.

21. DATE(S) FOR THE NEXT MEETINGS OF THE CCQM AND CLOSURE

Dr A. Botha gave a brief presentation outlining arrangements for the forthcoming CCQM WG meetings in Pretoria, South Africa, from 4-7 November 2013.

Dr T. Fujimoto confirmed that NMIJ would host the CCQM WG meetings in October 2014, probably between 14-16 October.

Dr W. May proposed that the 20th Meeting on the CCQM would take place on 7-11 April 2014 with the KCWG meeting on 4-5 April 2014.

In the absence of further business, the President of the CCQM closed the meeting at 15:40 and thanked participants for their contributions, reports and active participation in the discussions. Dr W. May expressed his desire to increase the quantity of open discussion at future meetings and reduce the number of formal presentations. Dr W. May thanked the staff of the BIPM for their support in hosting the meetings and wished all participants a safe trip home.

Dr R. J. C. Brown

Rapporteur, 24 April 2013

Revised 24 June 2013

DECISIONS AND ACTIONS FROM THE 19TH MEETING OF THE CCQM

1. Dr W. May to review the activities, structure and name of the CCQM and report back to the 20th Meeting of the CCQM.
2. As rapporteur, Dr R. Brown to draft “Decisions and Actions” document and “Report of 19th Meeting of the CCQM”.
3. Dr J. Kim is elected and confirmed as chair of the GAWG.
4. Dr W. May and Dr R. Kaarls will draft a set of CCQM guidelines for electing CCQM WG chairs and vice-chairs by November 2013, with the aim of a final draft to be approved at the 20th Meeting of the CCQM.
5. The CCQM approves the modifications proposed by the SPWG (CCQM/13-38) to the CCQM Strategy document. The document will be updated based on these proposals, as well as those agreements based on discussions at 19th meeting of CCQM. The revised document will be submitted by end of April 2013 to the SPWG and two additional members of the CCQM, Dr Hongmei Li (NIM) and Prof. H. Emons (IRMM) for final review.
6. The CCQM supports and approves the ‘BIPM Laboratory activities in Chemistry to meet future CCQM Strategic Plans’ as described in document CCQM/13-23 (SPWG/13-03), and requests that this document be added as an Appendix to the revised CCQM Strategy Document.
7. Dr W. May will recommend to the CIPM that the current peer review process undertaken for measurement services provided by the BIPM Chemistry Laboratories, based on audits by individual NMI experts at different times, be modified to a peer review by a group of NMI experts, auditing all measurement services in one visit.
8. The CCQM agrees that the use by NMIs of external NMR facilities for qNMR measurements is not a traceability exception but should instead be covered by CIPM document CIPM/2005-09 concerning the subcontracting of measurements under the CIPM MRA.
9. Dr W. May and Dr R. Kaarls will produce a first draft of a document describing the history of the CCQM by the 20th Meeting of the CCQM.
10. Dr R. Kaarls will establish and chair a new group to look at how the CCQM can carry out its activities to address the goals of the CIPM MRA in the most efficient and effective manner. This might include reassessing the current CMC focus and intent; the process of how CMC generation, formatting, presentation and review could be improved in a CCQM context, etc. and report back to the 20th meeting of the CCQM for further discussions.
11. The CCQM agrees that the first two possible traceability exceptions proposed in CCQM/13-11 concerning inorganic analytes are to be considered as ‘covered by current working practices and CMCs should not be rejected on these grounds’, but that further decision on these be delayed until the text of Note 4 of CIPM/2009-24 is reviewed and clarified.
12. Dr M. Sargent to draft note for Dr W. May and Dr R. Kaarls to send to the RMOs for their use in intraregional CMC review regarding the issues and CCQM interpretation/agreements regarding the first two items in CCQM/13-11.

13. The CCQM agrees with the traceability exception related to delta scale isotope ratio measurements, and that a list of certified reference materials that constitute accepted references for traceability statements is agreed and maintained by the IAWG. The text of the exception will be modified accordingly by Dr M. Sargent for discussion and action by the SPWG.
14. Dr R. Wielgosz, in consultation with Mr A. Henson, will draft a standard letter and form describing the conditions that guest laboratories participating in CCQM pilot studies are required to agree to in order to allow their participation. Agreement and signature of the forms shall be mandatory for guest laboratories to participate in CCQM pilot studies. (Reminder: Guests are not to be listed as members of a CCQM Working Group).
15. With the exception of those workshops convened as part of a regularly scheduled WG meeting, the CCQM agrees that any workshops that are proposed to be organized under the auspices of the CCQM require approval by the CCQM President. Dr R. Wielgosz will consult with the CCQM WG chairs to develop proposals to enable all WGs to meet at the BIPM and not require the use external meeting spaces.
16. The CCQM agrees that the work of the *ad hoc* KCRV WG is completed and the group is now disbanded.
17. The CCQM agrees that final *ad hoc* KCRV WG document CCQM/13-22 'Guidance note: Estimation of a consensus KCRV and associated Degrees of Equivalence' should be made publicly available. It is a guidance document and its use in CCQM studies is not obligatory.
18. Mrs. H. Parkes to produce a document considering current measurement issues and uses of enumeration and copy number in the bio-measurement area for Dr R. Wielgosz for submission by 10 May 2013 to the forthcoming CCU meeting to be held on 11-12 June 2013.
19. It was agreed that the IAWG, GAWG, OAWG, and BAWG will hold meetings 4-6 November 2013 hosted by NMISA in Pretoria, South Africa. On 7 Nov 2013, NMISA will organize a one-day symposium open to Stakeholders as well as CCQM Meeting attendees.
20. Dr W. May to report back to the CCQM within the next month or so regarding plans for a half day symposium related to concerns about the proposed new definition of the mole.
21. Dr W. May to invite the President of VAMAS to give a presentation at the 20th meeting of the CCQM (April 2014) and attend the SAWG meeting.
22. The 20th meeting of the CCQM will be held at the BIPM on 10-11 April 2014.

APPENDIX 1 WORKING DOCUMENTS SUBMITTED TO THE CCQM AT ITS 19TH MEETING

Working documents submitted to the CCQM at its 19th meeting are on restricted access.

Documents restricted to Committee Members can be accessed at the [restricted website](#).

Document

CCQM/

13-00	Practical information, 1pp
13-01	Draft agenda of the 19th meeting of the CCQM, 1pp
13-02	Timetable of CCQM meetings 12-19 April 2013, 1pp
13-03	Draft Agenda of the CCQM Workshop, 1pp
13-04	CCQM Strategy Document 2013-2013 v 0.5CCQM SPWG, 26pp
13-05	Annex to CCQM Strategy Document - List of Future CCQM Comparisons, CCQM SPWG
13-06	CCQM Strategy Document Cover Letter, Willie E. May, 1pp
13-07	Comment form for CCQM Strategy Document, CCQM SPWG, 1pp
13-08	Publications submitted to the CCQM relating to the proposal for the redefinition of the mole
13-09	Agenda of the Steering Group and Task Groups on Microbial Measurements, 3pp
13-10	Revised GUM- the impact, Maurice Cox, 29pp
13-11	Traceability Exception proposal from the IAWG, Mike Sargent, 2pp
13-12	IAWG Core Capability Approach (IAWG/12-13), Greg Turk, 15pp
13-13	Outcomes of the JCRB Workshop on CMC Review procedures, 2pp
13-14	Report of the 11th Meeting of the JCTLM Executive (6-7 December 2012), 20pp
13-15	Proposed modifications to the draft MeP for the mole, Michal Máriássy, 5pp
13-16	Coomet TC 1.8 report to the CCQM, Leonid Konopelko, 7pp
13-17	ISO REMCO Report to the CCQM, Hendrik Emons, 3pp
13-18	Comments received on CCQM Strategy Document Version 0.5 (SPWG/13-02)
13-19	Report from the ad hoc WG on the KCRV, Maurice Cox, 4pp
13-20	EURAMET METCHEM TC report to CCQM, Michela Sega, 3pp
13-21	APMP TCQM report to CCQM, Euijin Hwang, 11pp
13-22	Guidance note: Estimation of a consensus KCRV and associated Degrees of Equivalence (updated version of CCQM 10-03), 37pp
13-23	Appendix to CCQM Strategy Document on BIPM Laboratory Activity, 3pp
13-24	Presentation of CCQM Strategic Plan document (Version 0.5), 16pp
13-25	Update on BIPM programme in metrology in chemistry, 20pp
13-26	Report from the KCWG WG, 15pp
13-27	Report from the MBSG, 30pp
13-28	Report from the SAWG, 26pp
13-29	Report from the BAWG, 25pp
13-30	Report from the EAWG, 34pp
13-31	Report from the IAWG, 25pp

- 13-32 Report from the OAWG, 34pp
- 13-33 Report from the GAWG, 18pp
- 13-34 Report from the ad-hoc WG on the KCRV, 13pp
- 13-35 Presentation on Chem/Bio CMCs in the BIPM KCDB, 19pp
- 13-36 November 2013 CCQM WG meetings hosted by NMISA, Pretoria, 5pp
- 13-37 Traceability Exceptions proposed for consideration by the CCQM, 13pp
- 13-38 CCQM approved comments on CCQM Strategy document (Version 0.5), 7pp
- 13-41 Actions and decisions from the 19th meeting of the CCQM, 2pp
- 13-42 CCQM Strategy Document Version 1.0 23/05/12, 31pp
- 13-43 Annex to CCQM Strategy Document Version 1.0: List of Key Comparisons and pilot studies
- 13-44 Enumeration for biomeasurements (CCU/13-09.0), Helen Parkes, 8pp
- 13-45 Units for dimensionless counting quantities, enumeration, and chemical concentration (CCU/13-09.03), 5pp