

International Committee  
for Weights and Measures

**Proceedings of Session I**

**of the 112th meeting**

(20-23 March 2023)

## Executive Summary

### 112th meeting of the CIPM (20-23 March 2023)

#### **CIPM Bureau**

The CIPM elected a new bureau: W. Louw as President, T. Usuda as Secretary and J. Olthoff and P. Richard as Vice-Presidents.

#### **Consultative Committee for Length (CCL)**

The CIPM appointed V. Coleman as President of the CCL for a four-year term.

#### **Consultative Committee for Ionizing Radiation (CCRI)**

The CIPM appointed J.-T. Janssen as President of the CCRI for a four-year term

#### **Pension Fund Advisory Board (PFAB)**

The CIPM appointed G. Macdonald as the Chair PFAB.

#### **CIPM Sub-Committee on Governance**

The CIPM decided to establish a CIPM Sub-Committee on Governance.

#### **Sectorial Task Group on Climate Change and Environment (STG-CENV)**

The CIPM accepted the structure, ToR, membership and work plan of the STG-CENV.

#### **Forum on metrology in the digital world**

The CIPM approved the establishment of a forum on metrology in the digital world, adopted the updated Grand Vision for the SI Digital Framework, endorsed the swift further development and implementation of the SI Reference Point (SIRP), and endorsed the SIRP to become the unit representation system for the digital products of the BIPM.

#### **CIPM Working Group on Data**

The CIPM decided to close the CIPM Working Group on Data and to merge its members into the CIPM Task Group on the SI Digital Framework.

#### **Application of CGPM Resolution 4 (2022)**

The CIPM noted the possible need for a negative leap second for the first time before 2035 and asked the CCTF to work towards a timely application of CGPM Resolution 4 (2022), working with the ITU.

#### **Democratic Socialist Republic of Sri Lanka**

The CIPM decided that it would be appropriate for Sri Lanka to accede to the Metre Convention.

#### **Membership of Consultative Committees**

The CIPM accepted NIS (Egypt) as a member of the CCEM and NSE “Ukrmetrteststandard” (Ukraine) as an observer.

**MEMBERS OF THE  
INTERNATIONAL COMMITTEE FOR WEIGHTS AND MEASURES**

As of 21 March 2023

**President**

W. Louw, South Africa.

**Secretary**

T. Usuda, Japan.

**Members**

V.G. Achanta, India.

D. del Campo Maldonado, Spain.

V. Coleman, Australia.

N. Dimarcq, France.

Y. Duan, China.

J.-T. Janssen, United Kingdom.

H. Laiz, Argentina.

G. Macdonald, Canada.

P. Neyezhnikov, Ukraine.

J. Olthoff, United States of America. *CIPM Vice-President.*

S.-R. Park, Republic of Korea.

M.L. Rastello, Italy.

P. Richard, Switzerland. *CIPM Vice-President.*

G. Rietveld, the Netherlands.

G.P. Ripper, Brazil.

J. Ullrich, Germany.

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## 1. OPENING OF THE SESSION; QUORUM

The International Committee for Weights and Measures (CIPM) held Session I of its 112th meeting on Monday 20 to Thursday 23 March 2023 in a hybrid format. Monday 20 was a close-out meeting attended by the outgoing members of the CIPM.

Outgoing members: F. Bulygin (on-line), I. Castelazo (on-line), T. Liew (on-line), M. Sené (on-line) and A. Steele (in person).

Present in person: V.G Achanta, D. del Campo Maldonado, V. Coleman, N. Dimarcq, Y. Duan, J.-T. Janssen, H. Laiz, W. Louw, G. Macdonald, M. Milton (Director of the BIPM), J. Olthoff, S.-R. Park, M.L. Rastello, P. Richard, G. Rietveld (21-23 March), G. Ripper, J. Ullrich and T. Usuda.

Present remotely: P. Neyezhnikov, G. Rietveld (20 March).

Also attending the meeting were: C. Fellag Ariouet (Personal Assistant to the Director and Head of the Executive and Meetings Office), A. Cypionka (Director of the International Liaison and Communication Department), C. Planche (Web and Translation) and R. Sitton (Publications).

The following were in attendance for parts of the meeting: V. Gressier (Director of the Ionizing Radiation Department and Executive Secretary of the CCRI), R. Guliyeva (International Liaison and Communications Department), C. Kuanbayev (International Liaison and Communications Department), J. Miles (International Liaison and Communications Department), G. Panfilov (Executive Secretary of the CCL), F. Rojas Ceballos (Legal Adviser), D. Vlad (International Liaison and Communication Department) and R. Wielgosz (Director of the Chemistry Department and Executive Secretary of the CCQM).

With eighteen members participating in the hybrid meeting, the quorum was satisfied according to Article 12 of the Regulations annexed to the Metre Convention.

W. Louw opened the meeting and welcomed those members attending in person at the BIPM Headquarters and those taking part remotely. The new members of the CIPM and the BIPM staff in attendance were asked to introduce themselves. He noted that the election of the CIPM bureau would take place from 09h00 on 21 March 2023 and will be overseen by the senior member of the CIPM, Y. Duan. W. Louw thanked the retiring members of the CIPM, F. Bulygin, I. Castelazo, T. Liew, M. Sené and A. Steele, for joining the meeting.

There were no changes to the agenda for the “close-out” session for the outgoing CIPM, which was approved.

The CIPM accepted the records of its 111th meeting as a true record.

**Decision CIPM/112-1 (2023)** The CIPM accepted the minutes of the 111th meeting of the CIPM as a true record.

## 2. SECRETARY'S REPORT

T. Usuda reported that the outgoing bureau had met on the morning of 20 March. It had discussed a range of topics including confirmation of the procedure for election of the bureau and for appointing Consultative Committee Presidents and members to serve on the CIPM Sub-Committees and Working Groups.

T. Usuda presented the decisions taken at the 111th meeting of the CIPM (June 2022). Three decisions that the outgoing CIPM had made by correspondence since its last meeting, were presented for noting.

**Decision CIPM/111-13** The CIPM noted the decision taken by correspondence in December 2022:

Considering that the BIPM dotation agreed at the 26th meeting of the CGPM increased by 1 % each year from 2020 to 2023 and that the agreed budget assumed a 2 % annual rate of inflation applied to salaries and allowances had justified the CIPM in making decision CIPM/108-49 (2019) to cap increases in the point applicable to salaries to 2 % for the period 2020 to 2023. Noting that for the years 2020 to 2022 there was no requirement to apply the above-mentioned cap to the increase in the point applicable to salaries, the CIPM decided that the value of the point applicable to salaries be revised on 1 January 2023, in accordance with regulation 10.2 of the staff regulations applicable to staff members, by 4.5 %, which will allow the BIPM to meet its financial obligations and essential operating requirements, while safeguarding the interests of staff given the particularly high inflation rate in France.

**Decision CIPM/111-14** The CIPM noted the decision taken by correspondence in December 2022:

Considering that the BIPM dotation agreed at the 26th meeting of the CGPM increased by 1 % each year from 2020 to 2023 and that the agreed budget assumed a 2 % annual rate of inflation had justified the CIPM in making decision CIPM/108-50 (2019) to cap increases in the point applicable to pensions to 2 % for the period 2020 to 2023. Noting that for the years 2020 to 2022 there was no requirement to apply the above-mentioned cap to the increase in the point applicable to pensions, the CIPM decided that the value of the point applicable to pensions be revised on 1 January 2023, in accordance with Rule 17.4 of the Rules of the Pension and Provident Fund, by 4.5 %, which will allow the BIPM to meet its financial obligations and long-term financial sustainability of the Pension Fund, while safeguarding the interests of pensioners given the particularly high inflation rate in France.

**Decision CIPM/111-15** The CIPM noted the decision taken by correspondence in December 2022:

Recalling decisions CIPM/106-07 (2017), CIPM/109-12 (2020) and CIPM/110-18 (2021) and following the recommendations from the CIPM Sub-Committee on Finance meeting held on 23 November 2022, the CIPM decided to authorize a second exceptional transfer of 3 million Euros of unreserved cash to the Pension Fund, effective by the end of 2022. The CIPM also decided to consider a further exceptional transfer in 2023, should the Sub-Committee on Finance consider such a measure appropriate to ensure the long-term financial sustainability of the Pension Fund and that it should not affect the BIPM's financial obligations or essential operational requirements.

T. Usuda presented a summary of the report [CIPM/2023-I-A2-5](#) "Quality Management System Review meeting notes".

The President thanked T. Usuda and invited questions.

H. Laiz referred to the issue mentioned in the report of the work requiring specialized personnel, which is a common problem amongst NMIs. The report of the QMS Review meeting proposed developing a "job market community" for experienced metrologists to ensure that the primary standards at the NMIs and BIPM remain resilient. He asked if this might be a subject for discussion at the next NMI Directors meeting. He asked T. Usuda to expand on the suggestion.

T. Usuda replied that this issue applies to all NMIs, particularly those that are more developed. The work of the NMIs is specialized and he suggested that they should share information and knowledge on how to perform specialized tasks with younger metrologists to ensure continuity and to prevent the loss of vital skills. A. Steele added that this idea of transferring knowledge fits in with the proposed Young Metrologists' programme (see §11) and supports the international advantage of having scientists at the BIPM Headquarters who carry out work on behalf of the international metrology community. In addition, the international cooperation and development work carried out by the BIPM and the ongoing knowledge transfer activities distinguish the role of the

BIPM Headquarters as a location for those involved in metrology to visit and engage in activities that are distinct from the programmes that any one nation could carry out: this collective advantage is very real and should not be overlooked. He suggested that the BIPM Headquarters could have a core of permanent staff over the next 5-15 years who are supplemented by specialists, separate to those who are seconded to the BIPM Headquarters to work on specific scientific projects that are part of the Work Programme. The proposals for the Young Metrologists programme would allow for this broadening of participation.

P. Richard said that he had comments regarding the Quality Management System Review report. He remarked that IT security is becoming increasingly important and that the BIPM hosts a number of international databases on its website. He noted that the report stated that an audit of IT security takes place every three years and questioned whether this periodicity is sufficient and whether additional measures are required.

The Director replied that an IT security audit took place in February 2023 and the majority of the actions recommended have been put in place. The longer-term recommendations will be implemented by mid-2023. (See §13 for a review of the main recommendations). He commented that he keeps IT security constantly under surveillance and that there would need to be some strong rationale for repeating a large-scale exercise more frequently.

P. Richard asked if the CIPM could receive a report on risk management annually. The Director said that with adoption of the new 2017 edition of ISO 17025, risk management has become an important part of the QMS review. The department directors in their individual departments carry out a review of risks and opportunities; they then come together to undertake a review of risks and opportunities for the whole BIPM. P. Richard said that the CIPM needs to be informed directly about the risk management review, rather than indirectly through the QMS review report.

G. Rietveld asked why the value of the ‘point’ in Decision CIPM/111-13 and Decision CIPM/111-14 had been set at 4.5 %. The Director recalled the background to the decisions, which is detailed in the document [CIPM2023-I-A2-3](#). He referred back to the fact that the CIPM had decided to cap the ‘point’ for salaries and pensions at 2 % each year for the period 2020-2023 in Decisions CIPM/108-49 and -50 (2019). He added that since the CIPM had not awarded the full amount of 2 % for each of the previous three years, what was left in the budget in 2023 was 4.5 %. P. Richard added that the FSC had supported the increase of 4.5 % and not more because it is necessary to be prudent and to consider the long-term implications of the decisions, particularly because salaries represent a significant part of the budget.

A. Steele recalled that a large fraction of the budget is related to staff costs, including pensions, salaries and benefits. He emphasized that whenever salaries are increased by more than the dotation increase, there will then be a consequential impact on the capital and operating budgets.

### **3. PRESIDENT’S REPORT**

W. Louw said that a summary of the work undertaken by the CIPM for the years 2018-2022 is available in his report to the 27th meeting of the CGPM. This includes an outline of the progress related to Resolutions 1, 2 and 3 adopted at the 26th CGPM (2018). He recalled that the development of the strategy had been in response to the resolutions. He concluded by saying that the CIPM 2018-2022 had been very successful: all seven draft resolutions presented at the 27th meeting of the CGPM were adopted without any changes to the text.

### **4. DIRECTOR’S REPORT**

The Director said he would give his report on Thursday 23 March under §13 “Report from the BIPM Director and International Liaison and Communication Department”.

## 5. REPORT FROM THE CHAIR OF THE PFAB

A. Steele, the outgoing Chair of the BIPM Pension Fund Advisory Board, gave a summary of the work of the Board since he took over as Chair in 2019. He recalled that the PFAB had replaced the Standing Sub-Committee on the BIPM Pension and Provident Fund and Health Insurance in 2015, following the adoption of Resolution 3 of the 25th meeting of the CGPM (2014). The CGPM, through this resolution, had tasked the CIPM to look into the structure, management and funding of the pension fund, in order to ensure its long-term financial sustainability. He acknowledged the work of his predecessor, Luc Énard, for the work he had done between 2015 and 2019.

A. Steele said that the ‘pay-as-you-go’ nature of the pension scheme means that the investment account is only funded to a level that is less than the total liability. He added that many countries are not in favour of unfunded schemes of this type – except for those held by governments. This low level of funding creates difficulties when the financial situation fluctuates, such as during periods of high inflation or when actuarial assumptions change. This was the background to increasing the pension contributions to the level of 19.8 % to be reached in 2026. He noted that this decision had triggered some challenges by staff and retirees to the International Labour Organization (ILO) Administrative Tribunal. The latest of these led to Judgement No. 4580 which was available as documents [CIPM/2023-I-B8-3.1](#) and [CIPM/2023-I-B8-3.2](#). The Judgement found fully in favour of the decisions taken to address the long-term financial sustainability of the fund. The judgement found that if the CIPM had made a mistake, it was that actions should have been taken much earlier.

A. Steele referred to document [CIPM/2023-I-A2-4](#) “Notes of Meeting of the CIPM Sub-Committee on Finance”. Section 4 refers to the transfer of funds to the Pension Fund from the unallocated BIPM reserves. He commented that the CIPM had made two separate transfers of 3 million Euros to boost the long-term sustainability of the fund. He concluded by saying that the future scenario for the pension fund has changed from estimating when it would go bankrupt to forecasting when it will be fully funded.

P. Richard, Chair of the CIPM Sub-Committee on Finance, thanked A. Steele for his contributions to the PFAB and the FSC and noted that they had worked together closely. The President added his thanks to A. Steele.

## 6. REPORTS FROM THE RETIRING CC PRESIDENTS AND REFLECTIONS FROM OTHER RETIRING CIPM MEMBERS

### Consultative Committee for Ionizing Radiation (CCRI)

M. Sené said that it had been a privilege to be the President of the CCRI. He commented that it is an active and committed community with a high level of engagement around the world. The CCRI is focused on end users who are dependent on the global consistency of ionizing radiation measurements. He thanked all of the people involved in the work of the CCRI, particularly the Working Group Chairs and the three Section Chairs: Malcolm McEwen; Lisa Karam; and Andreas Zimbal. M. Sené said that while he had been President of the CCRI he had worked with two excellent Executive Secretaries: Steven Judge followed by Vincent Gressier. He said that the work of the BIPM Headquarters is highly valued by the ionizing radiation community, particularly by those Member States that do not operate large-scale facilities.

M. Sené made a few personal observations about the future of the CCRI, particularly about how to optimize CMCs by finding a balance between ensuring confidence in the validity and excellence of the CMC data against the fact that maintaining CMCs is expensive and time consuming. In addition, the CCRI expects growing collaboration with the other Consultative Committees. The CCRI has existing collaborations with the CCQM on mass spectrometry and the CCEM on how to incorporate some of its expertise on low-current measurements into ionizing radiation. The CCRI will face a number of new challenges over the coming years such as the growing use of radionuclide therapy and the regulation of radionuclide sources that are critical to the community. There could be a major impact on the ionizing radiation community if it becomes prohibitively expensive to maintain certain radionuclide sources.



M. Sené commented that the COVID-19 pandemic had forced the CCRI to re-evaluate how it could use modern communications technology. The monthly webinars launched by the CCRI during the pandemic have been well attended. Feedback from ‘smaller’ Member States has indicated that the webinars have allowed them to obtain valuable knowledge in a way that would have been unaffordable if the events had been held face to face.

He concluded by saying that fusion technology is likely to transition to a commercial reality in the coming decades and this will bring a range of challenges not only to the ionizing radiation sector, but also to other fields of measurement. The CCRI will also need to respond to the digital revolution. It has set up the CCRI Task Group on Digital Transformation (CCRI-DT-TG), which has a broad ambition, but will focus initially on specific topics. The CCRI will ensure that its digital vision is aligned with the wider digital agenda of the CIPM. The CCRI will review and refresh its vision and strategy to bring it into line with the wider vision for the BIPM that the CIPM is developing for launch at the 150th anniversary of the signing of the Metre Convention in 2025.

J. Ullrich thanked M. Sené and A. Steele for their involvement with the CIPM Task Group on the Digital SI (CIPM-TG-DSI). The President thanked M. Sené for his active participation in the CIPM Sub-Committee on Strategy (CIPM-SC-STRATEGY).

### **Consultative Committee for Length (CCL)**

I. Castelazo, the outgoing President of the CCL, thanked the President and the CIPM Bureau for the opportunity to make a few remarks for his successor on the work in progress in length metrology. An important project that is under way is the development of an API to automate the retrieval of the standardized laser wavelengths for realizing the metre. The project is a collaboration between the BIPM and CCL members from the NPL. The BIPM and NPL are testing and refining the API and have published a paper in *Metrologia* on the digital framework for realizing the metre<sup>1</sup>. In addition, the CCL Working Group on the CIPM MRA (CCL-WG-MRA) has recommended that the BIPM key comparison database (KCDB) should include the date and the outcome of participations in key comparisons. This information is currently available in PDF documents and is therefore not machine-actionable. The CCL monitors this information using Excel spreadsheets to schedule repeat participation in a key comparison to support a CMC. He said that it would be possible to automate this process using an API by making the data available in a machine-actionable format in the KCDB.

I. Castelazo thanked the CIPM, the BIPM Director and all the staff at the BIPM, particularly G. Panfilo (the Executive Secretary of the CCL) for their support during his tenure as President of the CCL. He said that it had been an honour to be a member of the CIPM and the CCL President.

J. Ullrich thanked I. Castelazo for his involvement in the CIPM Task Group on the SI Digital Framework (CIPM-TG-DIG). He commented that the CCL is at the forefront of digitalization with its work on the API. The Director added that the CCL is ahead of many of the other Consultative Committees in terms of digitalization, particularly with its forward-thinking initiative for providing machine-readable data in the KCDB. He recalled that the CCL Working Group on the CIPM MRA (CCL-WG-MRA) had submitted a resolution to the Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB) requesting that the KCDB would provide information about the date of execution of key comparisons. Work is currently under way for the digital transformation of Appendix C of the KCDB and Appendix B is pending. The recommendation from the CCL-WG-MRA will be considered during the digitalization of Appendix B.

### **CIPM Working Group on Data**

T. Liew said that it had been a privilege to be the Chair of the CIPM Working Group on Data. He commented that the digitalization of the work in the Consultative Committees is essential so that they remain relevant in the digital world. He recalled the Terms of Reference of the Working Group and gave a summary of its work.

<sup>1</sup> Lewis A.J., Yacoot A., Milton M.J.T., Lancaster A.J. A digital framework for realising the SI—a proposal for the metre, 2022, *Metrologia*, **59**(4), 044004. <https://doi.org/10.1088/1681-7575/ac7fce>

He said that the CIPM Task Group on the SI Digital Framework (CIPM-TG-DIG) had operated in parallel to the Working Group on Data and that J. Ullrich, the Chair of the CIPM-TG-DIG will give a presentation later in the meeting. He noted that there is overlap between the membership of the two groups and that the work of the Working Group on Data was broad and cut across many areas of metrology. The Working Group on Data has provided input into the development of the CIPM Strategy 2030+ which have consequences for good metrology and trust in measurement data. He suggested that action items are needed for the CIPM and BIPM on these topics and there is a need to work with stakeholders, particularly in the area of quality infrastructure.

T. Liew thanked the CIPM for their input into the Working Group on Data. He added that he had also been an Executive Member of the Joint Committee for Traceability in Laboratory Medicine (JCTLM) and thanked S.-R. Park, R. Wielgosz and S. Maniguet for their support.

J. Ullrich thanked T. Liew for his input and for his initiative to draw the attention of the CIPM to the issue of problems with the reproducibility of metrological data. He recalled that there had been close collaboration between the Working Group on Data and the CIPM-TG-DIG and said that the Working Group had raised longer-term issues, while the Task Group had focused on immediate tasks. He added that the CIPM has considered how the work should continue and a proposal has been made to merge the two groups.

The President noted that F. Bulygin was also retiring from the CIPM. F. Bulygin said that it had been a great honour to work with his colleagues on the CIPM over the last eight years. The President thanked F. Bulygin for his input into the CIPM.

## 7. ANY OTHER BUSINESS FROM THE “CLOSE-OUT” SESSION

J. Olthoff asked about the level of participation in the induction meeting for new CIPM members, planned for the afternoon of 20 March. The President clarified that any members of the CIPM were welcome to attend.

The CIPM re-convened on 21 March at 9h00 with the senior member of the newly-elected CIPM, Y. Duan, in the Chair.

## 8. ELECTION OF THE CIPM BUREAU

Y. Duan explained the process for the election of the CIPM bureau.

Six members of the CIPM had put their names forward as candidates for positions on the CIPM bureau, with some candidates applying for several positions in the event that they were unsuccessful in their election to a higher position. Each candidate had previously supplied a written statement, which had been made available to the CIPM.

Each candidate would be allowed five minutes to make an introductory statement in support of their application. The order in which the statements were made was determined by the drawing of lots. In instances where a candidate was unsuccessful in being elected to a particular position and subsequently stood for an alternative position, the introductory statement for the alternative position was limited to two minutes.

All 18 members of the CIPM as well as the Director of the BIPM were eligible to vote. The majority required for a candidate to be declared successful was therefore ten votes. The voting proceeded by secret ballot.

### CIPM President

The two candidates for the position of CIPM President gave their introductory statements. Following a secret ballot, W. Louw was elected as the CIPM President. W. Louw thanked the CIPM for their confidence.

<b>Decision CIPM/112-2 (2023)</b> The CIPM elected Dr W. Louw as President of the CIPM by secret ballot.
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### CIPM Secretary

The three candidates for the position of CIPM Secretary gave their introductory statements. Following a secret ballot, T. Usuda was elected as the CIPM Secretary.

### CIPM Vice-Presidents

The four candidates for the two vacancies for CIPM Vice-Presidents gave their introductory statements. Following two sequential secret ballots, which consisted of several rounds of voting, P. Richard and J. Olthoff were elected.

**Decision CIPM/112-3 (2023)** The CIPM elected the following by secret ballot:

- Dr T. Usuda as Secretary of the CIPM;
- Dr P. Richard and Dr J. Olthoff as Vice-Presidents of the CIPM.

W. Louw took the Chair of the meeting in his role as President. He thanked Y. Duan for chairing the election and he thanked F. Rojas Ceballos and C. Fellag Ariouet for their support for the process.

## 9. APPROVAL OF THE AGENDA

The President asked if there were any comments or additions to the agenda. G. Rietveld said that he would present the background to document [CIPM/2023-I-B4gh.1](#) “Suggestion for implementation of CIPM sectorial task groups” on 22 March. The President noted that the status of the CIPM representatives to the Joint Committees will be checked under item 10.

The CIPM adopted the agenda.

## 10. CONFIRMATION AND NOMINATION OF CC PRESIDENTS AND SC/WG CHAIRS

The CIPM President asked the Presidents of eight of the Consultative Committees (the CCAUV, CCEM, CCM, CCPR, CCQM, CCT, CCTF and CCU) if they were willing to continue in the role for another four-year term. They all responded that they would continue, with the proviso that P. Richard (CCM President) will reconsider his position and may step down later in 2023.

The President asked if there were any other candidates from within the CIPM that would like to be considered for the Presidency of any of these eight Consultative Committees for the next four-year term. No other candidates were forthcoming. The CIPM elected unanimously the eight incumbent CC Presidents following a show of hands.

**Decision CIPM/112-4 (2023)** The CIPM decided to reappoint the Presidents of the following Consultative Committees for four-year terms:

- Consultative Committee for Acoustics, Ultrasound and Vibration (CCAUV): Dr H. Laiz.
- Consultative Committee for Electricity and Magnetism (CCEM): Prof. G. Rietveld.
- Consultative Committee for Mass and Related Quantities (CCM): Dr P. Richard.
- Consultative Committee for Photometry and Radiometry (CCPR): Dr M.L. Rastello.
- Consultative Committee for Amount of Substance: Metrology in Chemistry and Biology (CCQM): Dr S.-R. Park.
- Consultative Committee for Thermometry (CCT): Dr Y. Duan.
- Consultative Committee for Time and Frequency (CCTF): Dr N. Dimarcq.
- Consultative Committee for Units (CCU): Prof. J. Ullrich.

The CIPM President said that following the retirement of I. Castelazo (CCL President) and M. Sené (CCRI President), these two positions were vacant.

The sole candidate for the Presidency of the CCRI, J.-T. Janssen, was appointed unanimously following a show of hands.

**Decision CIPM/112-5 (2023)** The CIPM appointed Dr J.-T. Janssen as the President of the Consultative Committee for Ionizing Radiation (CCRI) for a four-year term.

The sole candidate for the Presidency of the CCL, V. Coleman, was appointed unanimously for a four-year term following a show of hands.

**Decision CIPM/112-6 (2023)** The CIPM appointed Dr V. Coleman as the President of the Consultative Committee for Length (CCL) for a four-year term.

The President said that the Chair of the Pension Fund Advisory Board (PFAB) was vacant following the retirement of A. Steele from the CIPM. G. Macdonald expressed an interest in the role and was appointed unanimously by the CIPM following a show of hands.

**Decision CIPM/112-7 (2023)** The CIPM appointed Ms G. Macdonald as the Chair of the Pension Fund Advisory Board (PFAB).

The President noted that there was a need to confirm the membership of the CIPM Sub-Committees, *ad hoc* Working Groups and Task Groups. The CIPM members that were appointed are detailed in Decision CIPM/112-8.

**Decision CIPM/112-8 (2023)** The CIPM appointed the following CIPM members to serve on the CIPM Sub-Committees and *ad hoc* Working Groups:

- CIPM Sub-Committee on Finance (FSC): Dr P. Richard (Chair), Ms G. Macdonald (Chair of the Pension Fund Advisory Board), Dr V.G. Achanta, Dr Y. Duan, Dr W. Louw, Dr T. Usuda,
- Pension Fund Advisory Board (PFAB): Ms G. Macdonald (Chair), Dr P. Richard (Chair of the CIPM Sub-Committee on Finance), Dr T. Usuda.
- CIPM Sub-Committee on Strategy: Dr W. Louw (Chair), Dr V.G. Achanta, Dr V. Coleman, Dr J.-T. Janssen, Ms G. Macdonald, Dr D. del Campo Maldonado, Dr H. Laiz, Prof. P. Neyezhnikov, Dr J. Olthoff, Dr M.L. Rastello, Prof. G. Rietveld, Dr G. Ripper, Prof. J. Ullrich.  
(Universal adherence to the Metre Convention: Dr V. Coleman, Dr A. Cypionka (BIPM), Dr W. Louw)
- CIPM *ad hoc* Working Group on Conditions of Employment: Dr T. Usuda (Chair), Dr M.L. Rastello, Dr P. Richard, Dr G. Ripper.
- CIPM Task Group on the SI Digital Framework (formerly Digital SI): Prof. J. Ullrich (Chair), Dr V.G. Achanta, Dr V. Coleman, Dr N. Dimarcq, Dr Y. Duan, Dr J.-T. Janssen, Dr H. Laiz, Ms G. Macdonald, Prof. P. Neyezhnikov, Dr J. Olthoff, Dr M.L. Rastello.
- CIPM Sectorial Task Group on Climate Change and Environment (STG-CENV): Dr D. del Campo Maldonado (Chair), Dr Y. Duan, Dr J.-T. Janssen.
- OIML-BIPM Joint Task Group: Dr W. Louw, Dr P. Richard, Prof. J. Ullrich, Dr T. Usuda.

## 11. CONFIRMATION OF MANDATES GIVEN TO THE CIPM BY THE CGPM AND TIMELINES FOR ACTIONS

The President recalled that prior to the 26th meeting of the CGPM (2018), the CIPM had focused on the revision of the SI as its principal objective. The CIPM changed its focus after 2018 to begin studying the future of the BIPM and how the organization should position itself to remain relevant over the next 50 years and the CIPM Strategy 2030+ was initiated.

He recalled that the CIPM Sub Committee on Strategy (CIPM-SC-STRATEGY) identified five strategic areas for which sub-groups were set up to advise and support the CIPM: (1) responding to the evolving needs in metrology; (2) addressing key scientific challenges to advance the global measurement system; (3) strategy for deepening engagement with other international organizations on measurement science issues; (4) reviewing the strategy for future membership of the organization; and (5) modernizing the operations of the organization. He said that sub-group 1 identified the grand challenges facing metrology and how to address them. The President gave a summary of the work undertaken by the sub-groups.

A. Cypionka, Director of the International Liaison and Communication Department, presented document [CIPM/2023-I-B4.1](#) “Mandates given to the CIPM by the 27th CGPM”, which summarized five actions mandated for the CIPM to address before the next meeting of the CGPM:

- To develop the CIPM strategy for at least the next 10 years based on broad stakeholder consultation (the “CIPM Strategy 2030+”),
- To complement the CIPM strategy with visionary ideas for future opportunities and challenges from young metrologists (the “Young Metrologists’ Vision 2050+”),
- To promote participation of states that are not yet engaged in the activities of the BIPM and thereby progress towards Universal adherence to the Metre Convention,
- To modernize the governance of the BIPM through the adoption of a written governance instrument (By-Laws) consistent with the Metre Convention (and the Annexed Regulations)
- To develop a long-term vision for the BIPM that will remain relevant and adequately address new metrological challenges.

A. Cypionka explained that these actions had been mandated by the discussions at the meeting of the CGPM and the Resolutions adopted. These actions will form substantial inputs to the draft resolutions presented to the 28th meeting of the CGPM (2026). Her presentation included timelines for many external actions including consultations, publications and presentations. The proposed timelines respected the need to report on progress to Member States and to make appropriate presentations at the 150th Anniversary of the signing of the Metre Convention on 20 May 2025.

The President thanked A. Cypionka and invited discussion of each of the actions.

### a. CIPM Strategy

Confirmation was sought on whether the stakeholder consultation will be within the metrology community or if a wider exercise will be carried out among a more diverse community to obtain the opinions of those who are not directly involved in metrology, on the future technological challenges. W. Louw said that there is limited time to carry out the consultation and there is already good contact with the outside communities through the NIMs and the Consultative Committees, which collaborate with many stakeholders. He added that work on the CIPM Strategy 2030+, the Young Metrologists’ Vision, and universal adherence needs to be finalized for presentation at the 150th anniversary on 20 May 2025.

It was asked whether the Young Metrologists' Vision will be an input to the CIPM Strategy 2030+ or if it is intended to stand alone. A. Cypionka said that the two projects will operate in parallel but there will be some convergence in the future. The output from the Young Metrologists' Vision project is expected to be a presentation, whereas the CIPM Strategy 2030+ will lead to a draft resolution. It is to be expected that the Young Metrologists' Vision will provide useful input for the CIPM strategy.

J. Olthoff said that one of the most important outputs of Resolution 1 of the 27th CGPM (2022) was to encourage the CIPM to develop a long-term vision for an international measurement system that will remain relevant and adequately address new metrological challenges. He noted that the international measurement system has the BIPM Headquarters and the CIPM at its core. He said that although the strategy for the future should include the RMOs and NMIs he had concerns that the timeline for the development of the "Vision/Mission Statement for the BIPM" indicated that the important discussions needed within the CIPM will not occur until June 2024. J. Olthoff said that the CIPM should discuss the future of the BIPM Headquarters and the role of the CIPM.

The Director said that the changes being proposed in the CIPM Strategy are for the long term and their impact will largely come after the next CGPM. The BIPM Headquarters has a work programme through to 2027 and the changes that may emerge from the development of the strategy will be for 2028 and beyond. He said that a mandate for any proposed changes should be sought from the 28th meeting of the CGPM in 2026. J. Olthoff recalled that there had already been a great deal of discussion by the previous CIPM about its strategy and this did not need to be repeated. This could free up time for discussions on the "Vision/Mission Statement for the BIPM".

G. Rietveld asked for clarification as to the future content of the CIPM Strategy 2030+. The original report included five elements, some of which, including the By-Laws and adherence to the Metre Convention, have now been split off from the document. He asked if the document is now focused on the "evolving needs for metrology". G. Rietveld added that he agreed with the earlier proposal to have a wide stakeholder consultation for the CIPM Strategy 2030+, with input from outside the metrology community. He said that there is a need to investigate how international cooperation will develop in the future with respect to the role of the BIPM and CIPM.

J. Ullrich agreed that the timelines in metrology are generally very long and suggested that a few topics could be presented to the 28th meeting of the CGPM (2026) so that a mandate could be granted to allow implementation in the following four years.

The Director said that the CIPM Strategy 2030+ must be complete by 2025 but a longer-term view is needed with a strategy that is more visionary and will remain relevant beyond the CGPM. For example, the CIPM Strategy published in 2022 did not contain much information on the impact of artificial intelligence on metrology, the challenges of providing metrology for new quantum technologies or the opportunities presented by "open metrology". Information on these and other new opportunities should be collated, reviewed by the CIPM, and presented to the CGPM. He added that the consultation exercise should be completed before the meeting of NMI Directors and State Representatives in October 2023.

The President suggested that a group should be convened before the June 2023 meeting of the CIPM to formulate the questions. He asked the members of the CIPM to discuss with their local RMO the possibility of adding the Strategy to their meeting agendas. A group was set up to work with A. Cypionka to develop the questionnaire; the other members were V. Coleman, W. Louw, J.-T. Janssen and G. Rietveld.

## **b. Universal adherence to the Metre Convention**

R. Guliyeva gave a brief history of the development of Membership, the associated Resolutions and the creation of Associate status. She referred to Resolution 6 of the 27th CGPM (2022) "On universal adherence to the Metre Convention". It was noted that since the adoption of Resolution 3 of the 21st CGPM (1999) "Associates of the Conférence Générale des Poids et Mesures" the number of Associates has grown from 48 to the current level of 64. R. Guliyeva recalled that Cuba and Sudan were excluded on 1 January 2022, although both states are negotiating to re-join, and that the Seychelles had withdrawn as an Associate. A total of 108 states participate in

BIPM activities; this includes Member States, Associates and those that participate via CARICOM. The 64 Member States account for 95 % of global GDP and 74 % of the world's population. The 36 Associates account for 3 % of GDP and 11 % of the population.

The CIPM noted that there are many relatively small countries around the world that cannot afford to belong to a regional metrology organization (RMO) and a strategy is needed to facilitate engagement with such countries. It was suggested that the RMOs should be empowered to foster good engagement with smaller countries via linkages with partner countries. V.G. Achanta recalled that the PTB had operated the Start Programme within APMP, which ended in 2022. The President commented that any proposal regarding future membership of the organization should consider the role of the RMOs. Most RMOs have a membership fee and this could be a barrier for small countries that wish to participate in the international metrology system, particularly if there is an additional fee to become a Member State or Associate. An alternative may be to find a way in which smaller countries can participate in the BIPM through an RMO. V. Coleman added that the cost of travelling to the BIPM Headquarters can be a barrier to participating in the work of the BIPM by smaller countries, whereas participating in an RMO may be cheaper as travel costs are reduced. The President speculated whether the CIPM should consider a third category of membership or if a way can be found to involve official members of an RMO in the work of the BIPM.

The Director said that the issue of universal adherence to the Metre Convention dates back to 1875 when the signatories to the Metre Convention considered that the Metric System, now known as the SI, would be a global measurement system and the benefits of a measurement system are greater when it is used by everybody. He added that the Metric System is thought to be used by everybody today, but there is no evidence to support this. The CIPM's early reports discussed the progress of the Metric System around the world and formed an important part of their work. He suggested that there is a need to stop considering the financial aspects of moving forward with universality. An alternative approach to boost adherence to the Metre Convention would be to review the membership models of international organizations such as the United Nations (UN), for which membership is universal. He noted that membership of the UN allows states to participate in the work of its other bodies such as the World Trade Organization (WTO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO). The UN fee system is arranged to suit all states, although the benefits and outcomes of engagement with the UN are very different to the BIPM. The review would look at how membership models for other organizations could be adapted to increase the number of states that adhere to the Metre Convention.

The President suggested that the CIPM may need to consider if the RMOs should have a governance role in the future. This is not currently possible because the RMOs have many members that do not adhere to the Metre Convention and the issue would require further discussions.

M.L. Rastello asked about the role of the European Union (EU) in terms of engagement with the BIPM. She commented that there are a number of laboratories operated by the EU which have CMCs and that the EU has an ad hoc associate status in the UN. The Director recalled that the CGPM has said that there shall be no further economies engaged in the associate status without its permission. He added that the BIPM engages with specific EU laboratories through EURAMET. If these laboratories choose to leave EURAMET or they are excluded for quality reasons, then they no longer engage with the BIPM.

R. Guliyeva returned to the issue of universal adherence, noting that there are 85 Member States of the United Nations (UN) that do not adhere to the Metre Convention. These states constitute 2 % of global GDP and 15 % of the population: they are users of the SI and therefore represent stakeholders. Of these 85 states, 71 have a UN scale of less than 0.02 %, which would qualify them as micro-CEEMS (Countries and Economies with Emerging Metrology Systems). Twenty-six of these states have a UN scale of less than 0.01 %. Fourteen of the 85 states have a UN scale of higher than 0.02 % and of these, six have a UN scale higher than 0.05 % (Algeria, Bahrain, Cuba, Dominican Republic, Nigeria and Venezuela).

R. Guliyeva said that the first step in boosting universal adherence to the Metre Convention, as mandated by Resolution 6 of the 27th CGPM (2022), should be a review of the membership packages of other international organizations. The current application of Article III of the Metre Convention will be examined. In addition, other

methods of adherence will be investigated, such as participation through the RMOs. Actions will be developed for presentation to the 28th meeting of the CGPM (2026).

The President thanked R. Guliyeva and said that if a strategy is developed to boost adherence through the RMOs, a method will be needed to consider those states that are not members of the RMOs. The Director said that a CIPM member is needed to work with A. Cypionka and R. Guliyeva to further develop the ideas for universal adherence; V. Coleman and W. Louw volunteered.

### **c. Young Metrologists 2050+ Vision**

The President invited C. Kuanbayev to present his plans for the Young Metrologists' 2050+ vision exercise.

C. Kuanbayev introduced the subject by reference to Resolution 1 of the 27th CGPM (2022) which encouraged the CIPM to develop a long-term vision for an international measurement system that will remain relevant and adequately address new metrological challenges. The CIPM had discussed how young metrologists could be given the opportunity to express their views and ideas on the future of metrology. He said that the BIPM proposes to work on this project in close association with the RMOs. The aim will be to complement the CIPM Strategy 2030+ with visionary ideas for future opportunities and challenges from young metrologists.

C. Kuanbayev said that he had been asked to coordinate the Young Metrologists 2050+ Vision project. The JCRB discussed the project at its meeting in March 2023 and each RMO has supplied the name of a contact who will work with him to define questions to be put to the young metrologists. The consultations will be carried out between June 2023 and June 2024 through a series of on line workshops and web-based conferences, along with a workshop at the BIPM Headquarters. The results will be presented at the 150th anniversary of the signing of the Metre Convention in May 2025.

The President said that the project should be ready for presentation to the meeting of State Representatives and NMI Directors in October 2024. He suggested that, some of the findings may be incorporated into the CIPM Strategy. It was asked if the CIPM will have a role in the activity or if it is being coordinated through the RMOs. C. Kuanbayev confirmed that the BIPM will coordinate the project with the RMOs. The CIPM may also include ideas from the Young Metrologists project as input for its CIPM Strategy 2030+.

Several CIPM members gave strong support to the idea of allowing the young metrologists to suggest their ideas without having to develop a formal separate strategy. S.-R. Park commented that established scientists may also have visionary ideas. C. Kuanbayev said that the young metrologists are free to discuss their ideas with other scientists. He reiterated that young metrologists will steer the process. G. Macdonald suggested that the young metrologists should be consulted about how they interact with each other and how they communicate and share ideas. C. Kuanbayev agreed.

### **d. By-Laws**

The President invited P. Richard to present his plans for the development of By-Laws.

P. Richard said that the development of By-Laws was discussed by the *ad hoc* Working Group of Member State Representatives and was mentioned at the CGPM in 2022. P. Richard stressed that it is necessary to develop the By-Laws ready for the 28th meeting of the CGPM in 2026 and that the work should start immediately.

He recalled that he had chaired Sub-Group 5 of the CIPM Sub-Committee on Strategy which had prepared the Rules of Procedure for the CIPM. A preliminary meeting of SG5, held in June 2022, had studied a first draft for the By-Laws prepared by Peter Quayle, an international lawyer specializing in the law, governance, and jurisdictional immunities of international organizations. He summarized the feedback that SG5 received. He noted that the Metre Convention and its Annexed Regulations do not describe certain organizational elements precisely that often trigger difficult discussions. The drafting of By-Laws will provide a unique and appropriate basis to clarify these matters in a binding manner.



He said that the main issues in the development of the By-Laws should be clarification of: the name of the organs of the organization; their roles, responsibilities and functions. He added that this work started with Decision CIPM/111-5 (2022) to use the term “Headquarters” to refer to the scientific and technical staff and facilities at the Pavillon de Breteuil. The By-Laws will provide guidance on roles and responsibilities. They will include general elements to clarify the purpose of the organization and the role of the CIPM. They may lead to a revision of the CIPM Rules of Procedure. He said that in addition to the By-Laws, he will produce a second document with detailed notes to explain why certain elements were included. He added that practical rules are required for the conduct of meetings of the General Conference along with Rules of Procedure. These would cover technical aspects such as voting, the election of the CIPM and the preparation for the Conference. During the elaboration of the documents it will be necessary to clarify which element will belong to the Rules of Procedure for the General Conference or the By-Laws.

He said that Document [CIPM/2023-I-B4c.1](#) includes draft Terms of Reference for a new CIPM Sub Committee on Governance, which will take over the work of SG5. He said that it includes a timeline for development of the By-Laws to ensure that they are ready for approval at the 28th meeting of the CGPM in 2026.

The Director observed that Document [CIPM/2023-I-B4c.1](#) said that the BIPM staff, including him, had a potential conflict of interest on this topic. He said that this was not the case. P. Richard agreed to amend the document.

There was a brief discussion, during which the CIPM agreed with the proposals made by P. Richard and adopted the following decision.

**Decision CIPM/112-9 (2023)** The CIPM decided to establish a CIPM Sub-Committee on Governance to execute the mandate given by the CGPM at its 27th meeting (2022) to modernize the organization, and appointed Dr P. Richard as the Chair. Dr V.G. Achanta, Dr D. del Campo Maldonado, Dr W. Louw, Ms G. Macdonald and Dr T. Usuda agreed to be members. The terms of reference of the CIPM Sub-Committee on Governance were approved.

#### e. Sectorial Task Groups

G. Rietveld presented the report [CIPM/2023-I-B4gh.1](#) “Suggestion for implementation of CIPM sectorial task groups”. He summarized the background to the CIPM’s evaluation of the evolving needs of metrology, which identified five “Metrology Grand Challenges”: climate change and environment; health and life sciences; food safety; energy; and advanced manufacturing. In addition to the five “sectoral” challenges, which impact “why” measurements are needed, the CIPM also identified two “cross-cutting challenges” which reflect on the changes and challenges related to “how” measurements are made.

He said that the CIPM is facing a challenge with how to make an impact in these horizontal themes. The report on the actions taken by the CIPM towards a “CIPM Strategy 2030+” given to the 27th meeting of the CGPM included annexes on the five elements of the strategy. He said that a more extensive document is available as an annex that gives longer descriptions of the challenges. The CCs have in turn used this wider background information to update their strategies. The intention is that the information, for example on climate change, can be fed into the proposed horizontal forums. G. Rietveld and A. Henson had drafted a second annex, which included suggestions on ways to implement the sectorial task groups or forums. These horizontal forums should be linked to the CCs and the RMOs, which may already operate such forums, as well as international stakeholders. The aim of the forums is to coordinate new possibilities from metrology to have impact on global cross-cutting measurement challenges. A main activity will be to facilitate dialogue by organizing workshops. The output from the dialogue is expected to be an overview of the challenges within the field of the forum. It is not the role of the forums to address the challenges; this will be achieved through a collaborative effort between the CCs, RMOs, NMIs and other stakeholders, which will be coordinated by the CIPM. The CIPM will review the scope of the forums every four years.

G. Rietveld proposed two options for membership of the forums. The first is a “lightweight” option (Focused participation) with 5 to 10 members, including a CIPM member. This team would steer the agenda and *ad hoc* members would be drafted into the group for specific tasks. The second option (Wider participation) is for a CC-type forum with wide participation that includes other stakeholders. This option would include a core team to drive the agenda. Both options would include strong links with the CCs and a CIPM contact person. The added value to the CIPM from creating these forums will be to gather together experts from NMIs, DIs and international stakeholders in particular fields; to identify long-term metrology needs in these fields; to stimulate collaboration and to steer the role of the BIPM to meet newly identified needs.

G. Rietveld said that there are several outstanding practical issues with setting up sectorial task groups, specifically whether to call them task groups or forums; how to use the existing text that the CIPM developed during its evaluation of the evolving needs of metrology; and how to implement them. He suggested that the CIPM could discuss these issues before going through the practicalities of setting up the specific forums on climate change and environment, and digitalization. The President thanked G. Rietveld and invited questions.

R. Wielgosz asked if the CIPM was planning to launch a sectorial task group in the food area in the current work programme as this is one of the five “sectoral” challenges. G. Rietveld replied that this was not the intention. The CIPM had identified the five horizontal themes, including food safety, and had decided to focus initially on two areas: climate change and the digital transformation to assess how they progress. However, there is an open question as to when the CIPM should initiate additional horizontal forums. R. Wielgosz reminded the CIPM that the theme for World Metrology Day in 2023 is food and he questioned what sort of message is conveyed if this is not followed up with action via a sectorial group. The CIPM noted that the other challenges are important and additional forums should not be delayed for too long or there is a risk that their work could become irrelevant. G. Rietveld said that the CIPM should not wait for another four years and it should find a compromise solution. He added that the CIPM needs to decide how to make an effective contribution in the sectoral challenges as there are already activities in the regions.

J. Olthoff commented that the CIPM has identified five sectorial challenges but there are at least four more that it could consider. If the CIPM decides to progress solely with the five challenges, it is effectively setting its future. He added that there is however a limit to the amount of work that the CIPM can undertake. The RMOs are already operating horizontal groups and he suggested that this could be used as a reason for the CIPM not to pursue certain topics.

J. Ullrich suggested that certain aspects of “new metrology” such as those related to sensor networks and artificial intelligence (AI) should be addressed in the sectorial task group on the digital transformation. V. Coleman suggested that the CIPM should focus on the overarching sectorial challenges such as climate change where there is existing global connectivity between stakeholders and where the CIPM can engage with international stakeholders such as the World Meteorological Organization (WMO). It may be the case that the RMOs are better placed to deal with some challenges, particularly where there are existing activities.

The Director reminded the CIPM that many of the topics included in the five sectoral challenges are already covered by existing structures and may not require specific task groups. For example, the CCQM already covers food safety and the CIPM could be consulted for guidance if required. Climate change is a topic that cuts across three CCs and the digital transformation affects all the CCs. He proposed that the CIPM should consider the minimum actions required to address the needs to meet the five challenges and not to cut across the existing successful structures. It was stressed that the work of the sectorial task groups will require significant input from the CIPM. The CIPM should give careful consideration to whether the work of each is unique and justifies the resources that will be required. Experience in the RMOs indicates that after horizontal groups have been set up, the workload is a burden on the people involved and there is an ongoing need to maintain and deliver the work. It can also be difficult to find people who are prepared to get involved.

The President summarized the discussion and reminded the CIPM that it had already adopted Decision CIPM/110-10 (2021) to establish a Sectorial Task Group on Climate Change and Environment. The CIPM had also

expressed support for the establishment of a task group on digital transformation. He added that participants at the 27th CGPM had expressed support for the findings in the Report on the actions taken by the CIPM towards a “CIPM Strategy 2030+” and the five sectoral challenges that it had identified. The CIPM will need to define how it will address the challenges and the benefits expected from the work. The Director confirmed that support for the two proposed sectorial task groups is available in the budget and is included in the Work Programme 2024-2027. J.-T. Janssen suggested quantum technology as a potential topic for a further horizontal forum. The President suggested that J.-T. Janssen should develop a proposal for consideration at the June 2023 meeting of the CIPM.

The President initiated a discussion on whether the term “Task Group” or “Forum” should be used for the groups that will undertake the work. There was consensus that “Task Group” is the preferred option.

#### **f. Sectorial Task Group on Climate Change and the Environment**

D. del Campo Maldonado gave a presentation on the proposed Sectorial Task Group on Climate Change and the Environment (STG-CENV) that she had developed with Y. Duan, J.-T. Janssen and R. Wielgosz. It follows the mandate from Resolution 1 of the 27th CGPM (2022), which encouraged the CIPM *to establish interdisciplinary (“horizontal”) groups that will address these new challenges and will be complementary to the existing quantity-based (“vertical”) structure of its Consultative Committees* and the recommendations of the BIPM-WMO Metrology for Climate Action Workshop to establish joint working groups to deal with specific issues. The workshop was held on 26-30 September 2022 and resulted in 100 recommendations.

The objective of the proposed Sectorial Task Group is to provide a global focal point for metrology activities related to climate change and environment by: advising the CIPM on opportunities and unmet requirements for international metrology activities in the field of climate change and environment, and the potential to address these through activities within the BIPM, the BIPM Headquarters’ work programme and with concerted efforts with other International Organizations; liaising with CCs and RMO forums that are active in the field of climate change and environment; liaising with International Organizations with Climate Change and the Environment programmes that are dependent on metrology; providing input to CCs to help shape their strategy and activities, including suggestions for international comparisons required to promote comparability of measurement values in the field of climate change and environment; documenting and monitoring internationally accepted metrology challenges in the field of climate change and environment and approaches to address these to support NMIs in articulating activity and resource needs to governments, with particular attention for countries with developing economies; and encouraging collaboration between CCs, RMOs, NMIs and stakeholders to address these challenges, including the transfer of relevant metrology and good practices pioneered by developed economies to developing economies.

D. del Campo Maldonado gave an overview of the proposed structure of the STG-CENV, noting that it will include a core coordinating group of ten members. She presented the proposed members of the core group. It will hold an annual or biennial plenary meeting that will be open to all NMIs, DIs and stakeholders. She gave an overview of the tasks planned for it during 2023-2026.

There will be opportunities for the STG-CENV to promote metrology at the Conference of the Parties of the UNFCCC (COP28) at which the BIPM has formal observer status.

D. del Campo Maldonado completed her presentation by listing the CC Task Groups that are already active in climate change and the environment and gave examples of international and national initiatives the STG-CENV can link to, for example the US Federal Strategy to advance an integrated US GHG Monitoring and information system. She invited questions and comments.

V.G. Achanta suggested that the STG-CENV should include a sub-group for developing economies to improve their representation, particularly as the challenges they are facing in relation to climate change may be different to those of developed economies. The Director said that the BIPM observership at the COP opens the door for NMIs to provide input for COP28. He added that it is not the responsibility of the BIPM Headquarters alone to

develop such input; the STG-CENV is the ideal vehicle to bring together and create the input. This is a demanding task as the COP meets annually and its focus changes regularly. The deadlines for submitting input are June of each year, so there will be a considerable amount of work required to submit a paper by June 2023 in order for it to be submitted at COP28. It was stressed that the BIPM's observership of the COP is unique and very important to the metrology community as it is something that the NMIs and RMOs cannot achieve alone.

The CIPM appreciated that the STG-CENV is playing a role that adds value to the topic and that organizations such as the WMO have welcomed its creation. The key strategic thinking outlined in the presentation is what the CIPM envisaged when it started to address the evolving needs in metrology. R. Wielgosz noted that the STG-CENV will provide a means to coordinate the actions from the BIPM-WMO Metrology for Climate Action Workshop and this coordination role has been well received by the NMI community.

The CIPM adopted the following decision.

**Decision CIPM/112-11 (2023)** Following Decision CIPM/110-10 (2021) to start the Sectorial Task Group on Climate Change and Environment (STG-CENV), the CIPM approved the structure, terms of reference, membership and work plan.

#### g. Proposal for a Forum on Metrology and Quality Infrastructure in the Digital World

J. Ullrich briefly reminded the CIPM on the achievements of the CIPM Task Group on the SI Digital Framework (TG-DIG) and its Expert Group and suggested a way forward to establish the Forum on Metrology and Quality Infrastructure in the Digital World (See documents [CIPM/2023-I-B4h.1](#) *CIPM Vision, Transforming the International System of Units for a Digital World*, [CIPM/2023-I-B4h.2](#) *Draft Decisions for the 112th Meeting of the CIPM concerning the TG digital SI and the Forum on Metrology and Quality Infrastructure in the Digital World*, [CIPM/2023-I-B4h.3](#) *Horizontal Forum on Metrology and Quality Infrastructure in the Digital World*, and [CIPM/2023-I-B4h.4](#) *Roadmap towards the Forum MQIDW*).

He recalled the milestones that have been reached so far: The TG DIG was established following Decision CIPM/108 28 (2019) together with the Expert Group both developing of the Grand Vision “*Transforming the International System of Units for a Digital World*”. Based on the five levels of digitalization (following an ISO/IEC whitepaper) from digital documents through to machine-controllable content he emphasized that from level 3, all digital formats will require interoperable unit and quantity representations. He gave an update on the Grand Vision, noting that the aim of the CIPM's digital initiative is to establish a framework that meets FAIR principles (whilst respecting business and privacy constraints) and allows all aspects of the international measurement system – measurement values, uncertainties, metrological traceability and provenance – to be accessed and interpreted digitally, enabling machine-to-machine communication and analysis. Metrological practice and the SI have already been established as key tools for ensuring interoperability and reusability of measurement data.

He then summarized the Grand Vision by saying that the SI Digital Framework consists of three layers:

1. The SI core with the SI defining constants, the SI Brochure and the *Mises en pratique*, defined by the CIPM and implemented by the BIPM Headquarters.
2. Metrological data services and tools, like the VIM, GUM, the KCDB or the CMCs provided by NMIs and related organizations together with the BIPM Headquarters.
3. Applications developed and deployed in the broader metrology community and in research disciplines that rely on the SI.

This was followed by recalling the International Workshop on “The International System of Units in FAIR Digital Data”, as well as the Joint Statement of Intent, now signed by ten International Organizations of the International Quality Infrastructure. This led to Resolution 2 *On the global digital transformation and the International System of Units*, that was passed by the CGPM at its 27th Meeting (2022). Here the CGPM

“welcomes the establishment of a flexible and inclusive governance structure supporting the development and implementation of that transformation.”

Based on Resolution 2, the CIPM Vision “*Transforming the International System of Units for a Digital World*” was updated by the EG and TG-DIG and J. Ullrich explained the changes in detail.

He then put forward the mission and structure for a Forum on Metrology and Quality Infrastructure in the Digital World (MQIDW) as proposed by the TG-DIG, following the recommendation of the CGPM to establish “a flexible and inclusive governance structure” and noting that the CIPM has not yet given formal approval for it. He also presented a roadmap towards the establishment of the Forum.

J. Ullrich then described the SI Reference Point (SIRP). He said that it will be the authoritative digital reference point for the SI. It forms an essential part of the Grand Vision, the SI Digital Framework (as outlined in Resolution 2 of the 27th CGPM), and the Joint Statement of Intent on the digital transformation in the international scientific and quality infrastructure. In addition, the SIRP will underpin the SI in the digital world by making metrology data interoperable and then machine actionable. The SIRP will provide: an anchor of trust for metrology and the Quality Infrastructure in the digital world; guidance for the metrology community; and will be the basis for mapping between existing unit formats.

The President thanked J. Ullrich and invited questions.

H. Laiz noted that the CIPM Forum to be established has one activity that is different to the other proposed STG, namely harmonizing internal procedures within the metrology community, for example the SI reference point and digital calibration certificates that will require broad discussion. V.G. Achanta said that the CIPM will need to send a message to the NMIs and RMOs at its June 2023 meeting that it is making progress with the digital transformation and the SI digital framework, otherwise there is a risk that the accreditation bodies will overtake the CIPM’s work, as they are following their own timetable. J. Ullrich replied that this is why the Task Group proposes to hold meetings with the CCs, NMIs and RMOs in May 2023 to provide an update on progress. He stressed that work is progressing rapidly within the TG and acknowledged the need for good communication and transparency.

The President agreed that the CIPM Task Group on the SI Digital Framework has already undertaken much work and asked J. Ullrich what the CIPM needs to do to allow it to proceed. J. Ullrich said the CIPM should give its permission to establish a “horizontal” forum and give approval to invite the CCs, RMOs and NMIs to participate. He stressed that from the outset the Task Group has worked with all stakeholders and the expert group is very inclusive. He added that the two current groups have grown to the extent that a new structure is required to provide a forum to shape the direction of the topic, which will also involve the NMIs, RMOs and CCs.

G. Macdonald said that the CIPM needs to convey the “uniqueness” of the proposed horizontal forum and suggested the unique SI Reference Point as a topic that the forum can develop to ensure that it is effective and accessible. The CIPM could then communicate this message to the stakeholders so that they understand how and why they can access it. J. Ullrich replied that the goal is to become the anchor of trust for the international quality infrastructure. This was a core request from the quality infrastructure stakeholders at the first international workshop organized by the Task Group. There are about 70 000 calibration laboratories that are traceable to the SI and which require this anchor of trust. In addition, NMIs that have legal obligations require assurance that digital signatures and calibrations are correct, which is a task that involves the OIML, highlighting a need for collaboration to ensure that the work is progressed. The work of the proposed horizontal forum can ensure that metrology remains an important part of the global quality infrastructure, particularly as the areas become more digitalized. G. Macdonald added that the CIPM needs to define its role relative to the NMIs to ensure that the work progresses in a harmonized way. The work in the NMIs and the legal metrology institutes is different to that of the CIPM, which should assume a coordination role and provide an accessible reference point produced by the BIPM Headquarters.

The President added that the CIPM should clarify exactly what is meant by an “anchor of trust”. For example is it to act as the anchor of trust to digitalization for other organizations. The Director said that there are two types of tasks that are under way. The first is taking the BIPM’s products, such as the SI Brochure and the KCDB into the digital realm: this is exclusively the task of the BIPM. The second, and much bigger discussion, is who is responsible for coordinating the work and agreements on topics such as DCCs and conformity assessment of smart machines. The latter is not an area in which the CIPM has had much involvement. He suggested that there may be some merit in a two-speed process. There is a need to progress rapidly with digitalizing the BIPM’s services but the wider discussion may require longer.

J. Olthoff suggested that the CIPM could assist with convening members of the international metrology community to help coordinate the work. For example NIST and PTB could collaborate to develop a common standard for DCCs as there is no formal organization of NMIs. He added that the CIPM should consider the subject of measurements in the virtual world. NIST has received money from the US Congress to develop ways to measure the trustworthiness of AI systems. The teams that develop AI systems do not necessarily consider measurements and there is an opportunity for the metrology community to bring the good principles of measurements to this sector. He suggested that by 2050 this subject has the potential to become enormous and that the future vision may need to consider if a dedicated CC is required to deal with digital matters. These ideas need serious consideration and the work needs to start now.

There was a detailed discussion on the structure of the proposed Sectorial Task Group including whether it should mirror that proposed for the STG-CENV, which is itself similar to the model used for the JCTLM. (The JCTLM has an executive group, a stakeholders’ meeting and working groups to deliver the work. This allows stakeholders to feed into the committee at the top level. This structure allows task groups to be set up very quickly that can deliver work and consult with the wider groups).

V.G. Achanta reiterated that whatever structure the CIPM chooses, action is needed now otherwise there is a danger that the CIPM will lose its leadership role in the digital transformation. J. Ullrich recalled that the CIPM Task Group on the SI Digital Framework had already proposed a draft mission and structure. In summary, it is important that the CIPM should have a forum in place as quickly as possible that allows it to engage with its stakeholders on the digital transformation in a formal manner. The CIPM should endorse the existence of the forum immediately; it will be able to develop its structure further after it has been set up.

J. Ullrich presented the document [CIPM/2023-I-B4h.2](#) *Draft Decisions for the 112th Meeting of the CIPM concerning the TG digital SI and the Forum on Metrology and Quality Infrastructure in the Digital World*. Following a further brief discussion the CIPM approved the establishment of a forum on metrology in the digital world and noted the draft mission and structure proposed by the CIPM Task Group on the SI Digital Framework. It requested the Task Group to propose a name for the forum. The CIPM adopted the following decision.

**Decision CIPM/112-12 (2023)** The CIPM approved the establishment of a forum on metrology in the digital world and noted the draft mission and structure proposed by the CIPM Task Group on the SI Digital Framework. It requested the Task Group to propose a name for the forum.

The CIPM adopted the updated Grand Vision for the SI Digital Framework.

The CIPM endorsed the swift further development and implementation of the SI Reference Point (SIRP, working title) by the BIPM Headquarters in close coordination with the Task Group on the SI Digital Framework and its Expert Group.

The CIPM endorsed the SIRP to become the unit representation system for the digital products of the BIPM, including the SI Brochure, the *mises en pratique*, the KCDB and the JCTLM database.

The CIPM agreed that due to synergies between the CIPM Working Group on Data and the CIPM Task Group on the SI Digital Framework, the former group should be closed and its members will be merged into the latter.

**Decision CIPM/112-13 (2023)** Considering the synergies between the CIPM Working Group on Data and the CIPM Task Group on the SI Digital Framework, the CIPM decided to close the CIPM Working Group on Data and to merge its members into the CIPM Task Group.

## 12. REPORTS FROM THE CONSULTATIVE COMMITTEES AND JOINT COMMITTEES

### Consultative Committee for Electricity and Magnetism (CCEM)

G. Rietveld presented his report ([CIPM/2023-I-B6a.1](#)) on the work of the CCEM. He said that the CCEM had held its 33rd meeting on 8-9 March 2023; highlights of the meeting had included a report on progress of liaison activities with the Consultative Committee for Mass and Related Quantities (CCM) and Consultative Committee for Ionizing Radiation (CCRI) as well as activities carried out by the BIPM and NMIs on digitalization.

He noted that the BIPM work programme in Physical Metrology is greatly appreciated by the NMI community. The on-site JVS and QHE activities provide comparison values and also important knowledge transfer. This is an important service to many Member States. The BIPM work programme includes new developments such as expanding the world of quantum not only to DC quantities but also to AC voltage. The work programme includes the starting of comparisons of AC quantum voltage standards and the CCEM members appreciated this move. This move into AC quantum voltage standards highlights a general role for the BIPM in the quantum world.

Scientific presentations at the CCEM meeting had included graphene as a resistance standard and the Josephson Arbitrary Waveform Synthesizer (JAWS) as an RF power standard. The CCEM decided to create a new Task Group on the application of graphene as a quantum resistance standard that will update the existing guidelines which only address GaAs devices.

G. Rietveld reported that NIS (Egypt) applied to become a member of the CCEM and NSE (Ukraine) applied to become a CCEM observer. He furthermore informed the CIPM that the CCEM had appointed two new Working Group chairs: Alexander Matlejoane (NMISA) for the CCEM Working Group on RMO Coordination (CCEM-WGRMO) and Paul Hale (NIST) for the CCEM Working Group on Radiofrequency Quantities (CCEM-GT-RF).

G. Rietveld said that the CCEM had reviewed its strategy during the meeting. He noted that, as part of its strategy, it will continue with its programme of webinars and workshops. The subject for the next workshop in 2025 will be “Power and energy metrology”. To strengthen this activity, the CCEM is planning to start a Task Group on evaluating and strengthening stakeholder interactions. He concluded his update to the CIPM by noting that 2027 will mark the centenary of the creation of the Consultative Committee for Electricity (CCE).

The CIPM adopted the following decision.

**Decision CIPM/112-10 (2023)** The CIPM accepted the following changes to the membership and observership of the Consultative Committees:

CCEM

NIS (Egypt) as a member

NSE “Ukrmetrteststandard” (Ukraine) as an observer

The President thanked G. Rietveld and invited questions.

J. Ullrich said that in the future “everything will be electric”. He asked if this trend represents specific challenges for metrology. G. Rietveld replied that this indeed is the case and that, for example, there are two new elements related specifically to electric vehicles. High-power charging uses DC power, whereas until recently only few NMI activities had DC power references. There are now new CMC categories related to DC power and the CCEM received two presentations on this subject at its 2019 meeting. The other element is grid monitoring

devices, which generate a lot of data. The challenges include how to calibrate the devices, how to guarantee the reliability of the data, as well as how to evaluate the reliability of applications based on this data. J. Ullrich said that in Germany these critical grids use sensor networks, which have to be certified, and they are likely to be connected using AI. G. Rietveld replied that utilities tend to be very “traditional” and are slow at adopting new technologies, so whereas AI surely is relevant for electricity grids, he does not foresee adaptation of AI in critical grid functions in the near future.

H. Laiz asked for an update on the development of the calculable capacitor at the BIPM. G. Rietveld said that there are few operational calculable capacitors around the world and this development thus remains an important part of the BIPM work programme. The role of the calculable capacitors has changed in the revised SI, but they remain an important method of adding confidence in the traceability of AC impedance. G. Rietveld was pleased to note the good progress that the BIPM has made in this project in the recent years.

G. Rietveld was asked if the global shortage of liquid helium has affected the work in the electricity laboratories particularly in the use of quantum standards. He replied that there is a global effort to move away from the use of liquid helium, for example by the use of cryocoolers that do not require liquid helium. M. Stock added that the BIPM is not developing transportable standards with cryocoolers because they are too heavy, however in the long term, many NMIs will have their own cryocoolers. The BIPM has its own cryocooler that it uses for the JVS associated with the Kibble balance. The BIPM is considering the installation of a small helium liquefier, which could produce 30 litres of helium per day.

### **Consultative Committee for Time and Frequency (CCTF)**

N. Dimarcq presented his report on the work of the CCTF ([CIPM/2023-I-B6b.1](#)). He recalled that the CCTF had held its 23rd meeting from 29 June to 1 July 2022. The meeting reviewed progress on the four “hot topics” identified by the CCTF: the roadmap towards the redefinition of the second; leap seconds in Coordinated Universal Time (UTC) and building a consensus for a continuous timescale; promotion of the mutual benefit of UTC and Global Navigation Satellite System (GNSS), including traceability of GNSS signals to UTC; and sharing of resources to improve international timekeeping (See the [CCTF President’s Report to the 27th CGPM](#) for details of the hot topics).

He said that communication and education on the four hot topics were considered to be important and papers on the subjects had been published in a Focus issue of *Metrologia* [Focus on Challenges in Time and Frequency Metrology](#). In addition to the *Metrologia* papers, the CCTF will publish a series of white papers on its web pages.

N. Dimarcq presented Resolution 5 of the 27th CGPM (2022) *On the future redefinition of the second* and the CCTF Roadmap towards the redefinition of the SI second. He proposed that the 28th CGPM (2026) would be able to validate a roadmap towards a redefinition of the second in 2030 if there was a consensus on: the definition option (single transition/ensemble of transitions), which radiation(s) to select, and if there is a clear, achievable and verifiable roadmap to satisfy the mandatory criteria by 2029. He gave the CIPM an update on the current position with the elements on the roadmap.

N. Dimarcq went on to present Resolution 4 of the 27th CGPM (2022) *On the use and future development of UTC*. He said that the process towards the future development of UTC will take place in two steps. The 27th CGPM (2022) decided to enlarge the tolerance in [UT1 – UTC] and approved the implementation date of “by or before 2035”. The 28th CGPM (2026) will be asked to approve the new tolerance (for example 1 minute reached after about 1 century or 1 hour reached after about 5000 years) or even an unlimited value (= the difference BIPM1 – UTC will continue to grow with no limit). It will also be asked to approve the periodic review process, which must take into account future discoveries and improvements in understanding of the Earth’s rotation. He said that 2035 is considered to be the best trade-off for the implementation date between the needs of updating systems and to address legal issues. The important issues that need to be taken into consideration are that discontinuities in UTC and different *ad hoc* solutions currently being implemented cause



confusion and put at risk the resilience of critical national infrastructures; one of the GNSS time scales may be used *de facto* as the international standard; and the current acceleration in the Earth's rotation may lead to a possible negative leap seconds being required in the next decade. He recalled that almost all Member States supported the proposals in Resolution 4, with only the Russian Federation voting against.

N. Dimarcq said that it is vital that the BIPM and the International Telecommunication Union (ITU) continue to work together to ensure a continuous UTC. The ITU-R and BIPM are producing an ITU News special issue on *Future use and applications of the Coordinated Universal Time* for publication in March 2023. The ITU-World Radio Conference Preparatory Meeting is scheduled for the end of March 2023 and the ITU World Radiocommunication Conference 2023 (WRC-23) will be held in Dubai from 20 November to 15 December 2023.

He said that the next meeting of the CCTF will be important as it will discuss topics in preparation for the 28th CGPM. He concluded with a brief summary of the CCTF's progress with the promotion of the mutual benefit of UTC and GNSS, and sharing resources to improve international timekeeping.

The President thanked N. Dimarcq and opened the meeting for questions.

J. Olthoff said that the timeline for the transition to continuous UTC is longer than necessary, especially considering that the second may be redefined before then. This is a particular cause for concern following the discussions on engaging with stakeholders and the risk of UTC becoming irrelevant. He recalled that stakeholders are desperate for leap seconds to be eliminated but this is likely to take another 12 years. There appears to be no technical reasons associated with the SI that a continuous UTC cannot be adopted today. He suggested that the CIPM should be pushing to make the move as soon as possible. He proposed that the CIPM could pass a decision mandating the CCTF to produce a plan to present to the 28th CGPM (2026) informing it that the leap second would be eliminated in 2030. This would allow the global timing community to start preparing for the change.

N. Dimarcq agreed that the elimination of the leap second should proceed as quickly as possible but cautioned that there are technical issues that must be taken into consideration. J. Olthoff replied that Resolution 4 (2022) mentions that implementation is planned by, or before, 2035 so the CIPM can interpret this as meaning that 2030 is possible. He suggested that unless the CCTF can provide a valid reason as to why 2030 is not possible, this should be the target date.

J. Ullrich recalled that the Russian Federation had voted against Resolution 4 (2022) and had suggested 2040 as the target date due to technical reasons related to its GLONASS system. N. Dimarcq confirmed that this was the case.

The Director agreed with J. Olthoff and suggested that the CIPM should take a leadership position. He recalled that the CIPM has carried out a considerable amount of work over the last decade to get the CGPM to agree that the BIPM is the "owner" of the leap second definition. The CIPM now has the mandate to take a leadership role, however, it should delay any decision until after the WRC-23 to see what outcomes result from the meeting. Discussions are under way with the BIPM to prepare a positive outcome at the meeting. The CIPM will be able to speak on behalf of the entire world of science and technology, after the WRC-23, to advocate the move to a continuous UTC.

The CIPM agreed the following decision.

**Decision CIPM/112-14 (2023)** The CIPM noted that the trend projected by the International Earth Rotation and Reference Systems Service (IERS) would lead to a negative leap second for the first time before 2035 and asked the CCTF to identify the best way forward and the necessary steps to allow a timely application of Resolution 4 adopted by the CGPM at its 27th meeting (2022) working together with the International Telecommunication Union (ITU).

### **Consultative Committee for Amount of Substance: Metrology in Chemistry and Biology (CCQM)**

S.-R. Park said that he had conveyed the CIPM's encouragement to the CCQM to meet global challenges, in particular to the CCQM Task Group on Infectious Disease Diagnostics and Metrology for Pandemic Preparedness (CCQM-TG-PANDEMIC), which had worked on the preparation of the *Roadmap to Metrology Readiness for Infectious Disease Pandemic Response*. He said that the CCQM is experiencing some difficulties in its comparison programme because some governments have banned their NMIs and DIs from working with the Russian Federation.

R. Wielgosz explained the situation in detail. Within the CCQM, comparisons are usually organized by a laboratory preparing a set of samples, which are sent to the participating laboratories; unlike other CCs there is no artefact. It is not possible to produce a second set of samples. In the current rules, when a pilot laboratory organizes a comparison, it invites all laboratories to participate, which is consistent with CIPM guidance. In some cases, an NMI may choose to refuse to participate if another laboratory participates. The simplest solution is to tell such laboratories not to participate. However, the rules allow the CCQM to run a supplementary comparison, which gives a laboratory the opportunity to link to a comparison. These supplementary comparisons are usually run after a comparison using the same samples. In the current situation, the CCQM is offering supplementary comparisons to any countries that cannot participate for political reasons and these will run in parallel using the same samples. The current rules, circulated by the CIPM in 2021, allow this course of action. This is not a question of relegation, it is simply an alternative method of participation that is within the rules.

The President thanked R. Wielgosz and suggested that the CIPM may need to revisit and discuss the guidance on dealing with the current geopolitical situation.

### **Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB)**

J. Olthoff reported that he had attended the 45th meeting of the JCRB, held on 16-17 March 2023. The meeting included a report on the review of the BIPM quality system, which found excellent customer satisfaction. The RMOs reported on their quality systems; there were no major issues, so the global quality system remains strong. The previous meeting of the JCRB had recommended the use of a standard format for reporting; half of the RMOs had started using the new format and considered that it was a useful way to improve efficiency.

The JCRB had received a report on the KCDB, which now includes 26 000 CMCs. The newest RMO is GULFMET which is increasing its capabilities and has shown a modest rise in CMCs.

The JCRB passed one recommendation, one action and one resolution. The recommendation and action were as follows:

Recommendation JCRB/46-1 (2023) Noting the availability in the KCDB of a unique and persistent identifier for each CMC (and each version of a CMC), the JCRB recommends use of these CMC identifiers by the participating NMIs/DIs (for example in their quality documentation) and asks the BIPM Headquarters to make available appropriate training material to encourage this.

Action JCRB/46-1 (2023) The JCRB asks each RMO to nominate (one or two) RMO coordinators for the "Young metrologists' 2050+ vision" foresighting exercise and to send their names to C. Kuanbayev by 31 March 2023.

The President thanked J. Olthoff and asked if there were any questions. J. Olthoff was asked if the temporary measure to allow remote quality system reviews in the RMOs, that was introduced during the COVID-19 pandemic, is now over and if the situation is back to as it was before the pandemic. The Director confirmed that this temporary measure is now over. The President added that although this measure is over, some of the good practices introduced during the pandemic, which resulted in reduced costs to the NMIs, such as some forms of remote review, and hybrid online meetings, should continue. He said that the JCRB is considering holding only one meeting per year.

The CIPM decided to reappoint J. Olthoff as its representative to the JCRB.

**Decision CIPM/112-15 (2023)** The CIPM reappointed Dr J. Olthoff to represent the CIPM at the Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB).

### **Joint Committee for Traceability in Laboratory Medicine (JCTLM)**

R. Wielgosz presented an overview of the work of the JCTLM. He recalled that a new version of the JCTLM database went live in October 2022. This was the first time the database software had been updated since 2006. The BIPM budget covered the cost up to 130 000 euros. Since there was a shortfall of 70 000 euros, it was not possible to add all of the desired functionality to the new database and the submission and review process has not been fully automated. The International Federation of Clinical Chemistry and Laboratory Medicine (IFCC) made a call to its corporate members to raise funds to cover the 70 000 euros shortfall; four companies came forward with funding but a shortfall of 50 000 euros remains. He added that it is important to meet this shortfall as the BIPM Headquarters has limited resources and the extra automation would ease the pressure on these resources as well as allowing the JCTLM to offer a more efficient service to its users and stakeholders.

R. Wielgosz reminded the CIPM that the collaboration between the JCTLM and the IFCC has continued to develop. The IFCC has donated roughly 50 000 euros each year to maintain the database since 2006. The BIPM uses the money to cover 50 % of the staff cost for the JCTLM secretariat. The JCTLM Executive Committee has set up a Strategy Task Group, which will develop a strategy for the role, outputs, operation and funding of the JCTLM for the next ten years by the end of 2023 and this will be made available for review by the CIPM.

S.-R. Park had proposed during the last meeting of the JCTLM Executive Committee that the CIPM could make a call for financial support from among the NMIs that are active participants in the JCTLM to fund the database extension. This would be similar to the call made by the IFCC to its corporate members. R. Wielgosz added that the question if the JCTLM should continue to host workshops in the same way as CC workshops had also been raised within the JCTLM Executive, noting that a joint committee is different to a CC and it may be appropriate to charge a registration fee. A discussion on whether a membership fees should be introduced for the JCTLM was also on-going within the JCTLM Executive Committee.

R. Wielgosz completed his presentation by noting that because T. Liew is no longer a member of the CIPM, it has the opportunity to appoint a new representative to the JCTLM Executive Committee. S.-R. Park said that he is a member of the Executive Committee and asked if any other CIPM member would be willing to join, particularly with experience of funding matters. W. Louw agreed to join.

The President asked if there were any questions or comments. R. Wielgosz was asked if an alternative word to “donations” could be found as this is a contentious one in some Member States. He replied that this is possible, particularly as there are CGPM Resolutions that mention “additional voluntary support of all kinds” and the IVD industry uses words such as “grants”. He added that some NMIs can make donations but this is not possible in all organizations, however, they can pay registration or membership fees. H. Laiz considered that IVD industry was the main beneficiary of the database and should be asked to contribute. R. Wielgosz said that the IVD industry receives many requests for funding and they are increasingly indicating that other bodies should provide funding. He noted that the JCTLM database also promotes reference materials and measurement services offered by NMIs, which would be a justification for approaching them for funding. The President reflected on this issue and whether the NMIs that produce certified reference materials (CRMs) should be asked to pay a fee to have these materials included in the database. R. Wielgosz replied that this option was also under discussion in the JCTLM Executive, but there were concerns that the introduction of a fee could become a barrier to NMIs nominating CRMs, methods and services for inclusion in the database. He said that the Strategy Task Group is looking at other sources of funding and that other options include the introduction of an annual membership or registration fee. He returned to the question of a registration fee for participation in JCTLM meetings and workshops and that a decision is needed as soon as possible so that this can be considered for the next round of

JCTLM meetings in December 2023. The Director confirmed that the BIPM has an established IT system in place to charge a registration fee for workshops and meetings. The CIPM agreed the following decision.

**Decision CIPM/112-16 (2023)** The CIPM reappointed Dr S.-R. Park and appointed Dr W. Louw to represent the CIPM at the Joint Committee for Traceability in Laboratory Medicine (JCTLM). The CIPM agreed for a letter to be sent to the NMIs and DIs participating in the JCTLM requesting voluntary contributions to complete development of the JCTLM database. The CIPM accepted to implement a registration fee for the JCTLM Stakeholders' meetings and workshops.

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

P. Neyezhnikov reported that the JCGM had met on 12 December 2022.

He said that it had received a report from W. Bich on the activities of the Working Group on the Expression of Uncertainty in Measurement (JCGM-WG1:GUM). This report gave an update on progress with two documents.

- The first Committee Draft of the document *JCGM GUM-1:202X Guide to the expression of uncertainty in measurement – Part 1: Introduction* among the member organizations (MOs) and NMIs in February 2022, which was positively received. The JCGM will circulate a Final Draft among the MOs for approval or rejection prior to its next meeting in December 2023.
- The first Committee Draft of document *JCGM GUM-5:202X Guide to the expression of uncertainty in measurement – Part 5: Examples of uncertainty evaluation* which will be ready for circulation among the MOs and NMIs for comments by summer 2023.

P. Neyezhnikov said that C. Ehrlich, convenor of the Working Group on the International Vocabulary of Metrology (JCGM-WG2:VIM) had presented its activities: WG2 had prepared draft responses to the comments received on the VIM4 1CD and it continued to develop the VIM4 2CD, which will be circulated to the JCGM MOs, with a three-month deadline for comments. A webinar is planned to clarify some points in the VIM4 2CD. Difficulties persist with the entry for 'quantity' despite the WG2 decision, based on numerous comments received about this on the VIM4 1CD, to return to having just one entry rather than two (for 'quantity' <general> and 'quantity' <individual>). The scope of 'measurement' will remain limited to quantitative properties, whereas the scope of 'metrology' will be expanded to include nominal properties.

Other VIM4 entries that have caused some difficulty for WG2 are 'measurement uncertainty' and related concepts. In the past WG2 worked closely with WG1 on this issue, through use of a joint task group. This did not produce a consensus outcome, and WG1 decided on a definition of 'measurement uncertainty' that is non-quantitative. Such a definition would break a long tradition whereby measurement uncertainty has been understood as a quantitative entity, and also significantly affect about ten other VIM4 entries. Since this new WG1 definition was not submitted on the VIM4 1CD, it has been decided not to introduce this non-quantitative definition into the VIM4 2CD.

P. Neyezhnikov recalled that the JCGM received a proposal to change the JCGM charter to reflect the fact that the GUM is not maintained in French as well as in English. A draft revision of the charter will be presented at the next meeting of the JCGM in 2023. The JCGM received an update on the use of the JCGM logo. The proposed logo is not intended to be considered 'superior' to the logos of the individual member organizations; for example, it is not intended to supplant them on official JCGM publications; it is simply intended for use on materials such as Working Group webinars and PowerPoint presentations.

The Director, speaking as the Chair of the JCGM, noted that the committee and its working groups had undertaken much work over the last two years.

The President thanked P. Neyezhnikov for his representation to the JCGM and WG2 and asked if he was willing to continue. P. Neyezhnikov agreed to continue with this role, as well as the CIPM representative to the CCU Working Group on Core Metrological Terms (CCU-WG-CMT).

**Decision CIPM/112-17 (2023)** The CIPM reappointed Prof. P. Neyezhnikov to represent the CIPM at the Joint Committee for Guides in Metrology (JCGM).

### 13. REPORT FROM THE BIPM DIRECTOR AND INTERNATIONAL LIAISON AND COORDINATION DEPARTMENT

#### Director's Report

The Director began with staff matters and welcomed A. Cypionka and D. Vladto the BIPM. P. Imbert, the Head of Human Resources, has announced that he will retire by the end of 2023. The BIPM has recruited a secondee from KRIS (Republic of Korea) to support the strategy development process and a new JCRB Secretary from KEBS (Kenya) for a two-year period. Two of the BIPM's senior scientists, D. Burns (Ionizing Radiation Department) and S. Westwood (Chemistry Department), will retire by the end of 2024. The BIPM will bring forward the recruitment of their replacements to 2023; this may temporarily raise the number of staff at the BIPM to higher than ceiling previously agreed by the CIPM for the end of 2023. The BIPM has put in place a new structure for its digital transformation activities. Under this new structure J. Miles will work with G. Dudle, a secondee from METAS (Switzerland), and other secondees to drive the activities on the BIPM's core digital products, for example the SI Reference Point and the KCDB. The BIPM laboratories are working with the CCs, in the context of the BIPM laboratory programme, to plan the digitalization requirements of the CCs. The Executive Secretaries of the CCs are involved in the work, which is dependent on secondees from the the NMIs. The CCM and CCTF have already carried out successful activities in this area; the CCPR and CCT will follow.

The Director recalled that the election of the BIPM Commission for Conditions of Employment (CCE) in early 2022 had been unsuccessful due to a lack of candidates. An *ad hoc* group of twelve BIPM staff was created to "rethink" the CCE. The *ad hoc* group has drafted a report, which it shared with all staff for comment. This report led to a number of recommendations, which the group submitted to the Director, the CIPM Bureau and the new CCE. The Director said he had accepted all the recommendations, many of which were already in progress. Three new members of the CCE were elected following an election in March 2023.

The Director has commissioned a survey of the hydrology and geology of the site. The BIPM initiated the survey following concerns about the steep bank behind the observatoire building and cracks that have developed in the courtyard. The geologists have submitted reports and they will continue to monitor the situation.

He said that a team of three people from an expert contractor carried out a cyber security audit in February 2023. The contractors focused on: external penetration testing; on-site internal penetration testing; a configuration review; and two phishing campaigns. They identified a number of good points including the network access controls, the firewalls and the security monitoring systems. The phishing campaign found that it was impossible to gain access to the IT systems. The areas that the audit identified for improvement included the need for an independent network for internal systems that access the internet. He added that there is an ongoing problem with laboratory equipment that use old versions of Windows. The use of USB sticks to transfer files in meeting rooms will stop in late March 2023 and will be replaced by the use of a dedicated email addresses in each room. All of the meeting rooms have been equipped to allow hybrid meetings.

The Director reported that he had reorganized safety and security at the BIPM Headquarters, which is now the responsibility of J.L. Pilon. The BIPM Headquarters has closely aligned its safety system to the French system to ensure that in the event of an emergency, the police and fire services will encounter systems commonly used throughout France. The security cameras and electronic door locks around the site are being upgraded and access to the site will soon be possible using a QR code.

The Director informed the CIPM that the Finance Office has recalculated the contributions for Member States; the information is now available and the BIPM will publish the information in mid-2023.

The BIPM is benefitting from an electricity tariff reduction from EDF. The BIPM was registered as an *Établissement d'utilité publique* in the nineteenth century, which qualifies it as being eligible for the reduction.

The Director said that the report of the 111th meeting of the CIPM has been published in both French and English and the publications team is making good progress with the report of the 27th meeting of the CGPM.

On 14 December 2022, the Director met with Oleksander Gryban, the Deputy Minister of Economy of Ukraine and head of the delegation to the CGPM. The meeting took place in Paris and the discussions centred on the reorganization of the metrology institutes in Ukraine, the delegations at the CGPM and a formal request to defer Ukraine's contributions.

The Director said that he had been working with D. del Campo Maldonado and CEM (Spain) on a proposal for the BIPM to receive the Princess of Asturias award in the category "International Cooperation". D. del Campo Maldonado has received more than 50 letters of support for the nomination.

He finished by saying that Dr Ian Mills had died since the previous meeting of the CIPM. Dr Mills made a significant contribution to the development of the SI, the SI Brochure and Chaired the CCU from 1995 to 2013. Dr Mills brought a huge amount of knowledge and experience to the metrology sector from his work in spectroscopy and from the development of the IUPAC Green Book. He cared deeply about the language of science and was able to attend the 26th meeting of the CGPM to witness the fruition of the work to revise the SI.

The President thanked The Director and opened the meeting for questions and comments. He was asked to comment further on the involvement of the CCs in the digital transformation of the KCDB, specifically if there is a programme and timeframe for the work. The Director said that the work on the KCDB is covered by the BIPM's resources and the project is being overseen by J. Miles. The work with the CCs is under way and the timetable for the CCs coming forward and participating is their individual responsibility. The CCTF and CCL have been quick to react due to their existing digital and on-line products, while other CCs are not yet discussing the issue. Most of the CCs have a digital task group and G. Duddle is bringing together the Chairs of these task groups to coordinate the work of the CCs.

J. Ullrich made a general remark that the BIPM Headquarters is currently advertising two vacant positions. He reminded the CIPM that the BIPM's resources are limited so caution should be exercised when replacing staff in order to ensure that it will be possible to address new challenges in the future. The BIPM should consider whether it is prudent to simply replace staff or if the resources would be better used to address these new challenges. The President agreed that this is an important issue but there are some positions that are essential and must be replaced, for example the Head of Human Resources.

G. Rietveld recalled that Dr Blevin had died since the last meeting of the CIPM. Dr Blevin was a member of the CIPM for eighteen years. He served as the CCPR President from 1982 to 1994, CIPM Vice-President from 1992 until 1997, and CIPM Secretary from 1997 until 2000. He was the main author of the "Blevin report" submitted by the CIPM to the 21st General Conference on Weights and Measures in 1999. During the course of his career Dr Blevin held positions as the Chair of the National Standards Commission, CSIRO's Chief Standards Scientist, and Chief of the CSIRO Division of Applied Physics.

### **Reorganization of the ILC Department**

A. Cypionka introduced her first report of the work of the International Liaison and Communication (ILC) Department. She said that its scope of work has not changed and that it has been restructured following the retirement of A. Henson in order to account for the diversification of tasks and seniority of some of the staff members; and the workload of the department over the coming years. The restructuring included the creation of teams within the department to better organize its work. A. Cypionka presented the new structure and staff of each team. It is organized with the liaison activities under the coordination of R. Guliyeva; digital transformation activities coordinated by J. Miles; CBKT and CIPM MRA activities coordinated by C. Kuanbayev; and communications coordinated by D. Vlad. It also supports the BIPM Director and the CIPM, for example by the

preparation of the BIPM Work Programme and strategy.

A. Cypionka gave an update of participation in the CIPM MRA. As of March 2023 a total of 251 institutes participate in the CIPM MRA and, as previously reported, one meeting of the JCRB has been held (15-16 March 2023) since the last session of the CIPM. She noted that the review period for CMCs using the KCDB 2.0 has been reduced to 67 days from 140 days using the old system. The Application Programming Interface for CMCs that are included in the Key Comparison Database (API KCDB) has been completed and implemented. A detailed user guide for machine-readable CMCs is now available. A survey among the users of the KCDB found that, at present, 7 % of respondents already use the API KCDB and another 42 % plan to do so. J. Miles will give more details of the next steps of the digital transformation of the KCDB later in the meeting.

The Communications team has been strengthened with the recruitment of D. Vlad. More resources are now available to enhance the existing tools and channels of communication. A. Cypionka gave a summary of key achievements of the communications team in 2022 and its objectives for 2023. The key numbers for the website and achievements of the publications team in 2022 were presented.

A. Cypionka completed her presentation by summarizing recent information about *Metrologia*, which has recently included a focus issue on Length Metrology and Challenges in Time and Frequency metrology.

### **Progress with the “Capacity Building and Knowledge Transfer Programme”**

C. Kuanbayev presented a report of progress with the CBKT programme. He recalled that it aims to increase the effectiveness with which Member States and Associates engage in the world-wide coordinated metrology system. The CBKT initiatives are delivered through workshop- and laboratory-based activities, knowledge transfer projects and remote learning tools, which include the e-learning platform, webinars and technical exchanges.

He reported that 52 CBKT activities have been delivered, of which 27 projects were in-person at the BIPM Headquarters and in the regions; 25 projects were held on-line (12 of which were repeated to cover all time zones); and more than 60 lecturers from the NMIs/DIs and IOs have been involved in delivery of the CBKT activities. To date, there have been more than 3 000 participations in the various CBKT activities (in-person and on-line) from more than 124 countries, covering all six RMOs.

The BIPM e-learning platform has been opened up to enable it to host material from interested RMOs (APMP, COOMET, EURAMET and GULFMET).

A suite of brochures has been published to provide information and assistance on key roles and mechanisms within the CIPM MRA. The brochures have been written in a way that is accessible to both experts and non-experts.

The BIPM and the OIML, with sponsorship from METAS (Switzerland), have launched an initiative to develop an e-learning course and publication material in support of the BIPM-OIML publication: *National Metrology Systems - Developing the institutional and legislative framework*.

Another initiative is being organized to equip RMO Secretariats with appropriate knowledge that can assist in effective implementation of various interactions with the BIPM. The Workshop will be held at the BIPM Headquarters in September 2023. One of the outcomes of this workshop is to provide a “Toolbox” for RMO Secretariats indexing various BIPM and RMO interfaces.

### **Progress with Digital transformation activities**

J. Miles presented a brief update on the digital transformation activities under way at the BIPM. One of the main topics is the development of the SI Reference Point (SIRP), which will provide permanent identifiers for the SI units and prefixes defined in the SI Brochure, along with the corresponding quantity kinds and defining constants.

She said that significant progress on the SIRP has been achieved thanks to the secondment of G. Dudle (METAS) to the BIPM.

J. Miles reported that work is ongoing in the BIPM Time Department to provide an Application Programming Interface (API) to UTC data, and staff of the Time Department have collated and structured the data relating to all the standard frequencies underpinning the *mise en pratique* of the metre and secondary representations of the second. An API has been developed and is being alpha-tested in view of a release for beta-testing later in the year.

She said that the digital projects involve a great deal of consultation, both within the CIPM-TG-DSI and its Expert Group, but also with the QI partners, with the CODATA-DRUM, and with other experts in the field of digitalization. She said she was delighted to see that NMIs were suggesting staff secondments to the BIPM Headquarters to contribute to the project, and thanked all parties involved.

The CIPM thanked the BIPM Digital Transformation Team for their work, remarking that significant progress was being made despite the resources available.

## 14. INSTITUTIONAL AND STAFF MATTERS

### Issues with Member States and Associate States/Economies

R. Guliyeva presented an update on issues with the payment of contributions and subscriptions. She said that there are currently three Member States that are three years in arrears with their contributions: Argentina, New Zealand and Pakistan. If the arrears are not settled by the end of 2023, the three States will be suspended from 1 January 2024. Oman is the only Associate that has arrears of three years and it will cease to be an Associate from 1 January 2024 if the arrears are not settled by 31 December 2023.

She informed the CIPM that Sri Lanka now meets all the criteria adopted by the CIPM in its Decision CIPM/106-20 (2017) when considering whether it is appropriate for an Associate State of the General Conference on Weights and Measures (CGPM) to be encouraged to accede to the Metre Convention and hence become a Member State. The following decision was agreed.

**Decision CIPM/112-18 (2023)** The CIPM decided, based on the criteria it has previously adopted, that it would be appropriate for the Democratic Socialist Republic of Sri Lanka to accede to the Metre Convention. The BIPM Director will convey the Decision, recalling Resolution 4 ‘On the status of Associate State of the General Conference’ adopted by the CGPM at its 24th meeting (2011), and the implications regarding the increase in subscription should the Democratic Socialist Republic of Sri Lanka choose to remain as an Associate of the CGPM.

### Update on the election of the staff representative body (the “CCE”)

F. Rojas Ceballos, the BIPM Legal Adviser, added to the information given previously in the meeting and recalled that the BIPM Staff Manual (RRI) includes a provision for staff representatives to participate in the activities of two Staff Commissions, one of which is the Commission for Conditions of Employment (CCE). An election was held in December 2021 to replace half the members of the CCE and those that had resigned in December 2021, but no candidates came forward.

Several BIPM staff responded by setting up an *ad hoc* working group on rethinking the CCE, with twelve members, in July 2022. The working group issued a 65 page report in February 2023 containing a series of recommendations. A further election was held on 10 March 2023, which resulted in three candidates standing who were duly elected. The three elected members of the CCE are now analysing the recommendations of the working group.

The President thanked F. Rojas Ceballos and said that the CIPM will read the document and discuss the matter. The CIPM will decide if it needs to take any actions and will report back as quickly as possible.



### **Short summary of Judgement 4580 from the ILO Administrative Tribunal**

F. Rojas Ceballos presented the documents [CIPM2023-I-B8-3.1](#) and [CIPM2023-I-B8-3.2](#) relating to Judgement 4580 from the ILO Administrative Tribunal, which was issued on 1 February 2023. Please see the documents for full details of the judgement.

## **15. WORLD METROLOGY DAY**

### **Progress towards the recognition of World Metrology Day by UNESCO**

Ms Guliyeva reminded the CIPM that the United Nations Educational, Scientific and Cultural Organization (UNESCO) Executive Board took a key step towards recognizing World Metrology Day at their session on 13 October 2022, following the proposal presented by Kazakhstan and supported by the BIPM and OIML. The decision has to be ratified by the 42nd session of the UNESCO General Conference to be held in November 2023. If all goes to plan, UNESCO will proclaim 20 May of each year as a UNESCO world day which will then be celebrated every year from 20 May 2024.

The recognition of World Metrology Day by UNESCO will open new opportunities for the BIPM and OIML to promote World Metrology Day. It has already raised support from a number of UNESCO Member States that do not currently participate in BIPM or RMO activities. This stimulates opportunities for the BIPM to explore their participation within the context of the mission towards “Universal adherence” proposed by Resolution 6 (2022) adopted by the CGPM. It will also open the possibility for the BIPM to request part of its 150th Anniversary events in 2025 to be hosted at UNESCO and thereby opening it to a truly global audience.

### **Plans for the celebration of the 150th Anniversary of the signing of the Metre Convention**

The Director presented a summary of the plans for the 150th Anniversary of the signing of the Metre Convention on 20 May 2025. A one-day symposium is proposed for the 20 May. Ideally, this will be held at the UNESCO headquarters in Paris. Alternatively, it will be held at the Palais des Congrès in Versailles. This will be followed by a conference consisting of four half-day sessions on 21-22 May that will focus on sectoral measurement impact, for example on climate change and the environment, and the digital transformation. This two-day conference will be held in Versailles.

A series of receptions are being planned. A garden party for the CIPM, senior BIPM staff, local VIPs and 2-3 representatives from the Member State delegations is planned for the afternoon of Monday 19 May. A symposium on the history/philosophy of measurement is proposed for the morning of 19 May. This symposium will be open to the public and will be held in Sèvres. On Friday 23 May a workshop on options for future enlargement and other topics will be held in the Pavillon de Mail in the morning. A celebratory event for all staff is planned for the afternoon.

### **Plans for World Metrology Day 2023 and 2024**

C. Kuanbayev said that the theme for World Metrology Day 2023 is “Measurements supporting the global food system” and the poster was designed in association with SIM and INTI (Argentina). EURAMET will develop the theme and poster for 2024.

**16. PLANS FOR FUTURE MEETINGS**

**Dates for future meetings of the CIPM**

Session II of the 112th meeting of the CIPM and its working groups 19-23 June 2023

Session III of the 112th meeting of the CIPM and its working groups 16-18 October 2023

**Plans (and dates) for the October 2023 meeting of NMI Directors and Member State Representatives**

22nd meeting of the NMI Directors and Member State Representatives 19-20 October 2023

It is expected that the meeting will be held in-person at the BIPM Headquarters, with the option of attending on-line.

**17. ANY OTHER BUSINESS AND CLOSE OF MEETING**

There was no other business. The President thanked the CIPM members for their participation and closed the meeting.