

**International Committee
for Weights and Measures**

Proceedings of Session II

of the 110th meeting

(18-20 October 2021)

Executive Summary

Session II of the 110th meeting of the CIPM (18-20 October 2021)

MoU between the BIPM and CODATA

The CIPM decided by correspondence on 16 July 2021 to sign an MoU between the BIPM and CODATA.

Luxembourg to be encouraged to become a Member State

Luxembourg now meets all of the criteria when considering whether it is appropriate for an Associate State to be encouraged to accede to the Metre Convention.

New director of the Ionizing Radiation Department

Dr Gressier became director of Ionizing Radiation Department in July 2021.

Exceptional transfer of unreserved cash to the Pension Fund

The CIPM authorized the exceptional transfer of 3 million € of unreserved cash to the Pension Fund in 2021. A further exceptional transfer will be considered in 2022.

Approval of the budget for 2022

Following the recommendation of the CIPM Sub-Committee on Finance, the CIPM approved the budget proposed by the Director for 2022.

Changes to membership and observership of the Consultative Committees

- observership of CCM for NSC - IM (Ukraine) and CMS/ITRI (Chinese Taipei)
- observership of CCRI for NSC - IM (Ukraine)
- membership of CCU for NSC - IM (Ukraine)

Digital transformation in the international scientific and quality infrastructure

The CIPM approved the Joint Statement of Intent on the digital transformation in the international scientific and quality infrastructure.

Digital calibration certificates and engagement with the Digital SI Framework

The CIPM supported the plan for a Consultative Committee survey on NMI/DI plans for digital calibration certificates and engagement with the Digital SI Framework.

CIPM Rules of Procedure

The CIPM approved edition 1.1 of the CIPM Rules of Procedure.

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

As of 18 October 2021

President

W. Louw, South Africa.

Secretary

T. Usuda, Japan.

Members

F. Bulygin, Russian Federation.

D. del Campo Maldonado, Spain.

I. Castelazo, Mexico.

N. Dimarcq, France.

Y. Duan, China.

H. Laiz, Argentina.

T. Liew, Singapore.

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.

G. Rietveld, the Netherlands.

M. Sené, United Kingdom.

A. Steele, Canada.

J. Ullrich, Germany. *CIPM Vice-President.*

Honorary members

W.R. Blevin, Australia.

L.M. Branscomb, United States of America.

E.O. Göbel, Germany.

B. Inglis, Australia.

R. Kaarls, the Netherlands.

J. Skákala, Slovakia.

Agenda

1. Opening of the meeting and approval of the agenda
2. Confirmation of the report of Session I of the 110th meeting
3. Secretary's report (including recall of decisions taken by correspondence since the last session)
4. Director's report
5. Finance
6. Reports from the CC Presidents and Chairs of Sub-committees
7. CIPM Strategy
8. BIPM Strategy
9. Update on progress with the BIPM Work Programme
10. CIPM Governance
11. Plans for the 27th meeting of the CGPM
12. Other meetings
13. Any other business

**1. OPENING OF THE SESSION;
QUORUM;
AGENDA**

The International Committee for Weights and Measures (CIPM) held Session II of its 110th meeting on Monday 18 to Wednesday 20 October 2021 on-line.

Present: F. Bulygin, D. del Campo Maldonado, I. Castelazo, N. Dimarcq, Y. Duan, H. Laiz, T. Liew, W. Louw, M. Milton (Director of the BIPM), P. Neyezhnikov, J. Olthoff, S.-R. Park, M.L. Rastello, P. Richard, G. Rietveld, M. Sené, A. Steele, J. Ullrich and T. Usuda.

Also attending the meeting were: C. Fellag Ariouet (Personal Assistant to the Director and Head of the Executive and Meetings Office), C. Planche (Librarian and Drafting Officer) and R. Sitton (Publications Officer).

The following were in attendance for parts of the meeting: V. Gressier (Director of the Ionizing Radiation Department and Executive Secretary of the CCRI), A. Henson (Director of the International Liaison and Communication Department), F. Rojas Ceballos (Legal Adviser), M. Stock (Director of the Physical Metrology Department and Executive Secretary of the CCEM and CCU), P. Tavella (Director of the Time Department and Executive Secretary of the CCTF), and R. Wielgosz (Director of the Chemistry Department and Executive Secretary of the CCQM)

With 18 members participating on-line the quorum was satisfied according to Article 12 of the Regulations annexed to the Metre Convention.

Dr Louw, the CIPM President, opened the meeting and asked if there were any changes or additions to the draft agenda. There were no changes, and the agenda was adopted unanimously.

He proposed that the issue of electronic voting between meetings of the Consultative Committees would be discussed under §13 “Any other business”.

2. CONFIRMATION OF THE REPORT OF SESSION I OF THE 110TH MEETING

The minutes of Session I of the 110th meeting (2021) had been circulated to the CIPM for comment and the latest version, with the comments incorporated, had been available on the CIPM members’ working area of the BIPM website in advance of the meeting (see document [CIPM/2021-II-02.01](#)). The CIPM was asked for acceptance of the minutes as a true record, which was agreed unanimously.

<p>Decision CIPM/110-14 The CIPM accepted the minutes of the first session of the 110th meeting of the CIPM as a true record.</p>
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3. SECRETARY’S REPORT (INCLUDING RECALL OF DECISIONS TAKEN BY CORRESPONDENCE)

Dr Usuda, the CIPM Secretary, presented his report ([CIPM/2021-II-03.01](#)) for noting. He reported that the CIPM had made one decision by correspondence since Session I in June 2021. The decision, CIPM/110-15, was noted by the CIPM.

Decision CIPM/110-15 The CIPM noted the decision taken by correspondence on 16 July 2021 to sign an MoU between the BIPM and CODATA based on the draft circulated.

The Secretary reported that thirteen CIPM members had voted in favour of Decision CIPM/110-15 and five against. It was recalled that Decision CIPM/107-11 had originally asked the BIPM Director and Legal Advisor to explore options to formalize the BIPM liaison with the CODATA Task Group on Fundamental Constants. This initial request had subsequently evolved to become an MoU with CODATA as a whole.

The Secretary said that an amendment was required to Section C of the “*Criteria and Process for Election of CIPM Members*”, which states that the members of the CEC will include representatives from seven Member States. He recalled that Resolution 2 of the 25th meeting of the CGPM includes a clause that the CEC shall be composed of nine representatives, each from a different Member State. The CIPM adopted the following decision.

Decision CIPM/110-16 The CIPM revised the document “Criteria and process for election of CIPM Members” to align Section C (page 5) with Resolution 2 adopted by the CGPM at its 25th meeting (2014) by stating that there are nine (and not seven) seats on the Committee for CIPM Election (CEC).

The Secretary presented a plan for the election and replacement of the CIPM at the 27th meeting of the CGPM (2022). The action plan included a timetable of the key actions through to the seating of the newly elected CIPM in 2023. The Secretary asked if the CIPM agreed to adopt the action plan, which would then be forwarded to the CEC. There was unanimous agreement and the action plan was adopted.

4. DIRECTOR'S REPORT

The Director started by reporting that Dr Gressier had taken up his position as director of the Ionizing Radiation Department in July 2021. He has many years of experience in the metrology community, having worked at the *Institut de Radioprotection et de Sûreté* (ISRN) in its neutron metrology facility and having been the Chair of section III of the Consultative Committee for Ionizing Radiation (CCRI). His recruitment followed the retirement of Dr Judge who continues to carry out some work for the BIPM as a consultant supporting the quality management system. Mr Rojas Ceballos has returned to the BIPM after a 6-month placement at the Organisation for Economic Co-operation and Development (OECD). During his absence he was replaced by Ms Ariana Rohrer on a 6-month contract. Dr Solve has started to work alongside the Executive Secretary at the Consultative Committee for Thermometry (CCT) in anticipation of the retirement of Dr Picard at the end of 2022. Work is underway to recruit a physicist to replace Dr Petit when he retires from the Time Department in 2022.

Opportunities to receive secondees are opening again, and the BIPM has identified two secondments from NMIs to support the BIPM Meetings Office in 2022 during the preparations for the 27th meeting of the CGPM and to explore the use of new on-line meeting platforms to support the CCs and the CC WGs.

The Director said that as part of the BIPM's continuous efforts to support staff at work and in particular to support their mental health, two initiatives have been launched. Staff have been given access to an online service that gives personal access to a specialized confidential counselling service. Also, training is being organized for managers to help them be aware of issues of harassment and bullying in the workplace, and to further develop their skills to avoid them. The same training will be offered to all staff in a second phase.

The Director informed the CIPM that on 10 June 2021, the practical arrangement with the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) was signed following Decision CIPM/110-03.

On 7 September the BIPM received a visit from Ambassador Antonio Bernadini, permanent representative of Italy to International Organizations in Paris.

On 13 September the Director participated in the OECD event “Rethinking and modernizing international rulemaking to design better policies for the 21st century”. This virtual meeting was part of the 8th Annual Meeting of International Organizations within the context of the OECD IO Partnership. It was an opportunity to emphasize the critical role of the organizations involved in QI in underpinning effective international rulemaking.

On 11 October, the CODATA MoU was signed following Decision CIPM/110-14. This point will be discussed under “Any other business” because there is now an opportunity to elect a CIPM member to represent the organization at the CODATA General Assembly.

The BIPM has made an application to be an observer organization at the UN Climate Change Conference 2022 (UNFCCC COP 27). The deadline for the application was in August 2021, but a response is not expected from the United Nations Framework Convention on Climate Change (UNFCCC) until June/July 2022.

The BIPM has reviewed the terms of copyright that it offers on BIPM publications and has decided to adopt the Creative Commons CC 3.0 license, which has been adapted to the legal status of international organizations (<https://creativecommons.org/licenses/by/3.0/igo/>) This will be applied to the SI Brochure and to other BIPM publications.

The Director recalled that he had reported to the CIPM previously that whilst the BIPM has been granted functional privileges and immunities by the French State, including immunity of jurisdiction on French territory, it has been his practice to align the BIPM’s security policy with those applied by relevant French authorities. An example is the BIPM’s work to address the requirements of the *Autorité de sûreté nucléaire* (the ASN), which regulates all establishments that work with ionizing radiation in France. He reported that the ASN recently granted the BIPM an extension to the lifetime of its sealed sources, in particular the radium sources to 2023 and the cobalt sources to 2027. Also, the ASN visited the BIPM on 14 October 2021 and have confirmed that the BIPM fully meets new requirements for site security. This has required the BIPM to align its policies for fire safety and site security more closely with those required in France. Additionally, the BIPM has been able to reduce the level of surveillance of its staff in the Ionizing Radiation Department following recognition that the long-term measurements of the radiation doses they receive are substantially below the occupational exposure levels set in France.

With the approval of the CIPM President and the French National Archives, the Director reported that he had accessed the caveau containing the prototypes on 6 September with Dr Énard (retired member of the CIPM) and Dr Stock (Director of the Physical Metrology Department). It provided the opportunity to confirm that the new system for humidity control is working well.

The Director gave two examples of the BIPM’s work with the wider community in France. Two visitors with learning difficulties from a local charity have been welcomed to the BIPM several times a week to work under supervision in support services. The charity has reported that the commitment to building relationships shown at the BIPM has helped one of the visitors to take on work elsewhere in Sèvres. The BIPM opened its doors to the public on the weekend of 18 and 19 September 2021 for the 38th Journées européennes du Patrimoine (European Heritage Days). The open days attracted 215 participants, who were given a guided tour of the Pavillon de Breteuil, the BIPM collection of historical instruments and the garden.

The Director reported that the BIPM has completed three major IT projects: the development of the new BIPM website, which has been a big project over the last three years; the new e-learning platform, which opens many

possibilities for the BIPM's CBKT activities and for which discussions are underway to partner with the regional metrology organizations (RMOs) to share the platform; and the new database in the Meetings Office, which underpins the website.

The Director concluded his report by saying that the BIPM is grateful to the Inter-American Metrology System (SIM) for putting forward Christopher Cortes to audit its Quality Management System. He had completed his draft report earlier in October 2021 and the final report will be on the agenda at the annual QMS review with the CIPM Secretary in 2022.

The President thanked the Director for his report and invited comments. It was asked if the handover of Dr Picard's key comparison database (KCDB) responsibilities, following her retirement at the end of 2022, is being considered. The Director replied that plans are in place and there are a number of staff on site with considerable experience of using the KCDB.

The Director presented report [CIPM/2021-II-04.02](#) and recalled that the Grand Duchy of Luxembourg became an Associate State of the CGPM in 2014. Its National Metrology Institute has signed the CIPM MRA and participated in comparisons within the CIPM MRA, and in September 2021 published Calibration and Measurement Capabilities (CMCs) for the first time (in the field of Time and Frequency). The Grand Duchy now meets all of 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/110-17 The CIPM decided, based on the criteria it has previously adopted, that it would be appropriate for the Grand Duchy of Luxembourg 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, and the implications regarding the increase in subscription should the Grand Duchy of Luxembourg choose to remain as an Associate of the CGPM.

5. FINANCE

Dr Richard said that the report of the CIPM Sub-Committee on Finance (FSC) meeting held on 6 October 2021 was available on the CIPM members' working area of the BIPM website for their information (see document [CIPM/2021-II-05.01](#)).

The Director presented the proposed budget for 2022 (document [CIPM/2021-II-05.02](#)). He said that this is the same budget that had been proposed to the 26th meeting of the CGPM (2018) with one minor change. The income figures have been updated to give better estimates of contributions from Member States and subscriptions from Associates than was known in 2018; the net change is very small. There is no change to the budgeted expenditure for 2022. Dr Richard added that the proposed change had been approved unanimously by the FSC. The CIPM approved the revised budget for 2022.

Decision CIPM/110-19 Following the recommendation of the CIPM Sub-Committee on Finance, the CIPM approved the budget proposed by the Director for 2022.

The Director presented document [CIPM/2021-II-05.04](#) "*Summary of the reserves*" and gave a brief overview of the reserve fund, reserved cash and unreserved cash. He recalled that in 2020, following a recommendation from the Pension Fund Advisory Board (PFAB), the CIPM decided to ask the FSC to explore the possibility and

feasibility of authorizing exceptional contributions or voluntary injections of liquidity into the Pension Fund. On 6 October 2021, the FSC met to discuss, *inter alia*, the feasibility and affordability of a transfer from the BIPM reserves to the Pension Fund. During this meeting, it was stated that the amount of BIPM unreserved cash shown in the audited financial report at the end of 2020 was 5.64 million €. In addition, the FSC noted that the Pension Fund was underfunded. The Chair of the FSC had recalled at its meeting that, according to the auditor, the appropriate use of the BIPM reserves allowed the CIPM to make transfers from the reserves. Following a discussion within the FSC, it was unanimously agreed to recommend the transfer of some unreserved cash to the Pension Fund. More specifically, the FSC suggested that the CIPM consider an exceptional transfer of 3 million € in 2021 and, if possible, a further exceptional transfer in 2022. Any exceptional transfer in 2022 would have to consider the audited financial report for 2021 and the development of the long-term financial plan for the BIPM. The Director commented that the proposed exceptional transfer will improve the long-term sustainability of the Pension Fund as well as confirming the commitment by the CIPM to the maintenance of the Fund.

Dr Richard noted that the rationale and proposal for the transfer is detailed in document [CIPM/2021-II-05.03](#) “*Note to the CIPM- Proposal for a CIPM decision on Exceptional transfer of cash reserves to the Pension Fund*”. After a discussion, the following decision was adopted unanimously.

Decision CIPM/110-18 Following the recommendations dated 7 September 2020 from the Pension Fund Advisory Board (PFAB) and the recommendations from the CIPM Sub-Committee on Finance meeting held on 6 October 2021, the CIPM decided to authorize the exceptional transfer of 3 million € of unreserved cash to the Pension Fund in 2021.

The CIPM also decided to consider a further exceptional transfer in 2022 following the publication of the audited financial report for 2021 and the development of a long-term financial plan for the BIPM.

The Director gave an overview of the long-term financial plan for the BIPM (document [CIPM/2021-II-05.05](#)), noting that it had been discussed in detail by the FSC. The associated budget includes assumptions about inflation and the composition of the BIPM staff and assumes that the dotation to be agreed in 2022 will be level with the current dotation. The proposed budget is balanced over the four-year programme and includes commitments for investments in site infrastructure, building maintenance and laboratory infrastructure. The Director requested approval from the CIPM to go ahead to draft proposals for the BIPM Work Programme for 2024-2027, which will be based on the long-term financial plan and the BIPM Strategy. He added that the long-term financial plan could be readdressed to show scenarios of how the budget would work if there were increases in the dotation over the course of the Work Programme 2024-2027. The practice at recent meetings of the CGPM has been to present several options with different levels for the dotation.

Dr Richard said that the FSC had recommended slight increases in the provisions for inflation and travel shown in the long-term financial plan, which have been implemented in document [CIPM/2021-II-05.05](#). The FSC had agreed that presenting a “flat” dotation to the CGPM at its 27th meeting (2022) was a starting point, however it had suggested the option of proposing a stepped increase of 0.5 % in 2025, 1 % in 2026 and 1.5 % in 2027 as an alternative. A rationale for pursuing a modest increase from 2025, rather than 2024, could be the need to allow Member States an extra year to recover from the financial effects of the Covid-19 pandemic.

It was noted that the budget associated with the long-term financial plan is negative in the last two years. It was suggested that this sends a message to the Member States regarding the consequences of agreeing a flat dotation for the four years of the Work Programme 2024-2027. The President agreed that pursuing a flat dotation was a prudent course of action but suggested that the Director should investigate further the option of presenting justification for a small, stepped increase from 2025 onwards.

6. REPORTS FROM THE CC PRESIDENTS AND CHAIRS OF SUB-COMMITTEES

The President recalled that reports were invited from those CCs that had met since the last session of the CIPM.

Consultative Committee for Time and Frequency (CCTF)

Dr Dimarcq recalled that the CCTF is focusing its work on the four “hot topics” for which task groups had been set up in 2020. The hot topics are: Updating the roadmap towards the redefinition of the SI second; Leap seconds in Coordinated Universal Time (UTC) and building a consensus for a continuous timescale; Promoting the mutual benefits of UTC and Global Navigation Satellite Systems (GNSS); and Sharing resources to improve international timekeeping. The CCTF met in March 2021 where it discussed the topics in relation to its strategic plan.

The CCTF has drafted two resolutions: Draft Resolution D ‘*On the use and future development of UTC*’ and Draft Resolution E ‘*On the future re-definition of the second*’. Each draft resolution was accompanied by a supporting document and Draft Resolution E is additionally supported by the ‘*Roadmap towards the redefinition of the SI second*’. The two Draft Resolutions and the roadmap are available on the CIPM members’ working area of the BIPM website as documents [CIPM/2021-II-06-a.1](#), [CIPM/2021-II-06-a.2](#) and [CIPM/2021-II-06-a.3](#).

Dr Dimarcq presented the main points of Draft Resolution E ‘*On the future re-definition of the second*’. Three options are being considered for the definition of the second. Option 1 foresees a new definition based on a single atomic reference transition in the optical frequency range; Option 2 envisages an ensemble of reference optical frequencies; and Option 3 bases the new definition on fixing the value of a fundamental constant. It is believed that Option 3 is not achievable today as there is no known fundamental constant with the necessary accuracy. At present, there is no clear choice between Options 1 and 2. Three possible schedules to redefine the second were presented. Dr Dimarcq explained that the option to go ahead with the new definition at the 29th meeting of the CGPM (2030) was the preferred choice (see §6 of the report of Session I of the 110th meeting of the CIPM).

Dr Dimarcq gave the background to Draft Resolution D ‘*On the use and future development of UTC*’, noting that the main requirements for the common time scale are that it is continuous, monotonic, reliable and widely available. He recalled that UTC is under the authority of the CGPM, computed at the BIPM and realized by 85 NMIs around the world. It was stressed that if UTC is not modernized to become a continuous timescale it will become marginalized and less universal and that the role of NMIs as a source of traceability to national and international metrological standards and synchronization is at risk. An alternative GNSS system time, which is continuous and easily accessible, is already considered as a source of time and a frequency reference and there is a calculated risk that it could become, *de facto*, the international standard time. He added that UTC is maintained in close agreement with the irregular rotation of the Earth by *ad hoc* corrections, which are not implemented by most GNSSs, digital networks, or diffused internet time synchronization protocols.

Dr Dimarcq proposed that the method to reach a continuous UTC would be based on an increase to the tolerance in [UT1 – UTC] to a new limit. A CIPM Task Group on Continuous UTC has been set up to improve communications on the use and future development of UTC with Member States and other communities to try and ensure that Draft Resolution D receives wide support. The Task Group will hold its first meeting in November 2021.

The President thanked Dr Dimarcq and invited questions. It was asked why it is necessary to wait until 2035 to change the limit for [UT1 – UTC]. Dr Dimarcq replied that at the last meeting of the CCTF, the representative from VNIIFTRI (Russian Federation) had said that current GLONASS software is unable to handle a difference between UT1 and UTC of greater than one second. If this limit were to be changed now, it could have a negative impact on GLONASS.

Consultative Committee for Units (CCU)

Prof. Ullrich presented the activities of the CCU as detailed in the documents available in the zipped file [CIPM/2021-II-06-b.2](#). He recalled that the CCU had held its 25th meeting on 21-23 September 2021. An outcome reported to the meeting had been the results of the survey among CCU stakeholders on the implementation of the new definitions of the SI. The survey found that none of the NMIs surveyed had reported difficulties in implementing the revised SI and all NMIs surveyed, except one, had used the redefinition of the SI as an opportunity to promote metrology and the SI in their country. The questionnaire had found some new possibilities for innovative approaches and technologies based on the revised SI. Prof. Ullrich said that these suggestions could be fed into the development of the strategy as well as being circulated to the Consultative Committees. It was noted that the revision and implementation of the SI had been supported by a very successful information campaign. A detailed summary of the replies to the CCU questionnaire on the implementation of the revised SI is available in the zipped file [CIPM/2021-II-06-b.2](#).

Prof. Ullrich recalled that the CCU Working Group on Core Metrological Terms (CCU-WG-CMT) has been reviewing the definitions for the three core terms ‘quantity’, ‘unit’ and ‘quantity value’. The majority of the Working Group have come to an agreement but the representative from PTB does not agree, therefore no consensus can be reached. Moreover, both proposals do not agree with the present suggestion by the JCGM WG2 (VIM). Since the Working Group has not yet considered issues of machine actionability of the definitions as required by its ToR, it was suggested that to proceed, the CIPM Task Group on the Digital SI (CIPM-TG-DSI) and its Expert Group should analyse all three proposed definitions (CMT majority, PTB, VIM). The aim is to propose definitions that are as short and simple as possible whilst being logically consistent. The Expert Group will reach a conclusion by 11 January 2022, with the findings discussed and decided at the CIPM-TG-DSI meeting on 25 January 2022. This would allow the CIPM to make a final decision at its meeting in March 2022. The CIPM agreed that the three definitions should be referred to the CIPM-TG-DSI for review.

Decision CIPM/110-20 The CIPM received the report from the CCU on the Core Metrological Terms and noted that consensus could not be reached on the matter of three definitions (quantity, quantity of value and unit). The CIPM requests the CIPM Task Group on the Digital SI (CIPM-TG-DSI) to review the “machine actionability” of the three definitions under discussion and to report to the meeting of the CIPM in March 2022.

Prof. Ullrich informed the CIPM that a joint workshop between the CCU and the Consultative Committee for Amount of Substance: Metrology in Chemistry and Biology (CCQM) will be organized to discuss quantities that are quantified by counting. In addition, the CCU will form a new Task Group on angle and dimensionless quantities in the SI in response to the findings of a questionnaire among CCU members and liaisons. He finished the report by presenting the updated CCU strategy for the next 10 years. The draft CCU strategy was noted by the CIPM.

Dr Park thanked the CCU for taking the initiative to look into counting-based quantification, which is an important issue for the CCQM, and for the proposal to hold a joint workshop on the issue. Dr Steele commented that the proposal to form a Task Group on angle and dimensionless quantities in the SI should be welcomed but cautioned that there are constraints on issues such as introducing new base quantities, which were not under discussion. He said that the Task Group should be encouraged to modernize the language, within the current framework. Prof. Ullrich said that the Task Group will take account of comments from users where there are existing misunderstandings. He stressed that the Task Group will not propose any new units.

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

Dr Olthoff recalled that the JCRB had held its 44th meeting on 14-15 September 2021. The Gulf Association for Metrology (GULFMET) had been welcomed as a full member at the meeting and they had thanked the CIPM

for approval of their membership. He noted that all metrology areas are now compatible with the KCDB 2.0 and that the time taken between submission for inter-regional review to publication of a CMC on the KCDB has been reduced to 60 days, from 140 days in previous years.

Dr Olthoff said that the impact of the global Covid-19 pandemic on the ability to approve quality systems had been considered during the JCRB meeting. Extensions have been granted during the pandemic and these extensions will continue for RMO-approved quality management systems until March 2022. The situation will be reviewed at the 45th meeting of the JCRB.

The Statistics Task Group (see JCRB Action 42/3) has proposed revisions to document CIPM MRA-G-11 “*Measurement comparisons in the CIPM MRA: Guidelines for organizing, participating and reporting*”. The proposals were sent to the RMOs for comment and five of the six RMOs accepted the proposals without any changes. The European Association of National Metrology Institutes (EURAMET) provided a detailed list of comments, which have been addressed by the leader of the Task Group, Antonio Possolo. The Task Group and the JCRB plan to consult the CCs for their feedback.

The President thanked Dr Olthoff and invited comments. It was asked if there are any plans to provide feedback to the State Representatives on the significant progress that has been made with modernizing the KCDB and improving its efficiency. The Director commented that this could be added to the agenda for the next meeting of the CGPM and could possibly be included in the CIPM President’s report as a highlight of the strategic improvements made since the last meeting of the CGPM.

Dr Park asked if any concerns had been raised at the JCRB meeting regarding broad-scope CMCs. Dr Olthoff replied that no concerns had been raised.

CIPM Task Group on the Digital SI (CIPM-TG-DSI)

Prof. Ullrich presented version 0.6.1 of the “*Joint Statement of Intent on the digital transformation in the international scientific and quality infrastructure*” (document [CIPM/2021-II-06-d](#)). He recalled that the joint statement prepared together with the OIML-BIPM Joint Task Group has already been agreed by the International Measurement Confederation (IMEKO) and the International Organization of Legal Metrology (OIML) and agreement was reached at the International Committee of Legal Metrology (CIML) meeting on 18 October 2021. The approval process is underway in CODATA. The joint statement has been aligned to the text of Draft Resolution B and to make it more inclusive for organizations including the International Laboratory Accreditation Cooperation (ILAC) and the International Organization for Standardization (ISO). A list of potential signatory organizations was presented.

The President recalled that CODATA and ILAC had asked how they can participate and what the joint statement might mean for each organization. Prof. Ullrich added that following the signing of the joint statement, it is expected that each organization will be offered an opportunity to discuss how they can contribute to the digital transformation in the international scientific and quality infrastructure within the upcoming forum “Metrology and Digitalization”.

Decision CIPM/110-22 The CIPM approved the Joint Statement of Intent on the digital transformation in the international scientific and quality infrastructure and noted the intent for the Joint Statement to be signed by the OIML, CODATA and IMEKO. Other major stakeholders will be approached before the next quadripartite meeting of the BIPM, ILAC, ISO and OIML scheduled for March 2022.

Prof. Ullrich reported that a working exchange was being established between the BIPM, the Expert Group of the CIPM-TG-DSI, DCC Experts and the CODATA Digital Representation of Units of Measure (DRUM) group.

The four parties will meet quarterly, with the first meeting scheduled for late October 2021. The goal of the joint group is to achieve closer technical exchanges to come to urgently needed recommendations, such as on unit representations for practical use. This is particularly important because CODATA is working on the digitalization of physical constants, the NMIs are anticipating the adoption of digital calibration certificates (DCCs), and the BIPM is digitalizing the KCDB. Such tasks will require close interaction between the four partners to agree on standardized metadata.

Prof. Ullrich recalled his earlier presentation on the core metrological terms of ‘quantity’, ‘unit’ and ‘quantity value’ for which there are three different proposals for each definition. He noted that this issue will require further discussion about the applicability of the definitions within the SI Digital Framework. The aim is to have received feedback on the terms and definitions from the CIPM-TG-DSI and the Expert Group for submission to the CIPM by January 2022 and to JCGM WG2 after the decision of the CIPM in March.

He presented plans for a survey on the needs and experiences of NMIs and DIs on the digital transformation. The survey will be conducted through the CCs and will focus on plans for the adoption of DCCs and the level of engagement with the Digital SI Framework. It was noted that the first round of the survey will be conducted among a limited group of the CCs who are most strongly involved, with the remainder being included in a second round.

Decision CIPM/110-23 The CIPM supported the plan for a Consultative Committee survey on NMI/DI plans for digital calibration certificates and engagement with the Digital SI Framework.

Prof. Ullrich informed the CIPM that the IMEKO M4D conference is scheduled to be held on 19-21 September 2022. This international conference on metrology and the digital transformation is being organized by IMEKO Technical Committee 6 “Digitalization”. Prof. Ullrich said that the IMEKO Secretary General had written to him to thank the CIPM for its support for the event and to invite a member of the CIPM to participate in the International Programme Committee (IPC) for the conference. It was agreed that Dr Steele should act as the representative.

Decision CIPM/110-24 The CIPM nominated Dr Steele as its representative for the IMEKO TC6 International Conference on Metrology and Digital Transformation (M4D).

OIML-BIPM Joint Task Group

Dr Richard said that document [CIPM/2021-II-06-e](#) “*Report on the work of the OIML-BIPM Joint Task Group*” was available on the CIPM members’ working area of the BIPM website for noting.

Proposals for membership and observership of the Consultative Committees

The Secretary presented the proposals for membership and observership of the Consultative Committees. The proposals and supporting information are available in document [CIPM/2021-II-06-f](#). Following a discussion, Decision CIPM/110-21 was adopted.

Decision CIPM/110-21 The CIPM accepted the following changes to the members and observers to the Consultative Committees:

- observership to CCM for NSC - IM (Ukraine) and CMS/ITRI (Chinese Taipei)
- observership of CCRI for NSC - IM (Ukraine)
- membership of CCU for NSC - IM (Ukraine)

Mr Henson recalled that the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty

Organization (CTBTO) had applied for liaison status to the CCRI. He recalled that the BIPM-CTBTO Practical Arrangement, which had already been approved by the CIPM, includes an invitation to participate in meetings of the Consultative Committee for Acoustics, Ultrasound and Vibration (CCAUV) and CCRI.

7. CIPM STRATEGY

The President introduced document [CIPM/2021-II-07.01](#) “*Towards a CIPM Strategy 2030+ Draft for CIPM discussion October 2021*”, which is available on the CIPM members’ working area of the BIPM website.

He showed the presentation on the CIPM Strategy to be given to the meeting of NMI Directors and State Representatives on 21-22 October. The President described the current status and outputs of the five thematic areas. He said that the proposed timetable for development of the CIPM strategy for 2030 and beyond is for the 27th meeting of the CGPM (2022) to give a mandate to the CIPM to develop proposals and to consult on a broader strategy. Between 2022 and 2026 the CIPM will consult with Member States and the wider metrology community on a new vision and mission model for broader participation, in parallel with investigating best practice for international organizations. The CIPM strategy for 2030 and beyond will then be finalized and presented to the metrology community in 2025. It is anticipated that the strategy will be ready for implementation at the 28th meeting of the CGPM (2026) subject to agreement with the Member States.

A summary was given of the draft resolutions to be presented to the 27th meeting of the CGPM as well as the main outputs of the five Sub-Committees for the thematic areas (SC1 to SC5).

Prof. Rietveld asked if the summary report of the document “*Towards a CIPM Strategy 2030+ Draft for CIPM discussion October 2021*” should be published alone or if it should be published with its annexes. The President replied that the five Sub-Committees should decide how to publish the document, noting that the Annexes contain a significant amount of detail on the work that they have carried out. Prof. Rietveld added that cutting the annexes would make the document more readable. He will discuss the issue with the members of each of the five Sub-Committees to reach a decision.

The President asked if the CIPM agreed with the proposals for the development of the strategy. Dr Laiz suggested that the document “*Towards a CIPM Strategy 2030+ Draft for CIPM discussion October 2021*” should make it clear that the strategy does not include any proposals to modify the Metre Convention. This clarification should also be communicated to the State Representatives at their meeting on 21-22 October. Dr Dimarcq asked for Draft Resolution D “*On the use and future development of UTC*” to be explicitly mentioned at the meeting of NMI Directors and State Representatives because of its importance in relation to future needs in digitalization. The President agreed to mention this in his presentation and to inform participants that further details will be given during Dr Dimarcq’s presentation.

The President thanked the Sub-Committees for the work that they had put into developing the document “*Towards a CIPM Strategy 2030+ Draft for CIPM discussion October 2021*”. He remarked that input into the Terms of Reference for the proposed cross-cutting Task Groups/forums should be submitted by March 2022.

8. BIPM STRATEGY

The Director started by reminding the CIPM that the BIPM strategy (document [CIPM/2021-II-08.01](#) “*Strategic Plan (2022) for the BIPM*”) and the Long-term financial plan (document [CIPM/2021-II-05.05](#)) will be the essential inputs to the development of the Draft Work Programme for 2024-2027. The long-term financial plan

had been discussed under §5. He added that CIPM agreement is required for both documents.

The BIPM strategy document has been under development since February 2021 and a timeline for the development of key documents for decision at the 27th meeting of the CGPM (2022) was presented. The strategy had been sent to the NMIs and other stakeholders for comment and ten sets of comments had been received. The comments had been discussed with the department directors and shared with the CIPM bureau. He listed the points that had been added to the draft strategy as a result of this consultation exercise.

The Director added that following a preliminary review of the independent salary survey, which was conducted for the CIPM *ad hoc* Working Group on Conditions of Employment, a study should be undertaken into the possibility of changing the structure of expatriate allowances to put emphasis on ensuring recruitments can be made from all parts of the metrology world. In addition, the survey has triggered a discussion on whether staff contracts in the long term could facilitate more mobility of staff between NMIs and the BIPM. Both suggestions have been included in the BIPM strategy.

The Director invited comments. Following a brief discussion, the CIPM agreed the BIPM strategy (2022).

9. UPDATE ON PROGRESS WITH THE BIPM WORK PROGRAMME

The Director said that the Progress report on the BIPM Work Programme (2020-2023) is available on the CIPM members' working area of the BIPM website (document [CIPM/2021-II-09](#)) and invited comments. The good progress across all areas of the BIPM work programme, despite the difficulties associated with the Covid-19 pandemic, was noted. Dr Liew complimented the BIPM on organizing activities of direct relevance to the Covid-19 pandemic, in particular the activities of the CCQM and Joint Committee for Traceability in Laboratory Medicine (JCTLM) such as the CCQM Workshop: "*A roadmap for metrology of infectious disease and future pandemic readiness*".

Dr Laiz congratulated the BIPM on the advances it has made towards the digital transformation and particularly the development of Application Programming Interfaces (APIs) for the KCDB and the Time Department database. In addition, he asked about progress on the development of graphene-based quantum Hall resistance references at the BIPM. Dr Stock replied that different graphene samples have been evaluated. The metrological-grade samples can be compared to the GaAs standards with an extremely low uncertainty. He added that there is a requirement for guidelines on how these samples can be used in metrological applications. The timeline for the use of graphene in metrology applications is difficult to predict, although two to three years may be possible. Quantization of graphene QHE samples has been demonstrated for a flux density of 5 T or below and at the temperature of liquid helium up to 4.5 K.

The role of the BIPM Capacity Building and Knowledge Transfer Programme (CBKT) in fostering the development of metrology in developing economies was commended by Dr Park.

The President thanked the Director and the Directors of the BIPM departments for the report.

10. CIPM GOVERNANCE

Dr Richard said that the proposed amendments to the CIPM Rules of Procedure are detailed in a document included in the zipped file [CIPM/2021-II-10.01](#). The zipped file includes the full text of the proposed amended Rules of Procedure (Version 1.1). The suggestion to make the amendments had originated in discussions with

the Working Group of Member State Representatives. The CIPM President had subsequently asked the BIPM Director to obtain an independent legal opinion on the legal principles concerning the competence of the organs of the BIPM to enter into legal agreements. Following receipt of this legal opinion in May 2021, the BIPM legal advisor was asked to prepare legal advice on the consequences of the legal opinion for the Rules of Procedure of the CIPM. The result is a proposal to delete Rules 18.3 and 18.4.

The President thanked Dr Richard and invited comments. Following a comprehensive discussion, Decision CIPM/110-25 was agreed.

Decision CIPM/110-25 The CIPM approved edition 1.1 of the CIPM Rules of Procedure. The CIPM requested the BIPM Director to publish the amended CIPM Rules of Procedure and to update the Compendium accordingly.

The President reported that the draft “*Code of conduct for CIPM members*” (document [CIPM/2021-II-10.02](#)) is available on the CIPM members’ working area of the BIPM website for noting. He asked CIPM members to send comments to the President, the Secretary, the Director, Dr Richard and Mr Rojas Ceballos for discussion at the next meeting of the CIPM in 2022.

The Director informed the CIPM that document [CIPM/2021-II-10.03](#) “*Note to the CIPM: Enhancing open access to information to BIPM staff*” is available on the website for noting. Comments on the document should be sent to the President, the Secretary, the Director and Mr Rojas Ceballos so that a revised version can be drafted for discussion at the next meeting of the CIPM in 2022.

11. PLANS FOR THE 27TH MEETING OF THE CGPM

The Director gave a presentation that included document [CIPM/2021-II-11.01](#) “*Timing of CGPM agenda items for in-person and on-line meeting formats*”, which is available on the CIPM members’ working area of the BIPM website. He said that the expectation is that the 27th meeting of the CGPM will be held as a hybrid meeting during the week beginning 14 November 2022.

He explained two possible plans for the timing of the CGPM. Plan A is for a 4-day in-person format with the timings based on those at the 25th meeting of the CGPM (2014). Plan B is for a 4-day on-line/hybrid format based on timings adapted for participants in all world time zones. A full breakdown was presented of the time allotted to formalities and governance matters, reporting, introductions to resolutions, and decision making. He noted that if Plan B is adopted, it would not be possible to include presentations by external speakers and the reports from the CC Presidents.

The Director recalled that the *Palais des Congrès de Versailles* has been booked for 13-16 November 2022 to host the conference. Prof. Patrick Flandrin, the President of the *Académie des Sciences* 2021-2022, has agreed to act as the President of the 27th meeting of the CGPM. The Director informed the CIPM that the venue has been fully refurbished since the 26th CGPM (2018) and now includes the necessary IT infrastructure to host a hybrid meeting. A number of hybrid meeting platforms are being considered by the BIPM Meetings Office.

A communication plan, including key dates during the run up to the 27th CGPM (2022), was presented.

The President thanked the Director and asked if there were any comments. The added value of external speakers at the General Conference was emphasized and it was suggested that rather than dropping their contributions from a hybrid meeting, their presentations could be pre-recorded and made available on-line. The same suggestion was put forward for the reports from the CC Presidents.

It was proposed that an additional programme may be required for on-site attendees at a hybrid meeting, otherwise the short daily sessions may not provide sufficient justification to travel to a four-day conference. The extra programme could include broadcasting pre-recorded presentations to on-site delegates. The possibility of the CC Presidents giving their reports outside of the ‘core’ daily sessions of 2-3 hours at a hybrid meeting was proposed to ensure that there is a full daily programme for on-site delegates. These presentations would either be in-person or pre-recorded.

The President summarized the discussions by saying that the CIPM view is that every effort should be made to hold the 27th CGPM (2022) as an in-person meeting with contingency plans being made for a hybrid meeting in case the global pandemic situation makes it impossible for some Member States to send delegates. The final decision on the meeting format will be made by the CIPM at its meeting in June 2022. This proposal will be communicated clearly to the meeting of NMI Directors and State Representatives on 21-22 October.

The Director said that a Special Procedure to regulate the conduct of the 27th meeting of the CGPM, if it is held on-line or as a hybrid, has been drafted (see document [CIPM/2021-II-11.02](#)). The procedure has been drafted by Mr Rojas Ceballos and it considers the practices followed by other International Organizations, particularly the World Organisation for Animal Health (OIE). The purpose of the Special Procedure is to allow the meeting to be held in a hybrid format, permitting both in-person and remote participation of representatives of State Parties and also representatives from Associate States and Economies of the CGPM and invited observers. The procedure includes information on how to formalize the conduct of a hybrid meeting. It is proposed that the draft of the Special Procedure will be sent out with the convocation in early 2022. State Representatives will be asked to indicate their agreement to the Special Procedure in advance of the General Conference. The Special Procedure would need to be the first item on the agenda of the Conference to allow for its adoption. It was stressed that the Special Procedure is exceptional and would only apply to the 27th meeting of the CGPM.

The Director said that decision making at a hybrid meeting will require careful consideration. Historically, decision making at a General Conference has been via three different methods:

- Election by secret ballot, which is used for the election of the CIPM and CEC. It is proposed that an independent polling company will be contracted to provide an on-line voting platform.
- Roll-call voting, which is used for the adoption of the dotation. It was noted that this could be very time-consuming at a hybrid or on-line meeting.
- Raising of hands (and counting votes against or abstained). This is the most common decision-making procedure at the CGPM. At a hybrid or on-line meeting, it will be necessary to ensure that there is a strong consensus before using this method.

The Director invited comments. It was suggested that to simplify the voting on the dotation at a hybrid meeting, representatives from the embassies in Paris of each Member States should be invited to the *Palais des Congrès de Versailles* to participate in the voting. The question was raised of how to deal with absentee voting in a hybrid meeting and the principle of ‘no votes against’ in the voting for the dotation.

The President introduced the six Draft Resolutions ([CIPM/2021-II-11.03](#)):

- Draft Resolution A. “On the evolving needs for metrology”
- Draft Resolution B. “On the global digital transformation and the International System of Units”
- Draft Resolution C. “On the extension of the range of SI prefixes”
- Draft Resolution D. “On the use and future development of Universal Coordinated Time (UTC)”
- Draft Resolution E. “On the future redefinition of the second”
- Draft Resolution F. “On universal adherence to the Metre Convention”

The President said that the Draft Resolutions did not require final approval at the current meeting. It was noted that the Draft Resolutions had not yet received an editorial review by the BIPM. The main points of the discussion were as follows.

Draft Resolution A No comments.

Draft Resolution B It was suggested that the phrase ‘as a matter of urgency and priority’ should be deleted from the ‘encourages’ section so that it does not imply that this resolution is more important than the others. The President proposed an amendment to the ‘invites’ section by changing Regional Metrology Organizations to ‘other stakeholders’ to make it more inclusive. He added that more emphasis may be needed on the role of the SI in the digitalized world. Prof. Ullrich said that the CIPM Task Group on the Digital SI will meet on 24 November 2021 and any feedback on Draft Resolution B should be sent to him by 16 November for consideration.

Draft Resolution C A few minor edits were suggested.

Draft Resolution D This draft resolution had been discussed in §6. There was a discussion on whether to change the heading ‘decides’. It was remarked that retaining ‘decides’ will send out a strong message from the CGPM that there will be a change to the maximum value for the difference (UT1-UTC) in the future and that the stakeholders will be included in deciding how to implement the change.

Draft Resolution E Dr Dimarcq presented the background to this draft resolution. It was suggested that the wording in the ‘encourages’ section may need to be clarified. Dr Dimarcq said that the intention in this section is that the preferred option for the redefinition of the second will be proposed at the 28th meeting of the CGPM in 2026. The fulfilment of the criteria for the redefinition will be checked before 2030 and the proposal for the redefinition would be validated at the 29th meeting of the CGPM, also in 2030. The new definition would be implemented after 2030. The President commented that the wording of the ‘invites’ section should be checked to consider the likelihood that the development of new national measurement standards will be required. It was suggested that the language used in the resolutions pertaining to the previous redefinitions could be used as a template, in particular the two-stage process of selecting the set of fundamental constants followed by the choice of values.

Draft Resolution F Dr Steele explained the rationale behind the draft resolution. There was a suggestion that the second bullet point in the ‘recognizing’ section is too long and may need clarification. The President commented that the ‘decides’ section may be better presented as an ‘invites’ section.

The President closed the discussion by asking the Director to take the drafts forward through the editing process and taking account of the comments made by the CIPM.

12. OTHER MEETINGS

The Secretary presented the final draft agenda of the 21st meeting of NMI Directors and Member State Representatives, to be held on 21-22 October 2021 (document [CIPM/2021-II-12.01](#)).

The President proposed the following dates for CIPM meetings in 2022:

- 22-24 March 2022 at the BIPM.
- 21-22 June 2022 on-line.

13. ANY OTHER BUSINESS

Dr Castelazo raised the issue of taking decisions between meetings of Consultative Committees. He recalled that the CCL meets every three years and that some decisions have to be taken during the meetings. However, there are administrative points that can arise between meetings that need to be dealt with, and if these occur immediately after a meeting, there can be a three-year delay before they are resolved. For example, the protocol for the ongoing CCL-K11 comparison required an update immediately after the last meeting of the CCL in 2018. Following the practice at the CCL, such changes to protocols require approval by the relevant CC and in this case, there would have been a delay until the following meeting in 2021. Hence a decision was taken by correspondence, a course of action that is not defined in the guidelines in document CIPM-D-01 (Rules of procedure for the Consultative Committees (CCs) created by the CIPM, CC working groups and CC workshops. Version 3.1). He added that some issues cannot be dealt with by correspondence and require discussion at CC meetings. Dr Castelazo said that an additional problem is that there is no formal membership of a CC between meetings.

The President thanked Dr Castelazo and invited comments. Dr del Campo Maldonado recalled that the CCT has approved many documents by correspondence between meetings, for example, those related to the realization of ITS-90. She agreed that clarity is needed to define who constitutes the membership with the authority to take decisions between meetings. The Director said that the way in which the rules are interpreted and implemented varies between the Consultative Committees. The CCL has many procedures in place that define what can and cannot be decided at the CC level, whereas other CCs may be more flexible. Certain committees only take high-level strategic decisions at the CC level. He added that the move to on-line meetings during the Covid-19 pandemic has been very successful, however, the document CIPM-D-01 has not been adapted to consider what might be reasonably achieved on-line. It was suggested that CIPM-D-01 should be reviewed in its entirety by the CIPM to take account of what can be carried out on-line, particularly §6.

The President suggested that Dr Castelazo should discuss the issue with the other CC Presidents. Dr Castelazo agreed, but commented that CIPM-D-01, particularly clause 3.1.o, may require clarification concerning the duties of a CC when approving key comparisons. The President concluded the discussion by saying that CIPM-D-01 should be reviewed and updated.

The Director reported that following the signing of the CODATA MoU on 11 October 2021, there is now an opportunity to elect a CIPM member to represent the BIPM at the CODATA General Assembly. It was agreed that Dr Steele will take on this responsibility.

<p>Decision CIPM/110-26 The CIPM nominated Dr Steele as its representative to the General Assembly of CODATA.</p>
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The President thanked the CIPM and closed the meeting.