

BIPM Liaison Report

to the SIM General Assembly (SIM GA)

November 2021

THE VISION, MISSION AND OBJECTIVES OF THE BIPM

The BIPM is the intergovernmental organization established by the Metre Convention, through which Member States act together on matters related to measurement science and measurement standards.

Its **vision** is to be universally recognised as the world focus for the international system of measurement.

Its **mission** is to work with the NMIs of its Member States, the RMOs and strategic partners world-wide and to use its international and impartial status to promote and advance the global comparability of measurements for:

- Scientific discovery and innovation,
- Industrial manufacturing and international trade,
- Improving the quality of life and sustaining the global environment.

THE OBJECTIVES OF THE BIPM

- **To represent the world-wide measurement community**, aiming to maximize its uptake and impact.
- **To be a centre for scientific and technical collaboration between Member States**, providing capabilities for international measurement comparisons on a shared-cost basis.
- **To be the coordinator of the world-wide measurement system**, ensuring it gives comparable and internationally accepted measurement results.

Fulfilling our mission and objectives is underpinned by our work in:

- *capacity building*, which aims to achieve a global balance between the metrology capabilities in Member States;
- *knowledge transfer*, which ensures that our work has the greatest impact.

KEY HIGHLIGHTS

- As of January 2021, the BIPM had 63 Member States, and 39 Associate - Estonia became a Member State and Cambodia became an Associate. Cambodia is the latest signatory of the CIPM MRA.
- The first CCM key comparison of realizations of the kilogram, CCM.M-K8.2019, was completed. Traceability for the SI unit of mass is taken from the consensus value of the kilogram commencing 1 February 2021.
- NMIs demonstrated a high accuracy reference measurement system for SARS-CoV-2 testing in a comparison study organized by the CCQM Working Group on Nucleic Acid Analysis.
- Revision of the CIPM MRA policy and guideline documents has been completed and the updated documents were published in January 2021.
- In January 2021 the BIPM-ILAC joint webinar "Mining KCDB 2.0 in the context of accreditation" was held welcoming more than 600 experts.
- In February 2021 virtual workshop on 'The SI in FAIR digital data' was organized involving 600 participants.
- In April 2021 the Time Department achieved the milestone of publishing the 400th edition of *Circular T*.
- The BIPM's new website, based on an updated Content Management System and with a new graphic design, was released to the public in April 2021.
- The BIPM's e-learning platform was launched in April 2021. The CIPM MRA course modules are freely available to all.
- Projects to facilitate machine-readability of data were launched including an API for the KCDB.
- The [World Metrology Day](#) theme for 2021 was "Measurements for Health". The theme for 2022 will be related to digital transformation.
- In June 2021 GULFMET became fully recognized as an RMO within the CIPM MRA.
- In June 2021 the CIPM decided to establish a Sectorial Task Group on Climate Change and Environment.
- BIPM-CTBTO Practical Arrangement and BIPM-CODATA MoU was signed in June and in October 2021.
- The online [Workshop on Metrology for Climate Action](#), to be hosted by the BIPM and the WMO on 26-30 September 2022, is now open for preregistration.
- The dates for the 27th meeting of the CGPM have been proposed as 14-18 November 2022 at the Palais des Congrès de Versailles.

THE SI

The new definition of the kilogram, based on the fixed numerical value of the Planck constant, came into force on 20 May 2019. It gives in principle any National Metrology Institute (NMI) the possibility to realize the kilogram by using a Kibble or joule balance or by applying the X-ray crystal density technique.

The first key comparison of realizations of the kilogram, CCM.M-K8.2019 has been completed. Following completion of the first key comparison of realizations of the kilogram, CCM.M-K8.2019, the internationally coordinated dissemination of the kilogram entered into a new phase on 1 February 2021. The traceability of the mass unit to the Planck constant is taken from the 'consensus value' of the kilogram.

Considering the essential role of the International System of Units (SI) in providing confidence in the accuracy and comparability of measurements, the CIPM anticipates that maintaining and building confidence in global measurement will require the creation of a fully digital representation of the SI.

In order to help scope this initiative, the BIPM organized a virtual workshop on 'The International System of Units (SI) in FAIR digital data' for 600 participants in February 2021. Videos from the BIPM Workshop "The International System of Units (SI) in FAIR digital data" are now available on the [BIPM YouTube page](#). The event involved industrial stakeholders as well as international organizations active in data science to exchange ideas about the steps needed to agree basic standards for a "Digital SI" framework that will support activities by industry and IOs alike.

The CIPM is now undertaking the development, promotion, and implementation of this framework, which will include a globally accepted digital representation of the SI, compatible with existing, emerging, and future digital data exchange standards and protocols.

Time Department achieved the milestone of publishing the 400th edition of Circular T in April 2021. The BIPM took over responsibility for calculating UTC from the Bureau International de l'Heure (BIH) in 1988. Since 1988, the accuracy of UTC has improved from 10^{-13} to 10^{-16} and the number of laboratories that supply data for the calculation of UTC has increased to 90.

THE CIPM, CONSULTATIVE COMMITTEES, JOINT COMMITTEES

Sessions I and II of the 110th meeting of the CIPM were held online in June and in October 2021. All CIPM Decisions are available on the BIPM webpage at

<https://www.bipm.org/en/committees/ci/cipm/outcomes>.

The CIPM decided to establish a Sectorial Task Group on Climate Change and Environment, as proposed by the Sub-Committee on Strategy SC1.

The CIPM President has asked NMIs to share examples of how their work is supporting the fight against the COVID-19 pandemic.

The responses received are listed in a dedicated 'Metrology in the fight against Covid-19' repository,

<https://www.bipm.org/en/metrology-in-the-fight-against-covid-19>

Twenty-one National Metrology Institutes and expert laboratories from sixteen countries have demonstrated that highly accurate measurements of the amount of the SARS-CoV-2 viral RNA can be achieved worldwide using reverse transcription-digital PCR (RT-dPCR). The ability to accurately measure the amount of the viral cause of COVID-19 with global equivalence will considerably improve testing confidence and support countries in effectively tackling the pandemic.

The comparison study (CCQM-P199.b) organized by the CIPM CCQM Working Group on Nucleic Acid Analysis (CCQM-NAWG), and coordinated by the National Measurement

Laboratory at LGC (UK), NIM (China), NIBSC (UK) and NIST (US), required quantification of the same viral genetic sequences targeted by many of the diagnostic tests.

In the longer term, these capabilities have far wider implications as they can provide a global foundation for ensuring the accuracy of associated molecular methods whether applied to COVID-19, as preparation for any future global pandemic or for wider diagnostic uses such as in testing for antibiotic resistance or cancer.

A Task Group for Greenhouse Gas Scale Comparisons has been established within the Working Group on Gas Analysis (CCQM-GAWG) of the Consultative Committee for Amount of Substance: Metrology in Chemistry and Biology (CCQM) to increase global accessibility to standards for underpinning long-term monitoring and emissions authentication of CO₂ in the atmosphere.

Digital transformation

Digital transformation projects are under way, including completion of the Application Programming Interface (API) for the KCDB 2.0 and the preparation of a digital version of the 9th edition of the SI brochure.

The API is accessible through the KCDB page of the BIPM website, and a manual is available explaining how it can be used by software developers. This is a first step to demonstrate how metrology information can be made available to support the objective of providing digital calibration certificates that are based on traceability within the context of the CIPM MRA. It aims to enable digital certificates to be used as part of the application of the existing infrastructure for the world-wide recognition and acceptance of national calibration and measurement capabilities. Projects have been launched to facilitate machine-readability of data in our databases and to establish machine-readable formats for our reference publications. These developments present many advantages. They enable machines to communicate directly between each other

and they can be integrated in languages other than English.

The Time Department has developed an API, which is currently at the beta testing stage, that will facilitate machine-readability for its database. Positive feedback has already been received from several NMIs.

JCRB

The 43rd and 44th meetings of the JCRB were held online in March and September 2021. All outcomes of these meetings are available on the BIPM webpage at

<https://www.bipm.org/en/committees/jc/jcrb>.

JCGM

JCGM/WG2 VIM4 Webinar was held on 6 May 2021 which gave an overview of the Committee Draft of the new edition of the International Vocabulary of Metrology (VIM4). More than 400 attendees watched the webinar. The panel gave presentations on the Joint Committee for Guides in Metrology (JCGM) and its Working Group 2 (WG2 - VIM Committee); the VIM4 Committee Draft.

The 27th meeting of the CGPM (2022)

The dates for the 27th meeting of the CGPM have been proposed as 14-18 November 2022 at the Palais des Congrès de Versailles. The format of the meeting (physical, hybrid or online) is to be confirmed.

INSTITUTIONAL NEWS

Liaison with Member States and Associates of the CGPM

As of January 2021, the BIPM had 63 Member States, and 39 Associate States and Economies of the General Conference on Weights and Measures (CGPM).

The list of Member States and Associates of the CGPM is annexed to this report and is also available at the BIPM website.

Liaison with international organizations

The BIPM has a series of ongoing institutional and technical interaction with over 30 international organizations and international bodies.

World Metrology Day

Each year on 20 May, the world-wide metrology community celebrates the day the *Metre Convention* was signed in 1875. The project is run jointly by the BIPM and the OIML. The theme for 2021 is "*Measurements for Health*". This theme was chosen to create awareness of the important role measurement plays in health, and thus in the wellbeing of every one of us. The 2021 poster was designed in collaboration with the GULFMET RMO and specifically with SASO, Saudi Arabia. The poster was translated into more than 20 languages and information on 36 national celebratory events was provided on the 2021 World Metrology Day Resource Website <http://www.worldmetrologyday.org/>.

Safe and effective cancer therapy using ionizing radiation is only possible due to accurate measurement of the radiation dose delivered to the tumour and surrounding tissues. These measurements are particularly complex for radionuclide therapy and involve measuring the activity of the radionuclide administered to the patient, determining the distribution of the radiopharmaceutical in the body and estimating the radiation dose delivered. This field, which combines biology, dosimetry and radionuclide metrology, is at

an early stage. To mark World Metrology Day, the Consultative Committee for Ionizing Radiation (CCRI) and the BIPM organized a workshop on metrology for radionuclide therapy on 20 May. The aim is to identify the current needs and gaps in metrology. Speakers are from the NIST, the University of Würzburg, the Medical University of Marburg, the NPL and the IAEA.

On the occasion of the World Metrology Day 2021 the Joint Committee for Traceability in Laboratory Medicine (JCTLM) shared the videos on measurements in Laboratory Medicine for broader perspectives on the importance of metrological traceability in laboratory medicine for individual patients and for risk assessments in populations, available at <https://www.bipm.org/en/committees/jc/jctlm/jctlm-wmd-2021>

The theme for World Metrology Day 2022 will be related to digital transformation, and the poster will be under the auspices of COOMET.

Liaison with the OIML

The BIPM contributed to the update of the document OIML D1, *Elements for a Law on Metrology*, which, after adoption, was published by the BIPM in 2021 as a joint BIPM/OIML publication with its new title reflecting the broader nature of the document: *National Metrology Systems Developing the institutional and legislative framework*.

The Joint Task Group between the BIPM and the OIML was set up as outlined in Decision CIPM/109-15 (2020). The Task Group met in December 2020, March 2021, June 2021, September 2021 where it discussed joint representation for liaison activities, joint initiatives, promotion of metrology, and promotion of digital transformation. The Task Group is considering a joint event to celebrate the 150th anniversary of the signing of the Metre Convention and the 70th anniversary of the OIML in 2025.

Liaison with ILAC

The BIPM and ILAC cooperate to ensure efficient and effective dissemination of metrological traceability, particularly to the SI, and also address the special case of accredited national metrology laboratories.

The BIPM and ILAC welcomed more than 600 experts from Accreditation Bodies and Accredited Laboratories around the world who participated in the webinar on "Mining KCDB 2.0 in the context of accreditation".

The joint BIPM-ILAC webinar was held on 21 January 2021. The main aim of the webinar was to demonstrate how to get the most out of the revised CIPM MRA database (KCDB), and to provide some context about how the data is quality assured.

Liaison with the OECD

The OECD established the *Partnership of international organisations for effective international rulemaking (IO Partnership)* as a voluntary platform of IOs, academics and OECD Regulatory Policy Committee delegates, to exchange good practices and promote greater quality, effectiveness, and impact in international rulemaking. The *Compendium of International Organisations' Practices: Working Towards More Effective International Instruments*, available at <https://www.oecd.org/governance/better-international-rulemaking/compendium/>, the first common tool developed within IO Partnership collaboratively by some 50 IOs to improve the quality was launched during the 8th Annual IO Meeting on 13 September 2021.

The Compendium lists the BIPM practices such as World Metrology Day, CBKT Programme, CIPM MRA Review, JCGM, etc. in five core focus areas.

The BIPM is represented in WG2 (implementation of international instruments), WG4 (evaluation of international instruments) and WG5 (IO coordination – as a focal point).

Formalization of liaisons

The Practical Arrangement between the BIPM and the Preparatory Commission of the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) on collaboration on the metrological traceability of measurements of infrasound, seismic activity and radioactivity was signed in June 2021.

The Memorandum of Understanding between the BIPM and the Committee on Data (CODATA) of the International Science Council (ISC) was signed in October 2021.

CIPM MRA AND KCDB

The CIPM MRA is the '*Mutual Recognition Arrangement of National Measurement standards and of calibration and measurement certificates issued by National Metrology Institutes*'. Participation in the CIPM MRA continues to grow: it has been signed by representatives of 102 institutes – from 63 Member States, 39 Associates of the CGPM (Cambodia is the latest signatory), and four international organizations – and covers a further 153 institutes designated by the signatory bodies.

As of October 2021, the [KCDB](#) included a total of 25 987 CMCs. There are 1102 key comparisons and 645 supplementary comparisons registered in the KCDB.

The documents supporting the CIPM MRA have been revised and published on 11 January 2021. This follows the international review of the Arrangement in 2016 and the update of the supporting documents, which was initiated in 2018.

CAPACITY BUILDING AND KNOWLEDGE TRANSFER (CBKT) PROGRAMME

The BIPM CBKT Programme (launched in 2016) is aimed to increase the effectiveness within the world-wide metrology community of those Member State and Associates with emerging metrology systems.

So far, around 500 participants from 102 countries, covering all six RMOs, have benefited from the CBKT initiatives. At the time of writing, over 76 % of Member States and Associates have participated in the CBKT Programme (as trainees, lecturers and sponsors).

The BIPM CBKT programme continues to support national metrology institute (NMI) and designated institute (DI) staff that are new to the KCDB 2.0 process, through a series of online training sessions. In April 2021, the BIPM launched an e-learning platform. This platform is designed to offer tailored courses related to the CIPM MRA mechanisms and other scientific metrology activities. A significant advantage of this platform is that participants have 24-hour access on any device. The first courses related to the CIPM MRA, and chemical metrology activities are now available for the NMI/DI community.

Chemical metrology activities include on-line knowledge transfer courses and studies on Metrology for Food Safety focusing on primary reference materials and calibration solution characterization. The first course covers

'Quantification of Non-structurally Related Impurity Content in Organic Pure Materials', previously provided as an on-site course for National Metrology Institutes and Designated Institutes developing mycotoxin standards for food testing applications.

Since May 2020, fifteen online projects have been organized involving more than 1310 participants from NMI/DI community and 604 from ILAC community.

Metrology for Safe Food: Pesticides and Residues was launched in 2021.

Metrology for Clean Air: on-line Knowledge Transfer Programme on the application of FT-IR for Gas Standard Characterization was launched in 2021 as a replacement for the on-site training secondments for NMIs scientists, which have been in operation until 2020. Metrology for Clean Air: on-line Knowledge Transfer Programme on the Dynamic gas standard generation will be launched in 2022.

Metrology for Laboratory Medicine: Peptide standards will be launched in 2023.

Full details of the BIPM CBKT Programme are available at:

<https://www.bipm.org/en/committees/cb/cbkt>

For highlights of the BIPM scientific programme for the period, please refer to the BIPM Annual Review 2020/2021:

<https://www.bipm.org/en/publications/annual-review>

ANNEX

63 Member States

(as of January 2021)

Argentina	Korea (Republic of)
Australia	Lithuania
Austria	Malaysia
Belarus	Mexico
Belgium	Montenegro
Brazil	Morocco
Bulgaria	Netherlands
Canada	New Zealand
Chile	Norway
China	Pakistan
Colombia	Poland
Croatia	Portugal
Czechia	Romania
Denmark	Russian Federation
Ecuador	Saudi Arabia
Egypt	Serbia
Estonia	Singapore
Finland	Slovakia
France	Slovenia
Germany	South Africa
Greece	Spain
Hungary	Sweden
India	Switzerland
Indonesia	Thailand
Iran	Tunisia
Iraq	Turkey
Ireland	Ukraine
Israel	United Arab Emirates
Italy	United Kingdom
Japan	United States of
Kazakhstan	America
Kenya	Uruguay

39 Associates of the CGPM (States and Economies*)

(as of January 2021)

Albania	Hong Kong (China)*
Azerbaijan	Ghana
Bangladesh	Latvia
Bolivia	Luxembourg
Bosnia and Herzegovina	Malta
Botswana	Mauritius
Cambodia	Moldova
CARICOM* <i>(11 members: Antigua and Barbuda Barbados Belize Dominica Grenada Guyana Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Suriname Trinidad and Tobago)</i>	Mongolia
	Namibia
	North Macedonia
	Oman
	Panama
	Paraguay
	Peru
	Philippines
	Qatar
	Seychelles
	Sri Lanka
	Sudan
Chinese Taipei*	Syrian Arab Republic
Costa Rica	Tanzania
Cuba	Uzbekistan
Ethiopia	Viet Nam
Georgia	Zambia
Jamaica	
Kuwait	



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