Draft Work Programme 2028-2031 Version B

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BIPM

October 2026

Executive Summary

Strategic Context and Purpose

The BIPM Work Programme 2028–2031 turns the strategic direction set out in the **BIPM Strategic Plan (2026)** and the **CIPM Strategy 2030+** into a coherent programme of activities. It ensures:

- continuity of critical infrastructural scientific metrology services to Member States that underpin the use of the International System of Units (SI) and Coordinated Universal Time (UTC); and
- responsiveness to evolving needs to meet global challenges with fit-for-purpose measurement capabilities.

The Work Programme reaffirms the BIPM's foundational role as the **world focus for the SI and UTC** in line with its three objectives to be:

- the representative of the international scientific metrology community in a range of forums;
- the centre for scientific and technical collaboration between National Metrology Institutes (NMIs); and
- the trusted, impartial coordinator of international measurement comparability.

The Work Programme is structured around these three primary objectives of the BIPM, complemented by a fourth pillar focused on stewardship of resources.

Two cross-cutting themes are embedded across all domains:

- Digital transformation, enabling machine actionable metrology;
- Capacity building and knowledge transfer, ensuring global balance and sustainability.

Partnership Opportunities

The Strategic Plan for the BIPM Work Programme (2026) identifies five complementary partnership opportunities to increase impact, improve flexibility in responding to stakeholder needs, and support the BIPM's financial sustainability during a period of growth and transformation.

The first mechanism involves **joint projects** with NMIs and key stakeholders, primarily through in-kind contributions. These partnerships are critical for activities right across our work programme. Examples include communication and educational initiatives with Regional Metrology Organizations (RMOs) and the United Nations Educational, Scientific and Cultural Organization (UNESCO), development of reference materials for comparisons, capacity building linked to the CIPM Mutual Recognition Arrangement (CIPM MRA), digital transformation of the quality infrastructure, and training of future metrologists.

The second partnership model focuses on sector-specific coordination funded by financial **contributions from stakeholders**. This approach supports targeted activities such as metrology for clean air, laboratory medicine traceability through the Joint Committee for Traceability in Laboratory Medicine (JCTLM), and CIPM sectorial task groups.

A third model involves the **use of shared external facilities**, allowing cost-effective delivery of specific services, notably in ionizing radiation metrology.

A highly effective partnership mechanism is the **secondment of NMI staff** to the BIPM. Currently contributing around 120 person months annually, secondees play a vital role in delivering BIPM outputs, transferring expertise, and promoting international alignment of best practices. The BIPM intends to expand this model and increase cost sharing by home institutes.

Finally, **donation of equipment** provides another targeted mechanism, notably by potentially enabling the BIPM to pilot a new key comparison for optical frequency standards.

Representation of the Global Measurement Community

Under its first objective, the BIPM strengthens its role as the **international voice of scientific metrology**, enhancing the visibility, understanding and uptake of metrology by decision makers, industry and society. The activities of this work programme enhance the impact of Member State investments in metrology by translating technical excellence into societal value and policy relevance.

Key directions for 2028–2031 include:

- Active representation and collaboration with international quality infrastructure bodies, United Nations (UN) agencies, scientific organizations, and sectoral partners;
- Deeper partnership with the International Atomic Energy Agency (IAEA) to support Member State needs for ionizing radiation services;
- Strengthened engagement with time users and international bodies to promote global adoption of UTC, including roles in support for emerging needs such as lunar timekeeping;
- Continued advocacy for metrological traceability in chemistry, biology, laboratory medicine, food safety, and environmental monitoring.
- Annual World Metrology Day campaigns delivered with UNESCO, the International Organization of Legal Metrology (OIML), and RMOs, reinforcing the societal relevance of measurement;
- Modern, coherent communication via an upgraded BIPM website, integrated document repositories, and consistent messaging across channels;
- Expansion of joint communication campaigns with RMOs, international organizations, and quality infrastructure partners.

Scientific and Technical Collaboration

The second objective remains at the core of the BIPM's mission: providing **shared, high-level scientific infrastructure and expertise** that no single country can efficiently maintain alone.

During 2028–2031, the BIPM will maintain and evolve major technical programmes in:

- **Electricity** (quantum standards for voltage, resistance, impedance);
- **Mass** (kilogram realization - Kibble balance, international comparisons and calibrations);
- **Time** (UTC, support for new definition of the second);
- **Chemistry and Biology** (gas, isotope ratio, organic molecule, protein and deoxyribonucleic acid (DNA)/ribonucleic acid (RNA) standards);
- **Ionizing Radiation** (dosimetry and radionuclide metrology for emerging medical and environmental applications).

Across these domains, the Work Programme emphasizes:

- Delivery of high priority international comparisons underpinning NMI Calibration and Measurement Capabilities (CMCs);
- Maintenance of reference standards and facilities with long-term stability and low uncertainty;
- Integration of new scientific developments, such as optical frequency standards, digital reference materials, and advanced nuclear data;
- Use of shared facilities and travelling standards to optimize costs and access;
- Strong reliance on NMI secondees and joint projects, reinforcing mutual capability development.

Scientific activities increasingly incorporate digital methods, from automated data acquisition and processing to digital twins and technical database services.

Coordination of the Worldwide Measurement System

As coordinator of the global measurement system, the BIPM provides the **institutional, technical, and digital infrastructure** that enables mutual recognition and international trust. This ensures that national measurement results are internationally accepted, comparable, and fit for emerging scientific and societal needs.

Key elements of this role include:

- Operation and evolution of the CIPM MRA, including the Joint Committee of the RMOs and the BIPM (JCRB);
- Secretariat support to Consultative Committees, Joint Committees, and CIPM groups;
- Organization of approximately 220 meeting days per year, supporting thousands of participants on-site and online;
- Stewardship of *Metrologia* as the leading international open access journal for metrology;
- Strengthening engagement with Member States, Associates, Observers, and potential new participants, working toward Universal Adherence to the Metre Convention.

Digital Transformation

Digital transformation is a defining feature of the 2028–2031 period. Through these efforts, the BIPM positions the Metre Convention as the **global digital anchor of trust** for measurements.

The BIPM will continue implementing the SI Digital Framework, providing:

- Authoritative digital representations of the SI and related vocabularies;
- Persistent identifiers and ontologies enabling machine-actionable traceability;
- Interoperable digital services connecting the Key Comparison Database (KCDB), JCTLM, time scales and other platforms.

Major milestones include:

- Deployment of machine-actionable KCDB services;

- Expansion of digital services, Application Programming Interfaces (APIs), on a common platform;
- Introduction of Artificial Intelligence (AI)-enabled tools aligned with governance, security, and integrity requirements.

Capacity Building and Knowledge Transfer

Capacity building remains central to the BIPM mission, with a strong focus on **equity and long term impact** to strengthen global participation and sustain the effectiveness of the international measurement system.

Key developments include:

- Implementation of an integrated "All-of-BIPM" Capacity Building and Knowledge Transfer (CBKT) framework, aligned with NMI needs;
- Expansion of e-learning, remote training, and digital resources;
- Continued delivery of summer schools, webinars, workshops, and technical exchanges across all measurement domains;
- Targeted support for Observers and developing metrology systems, in collaboration with United Nations (UN) agencies and RMOs.

Stewardship of Resources

To support delivery of this ambitious programme, the BIPM commits to strong stewardship of:

- **People**, through skills evolution, organizational agility, and expanded secondments;
- **Digital infrastructure**, including cybersecurity, AI governance, and modern Information Technology (IT) systems;
- **Built environment**, ensuring safe, sustainable, and accessible laboratories and meeting facilities.

Conclusion

The BIPM Work Programme 2028–2031 presents a forward-looking response to scientific, digital, and societal change while maintaining the continuity of core technical services. It reinforces the BIPM's unique international mandate while adapting delivery models, introducing more partnership opportunities, and developing its services to meet growing global expectations.

Through strategic focus, collaborative delivery, and responsible stewardship, the BIPM will continue to ensure that **measurements worldwide remain comparable, reliable, and trusted** – supporting science, innovation, trade, and sustainable development for the benefit of all Member States.

Structure of this document

The strategic objectives from the Strategic Plan (2026) are repeated in this document along with details of the projects and deliverables to achieve those objectives during the period 2028–2031. They are formatted as follows:

X01 Strategic Objective from the Strategic Plan (2026)

X01-1 Project to address strategic objective Description the project or activity	
X01-1.1 Description of the first deliverable	
X01-1.2 Description of the second deliverable	
X01-1.3 Description of the third deliverable	

Note that the deliverables in this document will be completed over the full period 2028-2031. Therefore, unless otherwise stated, all quantified deliverables (e.g. XX comparisons delivered) relate to the full period and are not annual targets.

The icons in the table above identify which of the deliverables provide opportunities for NMIs and other stakeholders to partner with the BIPM. Where there is no icon, the deliverable will be fully delivered with the resources provided by contributions and subscriptions of Member and Associate States respectively.

- **Where the icon is open (white)**, the effectiveness and impact of the deliverable will be enhanced if a partnership is formed.
- **Where the icon is closed (black)**, the delivery is critically dependent on partnership.

There are five different models for partnership, described briefly in the table below:

Partnership model	**The delivery is critically dependent on partnership**	**The effectiveness and impact of the deliverable will be enhanced if a partnership is formed**
Joint projects between the BIPM and NMIs or key stakeholders		
Sector specific coordination activities delivered through stakeholder contributions		
Use of shared facilities		
Involvement of NMI staff in the delivery of the BIPM Work Programme as secondees		
Support through the donation of equipment		

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Introduction

Vision, Mission and Objectives of the BIPM

The Work Programme 2028-2031 addresses the strategic objectives agreed by the Comité international des poids et mesures/International Committee for Weights and Measures (CIPM) in the Bureau International des Poids et Mesures/International Bureau of Weights and Measures (BIPM) Strategic Plan (2026) after consultation with all Member States.

We repeat here the Vision and Mission of the BIPM.

> The BIPM is an 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 recognized as the world focus for the international system of measurement.
>
> Its **mission** is to work with the National Metrology Institutes (NMIs) of its Member States, the Regional Metrology Organizations (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.

In 2018 the Conférence générale des poids et mesures/General Conference on Weights and Measures (CGPM) agreed on objectives for the BIPM. These are repeated below with some bullet points in italics that clarify the areas of focus relating to each objective for the next period 2028-2031.

> The **objectives** of the BIPM are to:
>
> represent the world-wide measurement community, aiming to maximize its uptake and impact,
>
> - *We liaise with relevant intergovernmental organizations and other international bodies in order to develop opportunities for the application of metrology to global challenges.*
> - *We communicate and educate about the importance of metrology, the progress in measurement science and the work of the BIPM*.
>
> be a centre for scientific and technical collaboration between Member States, providing capabilities for international measurement comparisons on a shared-cost basis,
>
> - *We coordinate international comparisons of national measurement standards agreed to be of the highest priority.*
>
> be the coordinator of the world-wide measurement system, ensuring it gives comparable and internationally accepted measurement results,
>
> - *We coordinate activities between the NMIs of Member States and the RMOs, including the provision of technical services to support the CIPM Mutual Recognition*

Arrangement (CIPM MRA) and the infrastructure for the development and promotion of the International System of Units (SI) and Coordinated Universal Time (UTC).

- *We provide the necessary Digital Framework to maintain the CIPM MRA and make the SI and UTC applicable, inclusive and accessible in the digital age*.

fulfilling the BIPM mission and objectives is complemented by its work in:

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

Priorities identified from the Strategic Plan

The Strategic Plan (2026) and this work programme are written in response to the priorities identified in the CIPM Strategy 2030+. The CIPM Strategy 2030+ foresaw the growth in importance of several activities of the BIPM. For reference, they are re-listed here and are strongly reflected in all of the work programme details found later in the document.

Coordination of CIPM MRA activities including Key Comparison Database (KCDB) and high-impact comparisons.

Coordination of UTC to build the global community of UTC laboratories and promote its uptake with users.

Liaison with priority international organizations to promote metrology solutions to grand challenges and to open access for NMIs to international stakeholders.

Expansion of Capacity Building and Knowledge Transfer (CBKT) and e-learning, in partnership with International Organization (IOs).

Coordination of sectorial activities initiated by the CIPM and particularly those that are co-funded by other IOs.

Facilitation of on-line participation to provide equitable access to meetings and resources for all Member States.

Coordination and implementation of new digital services including new database services to provide the SI “digital anchor of trust”.

Growth in use of new digital tools (for example based on Artificial Intelligence (AI)) to facilitate equitable access across all NMIs and regions.

Building of the ‘observer’ model for states and IOs to increase global participation.

Provision of meetings and workshops focused on objectives agreed in advance by the CIPM.

The CIPM Strategy 2030+ also identified new directions to improve efficiency to deliver high priority actions. These are also picked up in the programme of work and include:

Transition in balance of staff skills to best address future priority requirements.

Redirection of resources to address growing future commitments to digital transformation and new database activities.

Implementation of new mobility contracts to encourage greater exchange of staff between NMIs and the BIPM.

Increased outsourcing of access to external facilities to achieve greater efficiency and to minimize the need to employ technical and maintenance staff.

The next section describes various opportunities for partnership with us in detail and identifies the activities proposed later in the document that are critically dependent on these partnership models.

All the activities of the BIPM contribute to achieving one of the three primary objectives of the BIPM listed above or to ensuring good stewardship of the resources of the organization: human, infrastructural, and financial. The rest of this document is therefore divided into four main sections; three relate to the primary objectives of the BIPM and one relates to stewardship.

Two areas of particular importance that feature across the work programme are digital transformation and capacity building and knowledge transfer. Specific deliverables relating to each of these areas are found embedded in projects relating to all of our objectives. A summary of those deliverables and the coordinating role that the BIPM plays are drawn out in dedicated sub-sections within the 'Coordination' section below.

Partnership Opportunities

The final section of the Strategic Plan for the BIPM Work Programme (2026) identified five methods for partners to work with us through funding mechanisms that are complementary to the contributions paid by Member States and the subscriptions paid by Associate States. These approaches are intended to provide opportunities for partners to derive benefits from a closer involvement in the activities of the BIPM, to introduce more flexibility for the organization to respond to needs of Member States and to improve the financial sustainability of the organization during a period of growth and change.

As described previously, deliverables in this work programme that provide partnership opportunities have been marked with either open (partnership will result in faster or higher impact delivery) or closed (partnership is critical to delivery, i.e., it will only go ahead if a partner is found) icons.

The first mechanism for partnership is **joint projects** between the BIPM and NMIs or key stakeholders in support of agreed actions of common interest. Generally, the work is completed through in-kind contributions by both parties to a shared activity.

Of the many joint projects presented as opportunities in this work programme, the following are critically dependent on this mechanism to be delivered.

Representation

Delivery of communication campaigns with RMO and liaison organizations (R01-2.3, R01-2.4).

Celebration of World Metrology Day with RMOs and the United Nations Educational, Scientific and Cultural Organization (UNESCO) (R01-3.2, R01-3.3).

Promotion of the international quality infrastructure (R02-1.2, R02-1.3, R02-1.4).

Development of educational and promotional materials with UNESCO (R02-2.1, R02-2.2, R02-2.3, R02-2.4).

Delivery of supplementary Consultative Committee for Ionizing Radiation (CCRI) comparisons co-piloted by the BIPM and International Atomic Energy Agency (IAEA) (R02-3.2).

Scientific and Technical Collaboration

Extension of the portable Josephson Voltage Standard beyond 1 kHz (S01-1.3).

Determination of the local acceleration due to gravity in the Kibble Balance laboratory (S04-2.2).

Exploration of the need and feasibility for the BIPM to acquire a new role in coordinating the national realizations of Lunar time (S06-6.2).

Development of methods for comparisons underpinning NMI capabilities for delivering and value assigning primary deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) (S10-7.1, S10-7.2, S10-7.3). This also depends on secondees at the BIPM.

Provision of links for RMO International Reference System Transfer Instruments (SIRTIs) (S12-1.3).

Improvement of decay data for radionuclide metrology and applications. (S12-3.2).

Establishment of a framework for neutron comparisons and outreach to grow participation (S14-1.1).

Coordination of the RMO SIRTI network (S14-1.2).

Establishment of liaisons with facilities suitable for the long-term development and sustainability of high-energy neutron, proton- and hadron-therapy comparisons (S14-2.1, S14-2.2).

Delivery of webinars and workshops in support of the CCRI community (S14-3.1, S14-3.2).

Coordination

Provision of capacity building in relation to the CIPM MRA (C01.3-2, C01.3-3).

Provision of services and networking to support RMO Secretariats (C02-1.1, C02-1.2, C02-1.3).

Provision of capacity building services to Observer States (C03-3.1, C03-3.2, C03-3.2).

Implementation of ontologies and vocabularies into the SI Digital Framework (C07.1-2). Secondees will also be needed for this work.

Collaboration on the digital transformation of quality infrastructure including ensuring interoperability of the SI Digital Framework (C07-3.1, C8-3.2).

Development of new web services for the KCDB (C07-2.4). This development is also critically dependent on secondees.

Organization of training and placements for the development of young metrologists (C08-2.1, C08-2.2).

The second partnership model we offer is to conduct sector specific coordination activities through financial **stakeholder contributions** that support the BIPM to carry out work on their behalf.

The activities and deliverables that will only be possible with financial support from key sectoral stakeholders are:

> Secondments of visiting scientists on Metrology for Clean Air (S09-5.3).
>
> Promotion of metrological traceability in laboratory medicine and maintenance of the Joint Committee for Traceability in Laboratory Medicine (JCTLM) database for Reference Methods, Materials and Services (C04-4.1, C04-4.2, C04-4.3, C04-4.4, C04-4.5, C04-4.6). The full delivery of the proposed work to support the JCTLM also relies on the provision of secondees.
>
> Placement of secondees at the BIPM for specific purposes, including scientific collaboration and developing capacity building materials is a growing area of opportunity for stakeholder contributions.
>
> This model can also be envisaged to support CIPM Sectoral Task Groups during the next period 2028-2031.

Where appropriate, another model for partnership is in the use of **shared facilities**. In some cases, it is appropriate and cost-effective to carry out parts of the work programme in facilities managed externally to the BIPM.

The BIPM will continue to explore options for this model of partnership. Currently the use of shared facilities contributes strongly to the provision of ionizing radiation services:

> Provision of international reference systems for dosimetry (S11-2.1, S11-2.2).

A mode of partnership that is widely effective across our work is the involvement of NMI staff in the delivery of the BIPM Work Programme as **secondees**.

Seconded staff from partner NMIs currently contribute a total of around 120 person-months to the work of the BIPM every year. The cost of the subsistence allowance for these staff during their time here is being increasingly met by their home institutes. Those staff enable the completion and delivery of the BIPM's work, pass on knowledge and skills to BIPM staff, are themselves upskilled, and take what they learn back to their NMIs and their regions, thus participating in international alignment of best practice.

In the next period 2028-2031, we intend to grow the contribution by secondees and will seek to increase the fraction of expenses covered by the home institutes.

Numerous opportunities to contribute to the speed of delivery and the breadth of impact of deliverables can be found throughout the programme below. Here we pick out the deliverables that depend more critically on the availability of secondees.

> **Scientific and Technical Collaboration**
>
> Publication of guidelines for PSFS data exchange in support of UTC (S07-1.2).
>
> Delivery of e-learning courses and associated code for the UTC labs to validate and understand their data contributing to UTC (S08-1.1).
>
> Modelling of global network of primary ozone standards, development of optimized comparison model and digital twin completed for maintenance of network consistency (S09-1.2).

Improving consistency of light isotope ratio comparisons to support standard and service developments at NMIs (S09-3.2, S09-3.3).

Provision of knowledge transfer in gas metrology (S09-5.1, S09-5.2, S09-5.3). This project also relies on stakeholder contributions.

Provision of knowledge transfer on application of quantitative Nuclear Magnetic Resonance (qNMR) methods for Certified Reference Material (CRM) development at NMIs (S10-8.2, S10-8.3).

Provision of knowledge transfer on protein standard quantification methods for NMIs establishing/extending their biometrology programmes (S10-9.1, S10-9.2, S10-9.3).

Establishment of a new brachytherapy comparison service (S11-3.3).

Coordination

Provision of secretariat services to the Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB) (C01-1.1 to C01-1.6).

Fostering collaboration between RMO secretariats (C02-1.3).

Establishment of a new brachytherapy comparison service (S11-3.3).

The final mechanism for support from stakeholders in Member States is via the **donation of equipment**.
Mutual benefits for both the donor and the BIPM have been found in the past and during this work programme there is one project in particular that can be pursued only using this model.

Coordination of the efficient shared exploitation of a donated Optical Frequency Standard (OFS) to pilot a new key comparison (KC) of optical frequency standards (S07-1.3). The success of this project relies on both the donation of equipment and a joint technical project.

In addition to the activities specifically marked as seeking partnerships, the BIPM welcomes discussion on any other potential work of mutual benefit and interest.

Representation of the Global Measurement Community

The first objective of the BIPM is to:

> represent the world-wide measurement community, aiming to maximize its uptake and impact,
>
> - *We liaise with relevant intergovernmental organizations and other international bodies in order to develop opportunities for the application of metrology to global challenges.*
> - *We communicate and educate about the importance of metrology, the progress in measurements science and the work of the BIPM*.

This objective reflects the broad impact that metrology has across a wide range of human activities in which the BIPM can support its Member States to leverage their investments to maximum effect with partners outside the scientific metrology community.

Scientific metrology constitutes one of the four pillars of the quality infrastructure. Accordingly, the BIPM maintains and builds long-term relationships with organizations associated with the other pillars of legal metrology, accreditation and standardization.

Beyond quality infrastructure, many of the global challenges identified in the CIPM Strategy 2030+ document are priorities for Member States and require contributions from scientific metrology. In response, the CIPM has identified the establishment of "horizontal platforms to address multi-disciplinary measurement challenges" as a priority. Two such platforms have already been established (CIPM Sectorial Task Group on Climate and Environment (CIPM-STG-CENV) and Forum on Metrology and Digitalization (FORUM-MD)) - a Sectoral Task Group and a Forum. Their success has been supported by strong participation from a wide range of intergovernmental organizations and other stakeholders.

In this context, the role of the BIPM in representing the international metrology community externally is of increasing importance. The BIPM contributes by raising awareness, providing education, facilitating dialogue and identifying opportunities for engagement with organizations and in regions as prioritized by the strategic direction given by the CIPM and expressed by Member States through CGPM resolutions.

Details of the work programme for the period 2028-2031 in response to these drivers, and in support of this objective are given below. Strategic objectives drawn from the BIPM Strategic Plan (2026) are indicated in bold, followed by the corresponding activities and deliverables.

R01 To communicate effectively with BIPM stakeholders (NMIs/DIs, decision makers, IGOs and the scientific community) about the BIPM, the Metre Convention, metrology and the benefits of metrology.

To support NMIs and RMOs in effectively communicating the relevance of metrology by providing a broad range of promotional materials with a special focus on showcasing its impact. Through an asset database these materials are made available to Member States and Associates as well as RMOs.

R01-1 BIPM website

Providing and maintaining a new BIPM website that delivers BIPM services effectively and portrays an up-to-date image of the BIPM.

R01-1.1 New version of the website launched.	
R01-1.2 New document repository planned to manage BIPM publications and reports as well as working documents of working groups and committees.	
R01-1.3 Website maintained and constantly adapted to the needs of the BIPM, CIPM and the CCs if necessary.	
R01-1.4 Content of the website kept aligned with the communication goals of the BIPM.	
R01-1.5 Database of contact details and participation of Member States, Associates, Liaisons and Observers of the organization kept up to date and integrated into the delivery of the new website.	

R01-2 Communication Strategy

Ensuring a coherent communication strategy and representation of the BIPM over the different communication channels, maintaining and expanding the social media presence, providing the newsletter and the annual report.

R01-2.1 Content (text, visuals and videos) highlighting the work of the BIPM, the CCs and the CIPM published frequently through different channels; repository of material built.	
R01-2.2 Newsletter and annual report regularly published.	

R01-3 World Metrology Day

Collaborating with UNESCO, the OIML and the RMOs to run an annual campaign including poster, in-person events and webinars to promote the work of the BIPM and the relevance of metrology.

R01-3.1 Annual themed campaign including a poster design, visuals, messages and press release, content for websites, YouTube and LinkedIn channels delivered.	🤝
R01-3.2 Joint event organized on 20 May each year in different countries in collaboration with UNESCO.	🤝

R02 To raise visibility and understanding of metrology within the international quality infrastructure (QI) community, especially for the interrelation of metrology and accreditation with regards to the newly founded international body for accreditation. To deepen existing links and establish new collaborations with IOs outside the QI community to advocate for the application of metrology in specific areas.

To promote the importance and benefits of a unique international continuous reference time scale (UTC) to all user communities, meeting the needs of both current and future users.

To promote and develop the use of SI traceable standards and measurements with intergovernmental organizations and other stakeholders for use in chemical and biochemical analysis.

R02-1 QI promotion

Ensuring close coordination with other international QI bodies to continuously improve the international system and to promote quality infrastructure as one of the pillars supporting the Sustainable Development Goals (SDGs). Identifying common interests with other international organizations such as UNESCO, UNIDO, UNECE, UNFCCC, OECD, WTO and collaborating to profile the role of scientific metrology.

R02-1.1 Participate actively in meetings of liaison organizations and ensure effective dissemination of relevant information to the metrology community.	
R02-1.2 Collaborate in areas including communication, capacity building and digitalization to raise awareness for quality infrastructure.	
R02-1.3 Joint documents (e.g., studies, policy briefs) published on key topics.	
R02-1.4 Joint events delivered for stakeholders such as policy makers, industry representatives and scientists.	
R02-1.5 Maintain a registry of liaison organization, Memorandums of understanding (MoUs) and collaboration agreements and initiate new strategic partnerships based on regular stakeholder analysis.	

R02-2 UNESCO collaboration

Developing joint concepts for training and training materials within the UNESCO programmes for education and entrepreneurship.

R02-2.1 4-year collaboration plan developed.	
R02-2.2 Hands-on educational kits and other training materials developed to support understanding of measurement concepts.	
R02-2.3 Develop and deliver capacity building and knowledge transfer for different target groups in collaboration with UNESCO.	
R02-2.4 Contribute to and/or organize joint initiatives with UNESCO to raise awareness of metrology.	

R02-3 Liaison with strategic partners relevant for ionizing radiation metrology

Ensuring the development of strong liaison with strategic partners with an interest in ionizing radiation metrology.

R02-3.1 Signed Memorandum of Understanding (MoU) with the IAEA to extend existing collaboration in dosimetry and SSDL to radionuclide metrology, supporting coordination between the CCRI and the BIPM, and including the development of joint events and training activities.	
R02-3.2 Supplementary CCRI comparisons co-piloted by the BIPM and the IAEA using reference materials provided by the IAEA.	
R02-3.3 BIPM represented in international bodies including the International Commission on Radiation Units (ICRU), the International Committee for Radionuclide Metrology (ICRM), ISO (SC2 and working group meetings), and the SSDL scientific committee.	
R02-3.4 Strengthened liaison with the CTBTO on ionizing radiation metrology within the framework of the Practical Arrangement between the two organizations.	

R02-4 Uptake of UTC

Reinforcing the liaisons with IOs representing timing users (e.g. ITU-R, ITU-T, IEEE, ICG), organizations related to timekeeping and time and frequency metrological standards (e.g. IAG, IGS, IERS), scientific bodies (e.g. SKAO) and space agencies to ensure UTC is recognized as the consistent and useful time reference, or suitable time scales traceable to UTC are identified.

Encouraging the implementation of the 2026 CGPM resolution on continuous UTC.

R02-4.1 Relationship maintained and contributions given to ITU-R and other IOs representing timing users to support full implementation of CGPM decisions and recognition of UTC as an international reference in standards, recommendations, or best practice guidelines.	
R02-4.2 BIPM actively represented in IO meetings, user fora, and stakeholder events through presentations to explain continuous UTC and international time standards.	

R02-5 International organizations active in Chemical and Biological Metrology

Promoting the application of chemical and biological reference measurement systems to assure accurate and SI-traceable measurements through representation of BIPM at other international bodies.

R02-5.1 Data and documentation developed by IFCC, ICSH, WHO, ISO TC 212 WG2 and Global ACI related to Laboratory Medicine with references to metrological traceability through collaborative participation of the BIPM.	
R02-5.2 Data and documentation developed by WMO, IPCC, UNFCCC, UNESCO-IOC, UNEP-IMEO, ISO TC 207, ISO TC 146 related to atmospheric/ocean measurement with references to metrological traceability through collaborative participation of the BIPM.	
R02-5.3 Data and documentation developed by Codex, WHO, FAO related to food/feed measurement with references to metrological traceability through collaborative participation of the BIPM.	
R02-5.4 Established liaisons with bodies developing guidelines for bioengineering and biotechnology with references to metrological traceability through collaborative participation of the BIPM.	

Scientific and Technical Collaboration

The second objective of the BIPM is to:

> be a centre for scientific and technical collaboration between Member States, providing capabilities for international measurement comparisons on a shared-cost basis,
>
> - *We coordinate international comparisons of national measurement standards agreed to be of the highest priority.*

Since its establishment, the BIPM has provided scientific leadership and carried out expert technical work to support the international measurement infrastructure. Over its 150-year history, the level of activity in any given area has evolved to meet the changing needs of the Member States. Today the BIPM maintains a focused suite of technical activities that are selected strategically to maximize the benefit to Member States and to ensure the continuity of stable and comparable measurement scales for practical use.

The activities described below have been selected following extensive consultation with the relevant Consultative Committees, consideration of the CIPM strategy 2030+, and with a view to optimizing the organization's resources.

During the forthcoming period, the major areas of onsite technical activity – electricity, mass, time, gases, organic and biochemistry, radionuclides, dosimetry – will continue, but with significant evolution to address emerging user needs. In addition, a new activity area has emerged: digitalization.

Further details of the work programme for the period 2028-2031 are presented below for each area, together with more detail on the context for the selected activities. Strategic objectives taken from the BIPM Strategic Plan (2026) are highlighted in bold and are followed by the associated activities and deliverables.

Electricity

Scientific metrology in electricity is based on two primary quantum standards: the Josephson Voltage Standard (JVS) and the Quantum Hall Resistance standard (QHR). Their status as primary standards was established in 1990 with the adoption of conventional values for the Josephson constant and the von Klitzing constant for practical metrology, thereby creating a parallel system of practical electrical units.

With the implementation of the revised International System of Units (SI) in 2019, these quantum standards became the primary standards for direct SI realizations of the volt and the ohm. Consequently, the JVS and QHR now form the world-wide basis for the realization of electrical units.

Although the quantum effects provide intrinsically high accuracy and reproducibility, their practical implementation requires experimental validation. At present, there are no readily transportable artefacts capable of supporting comparisons at the level of accuracy claimed for these standards. As a result, the only means of establishing the validity of a measurement claim is to carry out bilateral on-site comparisons of quantum standards.

To address this requirement, the BIPM has developed a transportable Josephson Voltage Standard and a transportable Quantum Hall Resistance Standard to deliver on-site bilateral comparisons to the Member States. This service, unique to the BIPM, ensures the ongoing confidence in calibration and measurement claims for these primary quantities, and for all quantities derived from such primary standards, around the world. This confidence relies on the continuation of this activity at the BIPM. The BIPM comparison services constitute an essential component of the Consultative Committee for Electricity and Magnetism (CCEM) comparison programme as outlined in the CCEM Strategy.

In addition, the BIPM offers bilateral comparisons of voltage, resistance and capacitance measurements using well-characterized transfer standards for NMIs that do not operate quantum standards. These comparisons also serve as an initial step for NMIs preparing to participate for the first time in on-site comparisons of quantum standards. In these comparisons, the BIPM voltage standards are traceable to the JVS, while resistance and capacitance standards are traceable to the QHR.

The BIPM's established laboratories, expertise and equipment allow it to deliver these specialized services with marginal costs to the Member States, while the benefit to the wider metrology community is substantial. In particular, the BIPM provides calibration services to Member States that do not maintain primary standards for these quantities, a situation that applies to many new Member States.

The work programme in electricity presented below maintains a strong emphasis on the high-priority delivery of bilateral comparisons for the primary realizations of voltage and resistance, together with the related calibration services.

S01 To support the comparison programme of the CCEM by demonstrating the capabilities of the NMIs at the highest level to support their CMCs and to ensure global uniformity of electrical primary standards.

S01-1 Bilateral on-site comparisons of Josephson voltage standards (JVSs)

Directly comparing JVSs at dc and/or ac in the NMIs' laboratories, using the BIPM transportable JVSs, to obtain the lowest possible uncertainty.

S01-1.1 Bilateral on-site comparisons delivered for six institutes at dc and/or ac up to 1 kHz as part of BIPM.EM-K10.a/b/c/d with relative standard uncertainty of 1×10^{-10} or less at dc and 1×10^{-7} or less at ac.	
S01-1.2 The transportable Josephson voltage standard maintained in optimal conditions to achieve the required comparison uncertainty and support bilateral comparisons of Zener voltage standards (S01-2) and calibrations of Zener voltage standards for NMIs (S02-1.1).	
S01-1.3 Investigated the interest in and the technical options for extending the frequency range of the on-site comparisons beyond 1 kHz, in collaboration with NMIs, to evaluate the possibility of proposing an extension of the service in the following work programme.	

S01-2 Bilateral voltage comparisons using Zener diode transfer standards

Supporting NMIs which do not possess JVSs and as a first step before an on-site comparison of JVSs (S01-1).

S01-2.1 Bilateral comparisons of Zener voltage standards delivered for six institutes as part of BIPM.EM-K11.a/b with relative standard uncertainty of 5×10^{-8}.	
S01-2.2 Related RMO comparisons linked to BIPM.EM-K11 through BIPM participation.	
S01-2.3 The BIPM secondary voltage standards (Zeners) used as travelling standards for the comparisons maintained in optimal conditions to achieve the required comparison uncertainty and support the calibration of Zener voltage standards for NMIs (S02-1.1).	

S01-3 Bilateral on-site comparisons of quantum Hall resistance (QHR) standards

Directly comparing QHR standards in NMIs' laboratories, using the BIPM transportable QHR standard, to obtain the lowest possible uncertainty.

S01-3.1 Bilateral on-site comparisons of quantum Hall standards (including new graphene samples) delivered for six institutes as part of BIPM.EM-K12 with relative standard uncertainty at the 10^{-9} level.	
S01-3.2 The transportable QHR standard and related measurement chain maintained in optimal conditions to achieve the required comparison uncertainty and support bilateral resistance comparisons using resistance transfer standards (S01-4) and calibrations of secondary standards for NMIs (S02-1.2).	
S01-3.3 The capacitance unit realized based on the quantum Hall resistance to support comparisons and calibrations of capacitance (S01-6 and S02-1.3).	

S01-4 Bilateral resistance comparisons using resistance transfer standards

Supporting NMIs which do not possess a QHR standard and as a first step before an on-site comparison of QHR standards (S01-3)

S01-4.1 Bilateral comparisons of resistance transfer standards delivered for six institutes as part of BIPM.EM-K13.a/b with relative standard uncertainty of 5×10^{-8}.	
S01-4.2 Related RMO comparisons linked to BIPM.EM-K13 through BIPM participation.	
S01-4.3 The BIPM secondary resistance standards used as travelling standards for the comparisons and related measurement chain maintained in optimal conditions to achieve the required comparison uncertainty, also for the calibration of resistance secondary standards for NMIs (S02-1).	
S01-5 Graphene-based QHR standard Operating a graphene-based standard in a cryocooler at higher temperature (4.2 K) and lower magnetic field (< 7 T) to simplify QHR implementation during on-site comparisons (S01-3) and to reduce costs.	
S01-5.1 A compact QHR standard based on a graphene sample operated in a cryocooler implemented to replace the GaAs QHR standard.	
S01-6 Bilateral capacitance comparisons Supporting the CMC claims of NMIs for capacitance.	
S01-6.1 Bilateral comparisons of capacitance transfer standards delivered for four institutes as part of BIPM.EM-K14.a/b with relative standard uncertainty of 5×10^{-8}.	
S01-6.2 The measurement systems used to derive the capacitance unit from the quantum Hall effect and/or the calculable capacitor maintained in operating conditions to achieve the required uncertainty and support the calibrations of capacitance secondary standards (S02-1.3).	
S01-6.3 Participated in related RMO comparisons as required to link them to BIPM.EM-K14.	
S01-7 Impedance standard based on ac quantum Hall[1] Developing a primary method for direct realization of ac impedances according to the revised SI.	
S01-7.1 The ac quantum Hall effect developed into an operational primary standard of impedance to reduce the uncertainty of the realization of the capacitance unit.	

S02 To support NMIs that have no access to quantum standards by providing calibrations for electrical quantities.

S02-1 Calibrations of electrical secondary standards of NMIs Providing calibration services for NMIs that do not possess primary electrical standards using measurement systems already in place for comparison activities.	
S02-1.1 16 Calibrations of voltage secondary standards delivered to NMIs and other BIPM laboratories (Ionizing Radiation Department and Kibble balance).	
S02-1.2 150 Calibrations of resistance secondary standards delivered to NMIs and other BIPM laboratories (Mass, Ionizing Radiation, Kibble balance).	

[1] Progress on this project will be delayed by limited funding.

S02-1.3 120 Calibrations of capacitance secondary standards delivered to NMIs.	

S03 To provide knowledge transfer by BIPM experts to NMI metrologists on electrical quantum standards.

S03-1 Knowledge transfer on electrical quantum standards	
S03-1.1 Knowledge transfer of best practice in electrical quantum standards delivered in the framework of the on-site comparisons of Josephson voltage standards (BIPM.EM-K10) and quantum Hall resistance standards (BIPM.EM-K12).	
S03-1.2 A workshop on practical aspects of the operation of electrical quantum standards and related instrumentation organized with experts from the CCEM; presentations made available via the e-learning platform.	

Mass

Until May 2019 the mass of the International Prototype of the Kilogram (IPK), held at the BIPM, was the definition of the kilogram. As a result, the BIPM was the only source of traceability for the kilogram world-wide. In preparation for implementation of the redefinition of the kilogram in terms of Planck's constant in 2019, the BIPM developed a Kibble balance to contribute to the determination of the value of the constant and to anticipate the potential need for the BIPM to continue contributing to the realization and dissemination of the kilogram following the redefinition. The BIPM Kibble balance will present an independent traceability path for those countries that will not have a primary realization for many years.

Dissemination under the new definition is being implemented through several phases designed to establish confidence in the equivalence of kilogram realizations from Kibble balances and XRCD (X-ray crystal density) experiments around the world. During the current phase (Phase 2), dissemination is coordinated internationally using a "consensus value" of the kilogram rather than independent local realizations. The consensus value is determined from the reference values of a series of biannual or triannual comparisons of these realizations coordinated by the BIPM. These comparisons are based on the BIPM-maintained mass unit, which demonstrates a stability on the order of 1 µg per year. The BIPM Kibble balance also participates in these comparisons.

As the international community prepares to transition to Phase 3, in which the kilogram will be disseminated from independent local realizations, the ongoing maintenance and improvement of the BIPM Kibble balance is expected to play a critical role. The work programme presented below prioritizes the maintenance of expertise in the operation of the instrument and improving its efficiency and performance.

At the same time, national mass scales and scales for derived units continue to depend on dissemination from the consensus value determined through comparisons of primary realizations via the BIPM-maintained mass unit. The continuity of this service is reflected in the activities and deliverables below.

The BIPM also continues to provide calibrations of national 1 kg mass standards to its Member States, most of which do not operate a Kibble balance or an XRCD experiment. The work programme for mass described below is aligned with the activities identified for the BIPM in section 5.4 of the Consultative Committee for Mass and Related Quantities (CCM) Strategy 2026-2036.

S04 To support the *mise en pratique* of the kilogram by maintaining the BIPM Kibble balance and by coordinating CCM key comparisons of primary realizations held by NMIs.

S04-1 CCM key comparisons of kilogram realizations Demonstrating equivalence of realizations of the kilogram from NMIs possessing Kibble balances or applying the XRCD method and supporting uniform dissemination.	
S04-1.1 Key comparisons of kilogram realizations with Kibble balances, joule balances and the XRCD method, CCM.M-K8, organized as requested by the CCM.	
S04-1.2 Participated in CCM.M-K8 with the BIPM Kibble balance with a standard uncertainty below 40 µg.	
S04-1.3 A new consensus value calculated after each comparison.	

S04-2 BIPM Kibble balances Maintaining the BIPM Kibble balance as an international reference facility on a shared-cost basis, to support uniform kilogram realization and dissemination and to ensure the long-term sustainability of the facility by developing an easier-to-use instrument with at least the same performance, based on the experience gained from the established Kibble balance.	
S04-2.1 Maintained and refined the established Kibble balance for realization of the definition of the kilogram at the level of 1 kg with a standard uncertainty below 4×10^{-8}.	
S04-2.2 Value of the local acceleration due to gravity in the Kibble balance laboratory determined within 10 ppb in collaboration with NMIs.	
S04-2.3 A compact Kibble balance that implements a unique weighing and moving mechanism for use at masses of 1 kg and below designed and constructed.	
S04-2.4 Explored the possibility of achieving a smaller uncertainty than with the established Kibble balance.	

S05 To support the dissemination of the kilogram by providing calibrations of mass standards to NMIs that have no access to a primary realization.

S05-1 Calibration of 1 kg national Pt-Ir prototypes and stainless-steel mass standards Supporting NMIs which do not possess a method to realize the kilogram.	
S05-1.1 20 calibrations of 1 kg national Pt-Ir prototypes in air or under vacuum delivered.	
S05-1.2 50 calibrations of 1 kg stainless steel national mass standards calibrated, including volume and centre-of-gravity determination, if requested.	
S05-1.3 A mass unit with quantifiable stability maintained. Stable linkage between successive key comparisons (S04-1) provided to allow the calculation of the consensus value and the determination of the reproducibility of realization experiments.	
S05-2 Knowledge transfer on Kibble balances Supporting new and existing projects in the development and operation of Kibble balances.	
S05-2.1 Technical exchanges on themes relevant to Kibble balance design and operation organized in coordination with the Kibble balance community.	
S05-2.2 Advice provided to new or existing Kibble balance projects, as requested, on-line or during visits to the BIPM including demonstrations and capacity building with the compact Kibble balance.	

Time

The BIPM Time Department has been responsible for the realization and dissemination of Coordinated Universal Time (UTC) since 1988. The importance of the service has increased significantly with the rapid pace of technological development and the growing demand for precision timing across many sectors. The role of the BIPM as the coordinating body for UTC is therefore expected to remain central and is explicitly identified as part of 'The Headquarters of the future' in the CIPM Strategy 2030+. The change of UTC to a continuous time scale (to be adopted at the 28th meeting of the CGPM (2026)) will ensure an even broader recognition of the role of UTC and will require support for the correct understanding and related implementations by stakeholders.

The immediate nature of the calculation and dissemination of UTC requires continuous and active engagement with NMIs and time laboratories, as well as with other international organizations whose activities depend on accurate timekeeping. These include, for example, the International Earth Rotation and Reference Systems Service (IERS), which is responsible for the agreement between UTC and UT1; the International Telecommunication Union (ITU) and industrial organizations involved in UTC dissemination techniques; and standardization bodies responsible for ensuring correct references to UTC in technical standards.

The quality of UTC depends critically on the high-quality contributions provided by participating laboratories. Ensuring this quality requires continuous monitoring of measurements performed within UTC laboratories, as well as regular exchanges between the BIPM Time Department and laboratory staff in order to quickly identify and resolve anomalies in contributed data.

Continuous improvement of the service to implement better algorithms for processing data and comparing clocks, to accommodate the introduction of new clocks and new time transfer techniques, and to support digitalization for dissemination of the results that are adapted to changing user requirements, is fundamental to the ongoing relevance and quality of the work of the BIPM.

In addition to operational responsibilities, staff of the Time Department contribute scientific analysis and research in their role as independent experts. Examples include the assessment of risks associated with a negative leap second and the scientific considerations related to establishing a reference lunar time.

The Consultative Committee for Time and Frequency (CCTF) is currently anticipating the redefinition of the second. The BIPM is therefore considering opportunities to support the intercomparison of optical clocks, potentially using a donated optical clock. Additional developments, including new activities of the CCTF in support of Lunar timekeeping, may create further opportunities for BIPM engagement in strategic national and international projects related to new metrology applications in agreement with the CIPM Strategy 2030+. These developments may contribute to establishing universal standards for space exploration, potentially through the creation of Joint Projects.

The work programme in the time area described below is strongly aligned with the priorities outlined in section 11.5 of the CCTF Strategy 2025-2035 and with CGPM draft resolutions B, C and D for presentation in 2026.

S06 **To implement and further refine a state-of-the-art process for calculating and disseminating the international reference time scale UTC by:**

- **integrating data from new types of atomic clocks and frequency standards at the NMIs.**
- **implementing new types of time and frequency comparison techniques.**
- **continuing the automation process and improving the availability of digital data.**

S06-1 Realization of UTC, UTCr, TT and CCTF-K001.UTC

Supporting international coordination and underpinning national UTC labs by continuously providing the international reference time scale UTC and related products.

In particular, monitoring the correct implementation of 2026 CGPM resolution on continuous UTC (see R02-4) in support of the CCTF strategy

The overall goal of the project is to maintain

UTC accuracy (d parameter) < 2×10^{-16} (1 sigma)

|UTC-UTCr|< 1 ns,

Number of UTCr participating labs > 65

S06-1.1 Monthly UTC computed and published through *Circular T* and CCTF-K001.UTC.	
S06-1.2 Weekly UTCr computed and published.	
S06-1.3 Annual TT computed and published.	

S06-2 Availability, accuracy and reliability of UTC, UTCr, TT and CCTF-K001.UTC

Providing state of the art and best accuracy time products, ensuring their reliability, and increasing accuracy through continuous improvement.

S06-2.1 Algorithms and related operational software updated for integration of new types of clocks and PSFSs into the computation of UTC, UTCr, and TT. Picosecond resolution investigated and implemented if possible.	
S06-2.2 Algorithms and related operational software updated for the estimation of time and frequency links among UTC labs with more stable, accurate and novel techniques such as, for example, improved GNSS, SDR TWSTFT, optical fibre, and optical free space links. The need for coordination of calibration for non-GNSS links evaluated.	

S06-3 GNSS systems and provision of a frequency reference

Ensuring the appropriate characterization of time transfer delays of UTC labs' GNSS equipment by maintaining and experimenting with a set of GNSS receivers and BIPM travelling equipment, coordinating and organizing G1 calibration by the regular provision of reference travelling standards and supporting G2 calibrations.

Providing continuous and monitored service (including UPS maintenance) of the real time operation of a frequency reference, including on demand calibration, for BIPM internal users.

S06-3.1 Report on periodic G1 characterization of delays in GNSS equipment by means of the BIPM travelling standard published.	
S06-3.2 Continuous and monitored service of a frequency reference provided to the BIPM labs.	
S06-3.3 Certificates on frequency reference issued on demand for BIPM users.	

S06-4 Automation and improvement of digital data processes Developing and upgrading of processes and tools to improve efficiency of operations and to provide a wider range of services to support NMIs, the CCL and the CCTF in their roles.	
S06-4.1 Evolving versions of a time transfer format specifications and associated documents published.	
S06-4.2 A Python library demonstrating the use of this format developed.	
S06-4.5 Virtual machine operating system updated to ensure system continuity, improve reliability and performance, and reduce operational and support risks.	
S06-4.6 Updated monitoring software for the overall management and control of the department IT structure, installed and validated.	
S06-6 Evolution of BIPM timing products to support NMIs in their roles in space projects Supporting NMIs' contributions to space projects of national or international space agencies. Possible establishment of a joint project to support this activity.	
S06-6.1 Report published on future needs and possible new products in *Circular T* related to the offset UTC-Lunar Time.	

S07 **To support the work of NMIs in the development of optical frequency standards, their comparison, and their use in time scales and UTC, towards a future redefinition of the second and of time keeping based on optical clocks, following the roadmap of the CCTF.**

S07-1 Extended use of OFS in time scales

Supporting NMIs in the use of OFS in national time scales and UTC by defining data exchange format and protocols, adapting data treatment algorithms.

S07-1.1 Participated actively in the CCTF to track activity and responded to facilitate discussion and encourage progress.	
S07-1.2 Guidelines published on the format and provision of frequency data for efficient and redundant use of PSFS comparisons in UTC as developed in S06-2.1.	

S08 **To further enhance the capacity of UTC laboratories to realize, monitor and automate the generation and dissemination of UTC(*k*) time scales to serve their national and international users, and hence improve their contribution to UTC through the CCTF capacity building programme.**

S08-1 CBKT in time and frequency to support (inter)national timekeeping

Improving UTC and the national time scales UTC(*k*) by allowing UTC labs to validate the data contributing to UTC, providing software tools and exchanging best practice.

S08-1.4 On-line Technical Exchanges organized in collaboration with the CCTF WG on TAI and video recording published in the e-learning platform.	

Chemistry

Reliable chemical and biological measurements are essential for addressing the scientific, economic and industrial challenges faced by modern societies. The growth of chemical and biological metrology activities within National Metrology Institutes (NMIs) and Designated Institutes (DIs) of Member States led to the creation of the Consultative Committee for Amount of Substance: Metrology in Chemistry and Biology (CCQM) in 1993. The BIPM Chemistry Department was subsequently created in 2000 to support the CCQM key comparison programme for chemical and biological standards required by Member State laboratories to demonstrate the equivalence of their measurement services under the CIPM Mutual Recognition Arrangement (CIPM MRA), implemented in 1999.

The CCQM covers a broad range of measurement areas. These include emerging fields such as 'omics'; the development of new particulate standards; isotope ratio and microplastic standards; reference measurement systems for biomarkers; measurements of surface chemical composition relevant to semiconductor and quantum devices; deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) quantification; food authentication; and cell counting.

To manage this diversity, the CCQM has adopted a core capability approach in its comparisons. Under this approach, a relatively small number of comparisons demonstrate the performance of capabilities that can subsequently be applied to a much larger number of chemical or biochemical analytes.

The BIPM programme organizes and conducts comparisons for NMIs that are active in the CCQM on core capabilities for primary reference materials and calibrators. These comparisons include small organic molecules, peptides and proteins, binary gas mixtures, and isotope ratios for light stable isotopes. The programme is strongly supported by visiting scientists from NMIs.

Ongoing comparisons are repeated on new analytes with frequencies defined by the CCQM strategy, including on-demand comparisons in the gas and stable isotope fields. Together, these activities support the metrological traceability of a large number of chemical and biological calibration and measurement capabilities, which now exceed 6 500 entries.

The CCQM 2030+ strategy anticipates an expansion of standards and capabilities to support biotechnology and bioengineering and the emergence of digital standards, in alignment with innovations in health, food safety and emerging technologies identified in the CIPM 2030+ strategy. The BIPM Work Programme 2028-2031 responds to these developments by expanding comparison programmes for proteins to include *de novo* peptides and proteins in addition to clinical biomarkers; applying reference methods to cover comparisons of DNA and RNA calibrators; developing methods and comparisons for digital standards for quantitative Nuclear Magnetic Resonance (qNMR); on-going comparisons for small organics in support of food and clinical applications; and maintaining stable and mature facilities for on-demand comparisons for gases and light isotopes.

Laboratory-based knowledge developed through the comparison programme will be transferred to NMIs with emerging metrology systems through Capacity Building and Knowledge Transfer (CBKT) projects. These projects will focus on reference measurement procedures for small organics and qNMR; proteins and peptides; gases and light stable isotopes. Knowledge dissemination is achieved through on-line e-learning modules, visiting scientist placements and specialized summer schools.

S09 To support the CCQM strategy in demonstrating and improving equivalence and facilitating the establishment of national measurement standards and services for gas sensing and reactive gases at performance levels required to support national priorities.

S09-1 Ozone and nitrogen dioxide standard comparisons

Coordinating comparisons underpinning NMI capabilities for maintaining and disseminating reactive gas standards.

S09-1.1 Eight bilateral comparisons with NMIs maintaining primary ozone standards completed as part of BIPM.QM-K1.	
S09-1.2 Modelling of global network of primary ozone standards, development of optimized comparison model and digital twin completed for maintenance of network consistency.	
S09-1.3 Eight bilateral comparisons with NMIs producing and disseminating nitrogen dioxide standards completed as part of BIPM.QM-K6.	

S09-2 Isotope delta comparisons

Coordinating comparisons and providing standards underpinning NMI capabilities for delivering carbon isotope standards and measurements on the VPDB scale.

S09-2.1 Draft A, B and final report published for CCQM-pilot study to demonstrate the uncertainty of Carbonate-Phosphoric Acid Reference Method for realizing the VPDB scale.	
S09-2.2 Twelve bilateral comparisons with NMIs maintaining carbon delta scale standards completed as part of BIPM.QM-K3 and BIPM.QM-K4.	
S09-2.3 Twelve pure gas isotope carbon delta standards produced and value assigned allowing NMIs to disseminate highest accuracy VPDB scale measurements.	

S09-3 Traceability for isotope delta measurements

Improving consistency and extending the range of light isotope ratio comparisons to support standard and service developments at NMIs.

S09-3.1 Extension and validation of BIPM internal pure gas isotope carbon delta standards completed to allow dissemination and comparisons of the VPDB scale to -70 ‰.	
S09-3.2 Facility for comparison of delta oxygen-18 VPDB and VSMOW-SLAP scales completed and tested to improve uncertainties with which oxygen isotope ratio standard/measurements can be delivered by NMIs.	
S09-3.3 Database developed for definitions and realizations of isotope ratio scales to support activities with the CCQM Working Group on Isotope Ratios (CCQM-IRWG).	

S09-4 Core and high-precision gas standard comparisons

Coordinating comparisons underpinning NMI capabilities for delivering and value assigning equivalent core binary gas mixtures and highest precision gas standards.

S09-4.1 Ten bilateral comparisons with NMIs maintaining core binary mixture standards completed as part of BIPM.QM-K2.a and b.	

S09-4.2 Ten bilateral comparisons with NMIs maintaining scale standards for high precision measurements completed as part of BIPM.QM-P5 and 7 and BIPM.QM-K5 and 7.	

S09-5 CBKT Gas Standards

Providing knowledge transfer on reference method for gas standard value assignment/production for NMIs establishing/extending their gas metrology programmes.

S09-5.1 e-learning module of production and value assignment of pure gas carbon isotope delta standards completed.	
S09-5.2 e-learning module extended and workshop delivered on isotope delta measurements and standards.	
S09-5.3 Two secondments of visiting scientists on Metrology for Clean Air assignments completed.	

S10 To support the CCQM strategy in demonstrating and improving equivalence and facilitating the establishment of primary reference materials and calibrators for:

- **small molecule organics, at performance levels required to support reference measurement systems for laboratory medicine, food safety and trade in primary produce, forensics, environmental analysis and pharma.**
- **peptides and proteins, at performance levels required to support reference measurement systems for laboratory medicine, healthcare and bioengineering sectors.**
- **DNA and RNA, at performance levels required to support reference measurement systems for nucleic acid testing associated with human/animal disease, foods and environmental analysis.**

S10-1 Small Organic primary reference material comparisons

Coordinating comparisons underpinning NMI capabilities for delivering and value assigning equivalent primary small organic reference materials for establishment of SI traceable measurements.

S10-1.1 Measurements completed, draft A, B and final report published for a CCQM-K148.a series comparison on Quinidine (non-polar organic, with molar mass of (75 to 500) $gmol^{-1}$, with 20 NMI participations.	
S10-1.2 Method developed, measurements completed, draft A, B and final report published for a CCQM-K148.b series comparison on a polar organic, with molar mass of (75 to 500) $gmol^{-1}$, with 20 NMI participations.	

S10-3 Small Organic Primary Reference Solution Comparisons

Coordinating comparisons underpinning NMI capabilities for delivering and value assigning equivalent primary small organic calibration solutions for establishment of SI traceable measurements.

S10-3.1 Draft A, B and final report published for a CCQM-K78.a series comparison on polar organic multicomponent calibration solutions (glyphosate and metabolites) with 40 NMI participations.	

S10-3.3 Purity evaluation and calibrant assessment guidelines developed to support knowledge transfer and on-line e-learning modules and comparisons for NMIs with developing programmes in organic analysis.	

S10-4 Digital standard comparisons for qNMR

Developing and validating the application of digital standards for qNMR to facilitate SI traceable value assignment at NMIs.

S10-4.1 Comparison completed of quantum-based modelling and reference standard-based qNMR purity evaluation and published.	
S10-4.3 Workshop organized on digital qNMR standards and their application with CCQM and external stakeholders.	

S10-5 Peptide/Protein Primary calibrator comparisons

Coordinating comparisons underpinning NMI capabilities for delivering and value assigning equivalent peptide and protein primary reference materials and calibrators for establishment of SI traceable measurements.

S10-5.1 Draft A, B and final report published for a CCQM-K115 series comparison and associated pilot study on IgG monoclonal antibody and host cell protein quantification, with 12 NMI participations.	
S10-5.2 Method developed, measurements completed, draft A, B and final report published for a CCQM-K115 series comparison on peptide with no crosslinks, with 12 NMI participations.	
S10-5.3 Method developed, measurements completed, draft A, B and final report published for a CCQM-K115 series comparison on peptide calibrator with molar mass of (5 000 to 10 000) $gmol^{-1}$, with 12 NMI participations.	

S10-6 Reference Methods for Protein Calibrator Comparisons

Developing reference methods to support comparisons of protein standard values assignment capabilities at NMIs.

S10-6.1 Method developed and published for tryptic peptide purity evaluation of conventional/*de novo* proteins as potential candidates for CCQM comparisons.	
S10-6.2 Method developed and published for quantification of > 10 kDa conventional/*de novo* proteins as potential candidates for CCQM comparisons.	
S10-6.3 Method and models developed and published for quantification of host cell proteins in recombinant protein standard material to support CCQM comparisons.	

S10-7 DNA/RNA primary reference calibrator comparisons

Coordinating comparisons underpinning NMI capabilities for delivering and value assigning primary DNA and RNA reference materials for establishment of SI traceable measurements.

S10-7.1 Method developed for quantification of high-purity and concentration DNA calibrators using IDMS methods as potential candidates for CCQM comparisons.	

S10-7.2 Method developed for quantification of high-purity and concentration RNA calibrators using IDMS methods as potential candidates for CCQM comparisons.	
S10-7.3 Method developed for CCQM-K199 co-coordinated comparison on DNA/RNA primary calibrator value assignment.	
S10-8 CBKT Small Organic Standards Providing knowledge transfer on application of qNMR methods for CRM development at NMIs.	
S10-8.1 qNMR summer school organized at BIPM laboratories for NMIs developing capabilities in qNMR.	
S10-8.2 On-line e-learning module on qNMR extended to cover heteronuclear qNMR.	
S10-8.3 e-learning module on introduction to digital standards for qNMR completed.	
S10-9 CBKT Large Molecule Standards Providing knowledge transfer on protein standard quantification methods for NMIs establishing/extending their biometrology programmes.	
S10-9.1 e-learning module on development of protein reference methods based on tryptic digest peptide quantification completed.	
S10-9.2 e-learning module on host cell protein quantification methods to support protein CRM development completed.	
S10-9.3 e-learning module and case studies on *de novo* protein quantification in support of metrology for bioengineering and biotechnology applications at NMIs completed.	

Ionizing Radiation

The stability and continuity of the ionizing radiation services provided by the BIPM are essential to maintaining the confidence of Member States and their users in the validity of measurement results made in their countries in fields such as medicine, environmental monitoring, nuclear energy and radiation protection.

The global expansion in the use of radioactive sources and ionizing radiation beams in medicine, biology, physics, metallurgy and industry, created an early need for internationally accepted measurement quantities, units and standards. In response, the CIPM established a consultative committee for ionizing radiation in 1958 (Consultative Committee for Standards of Ionizing Radiation (CCEMRI), renamed Consultative Committee for Ionizing Radiation (CCRI) in 1997). Following its first meeting in 1959, the committee recommended extending BIPM activities to this field through the creation of specialized laboratories and staff, in close coordination with the International Atomic Energy Agency (IAEA). This decision laid the foundation for the BIPM Ionizing Radiation Department.

Today, the BIPM provides services for Member States in both dosimetry and radionuclide metrology. Work on neutron metrology at the BIPM headquarters was discontinued in 1995, although it was strongly recommended that the BIPM should maintain the skills needed to follow up this field of ionizing radiation metrology. Coordination of neutron activities remains with the CCRI.

Since 1999, following a decision of the CCRI, the dosimetric quantities determined at the BIPM have been adopted as Key Comparison Reference Values (KCRVs). This decision reflects the long-term and high stability of the BIPM primary standards and the reduced uncertainties associated with the determination of these dosimetric quantities.

Due to financial constraints, some reference dosimetry services are currently provided using off-site facilities. Since 2017, the KCRV for high-energy photon beam dosimetry has been established using a linear accelerator at the DOSEO facility in Saclay (France). Since 2023, the dosimetric reference for radiation protection has been re-established at the International Atomic Energy Agency (IAEA) laboratories in Seibersdorf (Austria) following the decommissioning of the BIPM ^{137}Cs source. Comparisons for ^{192}Ir high dose rate (HDR) brachytherapy have been conducted since 2009 using a transportable system deployed at participating NMIs.

The number and diversity of dosimetry comparisons continue to increase, reflecting the growing range of applications, particularly in healthcare.

In radionuclide metrology, limitations associated with large-scale international comparisons led to the development of the *Système International de Référence* (SIR), which enables bilateral comparisons while reducing the need for transport of radioactive materials. The SIRTI system was subsequently developed to support comparisons of short-lived radionuclides, while the ESIR supports measurements of pure beta- and emerging alpha-emitting radionuclides. The increasing number of radionuclides measured reflects growing demand from medical, environmental and industrial sectors.

The BIPM Ionizing Radiation Department plays a central role in international comparisons, delivering approximately 80 % of ionizing radiation comparisons world-wide, through bilateral comparisons. These services are prioritized in accordance with CCRI requirements and provide faster, more accurate, and more consistent results than decentralized approaches, while ensuring global comparability and supporting effective knowledge transfer.

Future developments are defined jointly with the CCRI, incorporated into departmental work plans, validated through international consultation, and supported by secondees.

Ionizing radiation metrology underpins critical technologies in medicine, industry, environmental monitoring, space exploration, and radiation protection. In response to evolving societal and technological requirements, the CCRI has identified priority development areas in dosimetry, radionuclide metrology, neutron metrology, and digital technologies. These include work on high-energy and pulsed fields, new radionuclides for emerging applications, improved nuclear data, advanced measurement techniques, and validated digital data-processing methods.

To address these challenges, the BIPM Ionizing Radiation Department continues to adapt its programme in alignment with CCRI priorities. Through these activities, the BIPM aims to maintain its central role in supporting international equivalence, innovation, and capacity building in ionizing radiation metrology.

In dosimetry, continued access to high-performance facilities remains essential. The BIPM therefore plans to maintain x-ray and ^{60}Co services at its headquarters to support the growing needs of Member States. In the field of diagnostics and radiotherapy ^{60}Co plays a central role as the reference beam for the dosimetry in radiotherapy. New reference x-ray qualities and a comparison service for low-dose-rate ^{125}I brachytherapy will be established. Collaborative investigations with the CCRI will also explore future comparisons involving high-energy particle beams.

In radionuclide metrology, major projects include the International Reference System (SIR) 2.0, the RMO International Reference System Transfer Instrument (SIRTI) and the Extended International Reference System (ESIR). Collaboration with the IAEA will be strengthened to support reference material comparisons and reinforce links with the CCRI(II) community. The BIPM will also expand its role in nuclear data production and evaluation, investigating new technologies and capabilities, and developing partnerships to accelerate progress in digital electronics, nuclear data and digital comparison methodologies.

S11 Deliver high-precision, high-accuracy dosimetry measurement services that enable National Metrology Institutes (NMIs) to compare and calibrate their standards, sustaining global metrology in healthcare and radiation protection. Particular emphasis will be placed on supporting emerging metrology institutes and developing dosimetry capabilities for innovative therapeutic techniques, together with a global strategy to adapt and prioritize over time the existing services to meet the continuously growing demands from the Member States.

S11-1 International reference system for dosimetry with BIPM facilities[2]

Underpinning the international equivalence of national standards for radiotherapy, diagnostic x-rays, mammography and radiation protection, through the provision of comparison and calibration services, using BIPM facilities.

S11-1.1 20 bilateral comparisons delivered at the BIPM to validate national primary standards for x-ray dosimetry and ^{60}Co beam.

- air kerma for low energy x-rays (BIPM.RI(I)-K2), medium energy x-rays (-K3), mammography x-rays (-K7) and ^{60}Co radiation beam (-K1).
- absorbed dose to water for medium energy x-rays (-K9) and ^{60}Co radiation beam (-K4).

[2] If the ^{60}Co source is not replaced in this period (see S11-3.2 in the Annex), then these deliverables are at risk in case of a failure of the current ^{60}Co irradiator.

S11-1.2 80 calibration certificates issued to ensure the traceability to the SI of national secondary standards in all fields mentioned in S11-1.1 (C1, C2, C3, C4, C7 and C9).

S11-2 International reference system for dosimetry with off-site facilities or travelling instrument

Underpinning the international equivalence of national standards for radiotherapy, brachytherapy, radiation protection and radio-sterilization through the provision of comparison and calibration services, using off-site facilities or travelling instrument.

S11-2.1 Eight bilateral comparisons delivered to validate national primary standards for gamma-rays, brachytherapy and high-energy photon beams:

- Off-site ^{137}Cs beam (IAEA): air kerma (-K5) at radiation protection level
- Off-site ^{192}Ir HDR source: travelling instrument for comparisons of reference air kerma rate standards (-K8)
- Off-site DOSEO: absorbed dose to water for high-energy photon beams (-K6).

S11-2.2 16 calibration certificates issued to ensure the traceability to the SI of national secondary standards in the ^{137}Cs (C5) and high-energy photon beams (C6).

S11-3 Long-term sustainability of the international reference system for dosimetry

Strengthening and maintaining the international equivalence of national dosimetry standards to respond to the growing and emerging needs of Member States.

S11-3.1 New low-energy x-ray reference qualities established (e.g., 80 keV) at the BIPM facility including full characterization and validation for international comparisons.

S11-3.3 A new brachytherapy comparison service established and delivered at the BIPM for ^{125}I low-dose-rate sources.

S11-3.4 Calorimetric measurement system dedicated to the high-energy photon beams updated and re-established.

S12 Provide long-term, highly stable comparison services that support radioactivity measurements world-wide, while developing new capabilities to demonstrate the equivalence of standards for emerging radionuclides used in nuclear medicine, environmental monitoring, and challenging-to-measure isotopes.

S12-1 Comparisons for activity measurements of radionuclides

Underpinning the international equivalence of national standards of radionuclides for applications in nuclear medicine, the nuclear industry, nuclear physics, environmental protection, radiation protection and nuclear forensics, through the provision of BIPM key comparisons.

S12-1.1 Key comparisons (BIPM.RI(II)-K1, with 40 NMI/DI participations) of national activity standards of gamma-ray emitting radionuclides provided using the high-precision, high-stability, SIR ionization chambers.

S12-1.2 Key comparisons (BIPM.RI(II)-K4, with 10 NMI/DI participations) of national activity standards of short-lived gamma-ray emitting radionuclides provided using the high-precision, high-stability SIRTI scintillation counter, in remote or on-site modes.	
S12-1.3 Assured traceability of the RMO SIRTIs delivered through links to the BIPM SIRTI during international exercises.	
S12-1.4 Key comparisons (BIPM.RI(II)-K5, with 20 NMI/DI participations) of national activity standards of medium- and high-energy beta-particle emitting radionuclides provided using the high-precision, high-stability ESIR liquid scintillation counter based on the TDCR method.	

S12-2 Resilience and extension of SIR services

Strengthening and maintaining the international equivalence of national activity standards to respond to the growing and emerging needs of Member States.

S12-2.1 SIR services successfully transferred to the upgraded SIR 2.0 system, implementing a new measurement method based on state-of-the-art low-current instrumentation, and ensuring the long-term continuity of international equivalence of national standards.	
S12-2.2 Activity measurement range extended for the SIR system by exploiting the significantly enhanced sensitivity of the SIR 2.0 device.	
S12-2.3 SIRTI services extended to new four radionuclides, supported by dedicated metrological studies and validated cross-calibration with the SIR system.	
S12-2.4 Number of radionuclides (low-energy beta and alpha emitters) covered by the ESIR extended to eight new isotopes, through targeted studies to improve full-system simulations, liquid scintillation source preparation procedures, and impurity correction methods.	

S12-3 New capabilities in radionuclide metrology

Supporting the radionuclide metrology community by developing capabilities that respond to critical and high-impact needs.

S12-3.1 Established and validated primary $4\pi\beta-\gamma$ activity measurements methods.	
S12-3.2 High-quality nuclear data measurements and evaluations delivered in support of the DDEP database, contributing to improved decay data for radionuclide metrology and applications.	
S12-3.3 Validated methods developed for the measurement of gaseous radionuclide samples using the SIR 2.0 system.	
S12-3.4 Strategic study published in collaboration with NMIs/DIs on emerging measurement technologies offering new capabilities for radionuclide metrology, with an initial focus on mass spectrometry, including feasibility assessment and metrological impact analysis.	

S13 Advance the development of digital data acquisition systems and the progressive automation of ionizing radiation services to modernize BIPM measurement standards, replace legacy analogue technologies, and enhance operational efficiency.

S13-1 Digital electronics in ionizing radiation metrology

Undertaking the development of digital electronics for data acquisition from BIPM standards, aiming to replace the current analogue systems.	
S13-1.1 Advanced digital electronics systems delivered and commissioned for SIRTI and ESIR.	
S13-1.2 Digital data acquisition for the 4πβ–γ liquid scintillation counter at the BIPM implemented and validated supporting the establishment of a primary measurement method for nuclear data determination.	
S13-1.3 Centralized service provided at the BIPM to compare and validate data analysis methods for digital measurement data.	
S13-2.1 Automated systems for the production of comparison reports and calibration certificates implemented.	
S13-2.2 Automated measurement processes for one radionuclide service implemented and validated.	

S14 Work with stakeholders, including other IOs and RMOs, to ensure a coordinated international approach in ionizing radiation metrology by fostering collaboration to provide world-wide well coordinated and impactful responses to both current and emerging challenges.

S14-1 Global coordination of neutron comparisons Underpinning a global neutron comparison system that will be done in coordination with CCRI (III) and the RMOs.	
S14-1.1 Framework for the organization of neutron comparisons established and structured with clearly defined roles at the RMO and CCRI levels. Coordinated communication and outreach activity delivered to developing countries to increase participation in RMO-led neutron comparisons and the expansion of the neutron metrology community.	
S14-1.2 Global framework for monitoring and maintaining the development, status, and traceability of the RMO SIRTI network coordinated through active participation in dedicated CCRI working group meetings and the provision of operational support.	
S14-2 Access to high-energy facilities for ionizing radiation comparisons Supporting CCRI comparisons involving high-energy particles – including neutrons and hadrons – through liaison to coordinate access for NMIs to shared large-scale high-energy radiation facilities.	
S14-2.1 Formal liaison mechanisms established and maintained with two high-energy radiation facilities – RCNP (Japan) and iThemba LABS (South Africa) – to support the long-term development and sustainability of high-energy neutron comparisons (>20 MeV), including agreed collaboration frameworks and coordinated technical exchanges.	
S14-2.2 Structured partnerships established with leading proton- and hadron-therapy facilities to support the long-term development of dosimetry comparisons in these fields.	
S14-3 CBKT ionizing radiation Supporting knowledge transfer and capacity building through webinars, workshops and summer schools, delivered with the support of the CCRI Communication Working Group.	

S14-3.1 Annual programme of five to eight webinars organized in collaboration with the CCRI Communication Working Group covering a broad range of topics across all fields of ionizing radiation metrology.	🤝
S14-3.2 At least one targeted technical workshop per year organized at the BIPM headquarters, focused on priority and emerging areas of ionizing radiation metrology.	🤝
S14-3.3 Video recordings of all webinars and workshops disseminated through the CCRI YouTube channel, and structured e-learning modules based on this material delivered on the BIPM platform.	
S14-3.4 A summer school organized on radionuclide metrology, focusing on both primary and secondary standards, to strengthen the community and enable new institutes to develop such activities in their own countries.	

Coordination of the Worldwide Measurement System

The third objective of the BIPM is to:

> be the coordinator of the world-wide measurement system, ensuring it gives comparable and internationally accepted measurement results,
>
> - *We coordinate activities between the National Metrology Institutes (NMIs) of Member States and the Regional Metrology Organizations (RMOs), including the provision of technical services to support the CIPM Mutual Recognition Arrangement (CIPM MRA) and the infrastructure for the development and promotion of the International System of Units (SI) and Coordinated Universal Time (UTC).*
> - *We provide the necessary Digital Framework to maintain the CIPM MRA and make the SI and UTC applicable, inclusive, and accessible in the digital age*.

The comparability and long-term consistency of measurement results around the world depend on the active maintenance of equivalent measurement scales by Member States and on their ability to demonstrate that equivalence.

Since 1999, the CIPM MRA has provided the international framework that underpins confidence in national metrology capabilities. The BIPM plays a central role in supporting this framework by providing the required technical infrastructure, including meeting facilities, executive secretaries, document management systems and archiving.

A particularly important contribution is the maintenance of the Key Comparison Database (KCDB), which provides users world-wide with quantitative information on the comparability of national metrology services.

Members of the CIPM Consultative Committees work together to establish the very highest levels of measurement comparability and to prepare for emerging measurement needs. Regional Metrology Organizations support participation in these activities by Member States and others within their regions.

The BIPM organizes the meetings of the ten Consultative Committees of the CIPM and their Working Groups, as well as Capacity Building and Knowledge Transfer (CBKT) training sessions, summer schools, workshops on cutting-edge topics in metrology. It also provides forums of exchange within the scientific metrology community such as the Joint Committees, special groups initiated by the CIPM for horizontal activities (Sectoral Task Groups and Forums), annual meetings of the Directors of the NMIs and Member State Representatives, the CGPM and CIPM meetings.

Meetings hosted by the BIPM are part of the services the BIPM delivers to its stakeholders and are a cornerstone of its coordination activities. Each year, meetings held at the BIPM headquarters and online represent approximately 220 days. Around 2 000 participants from all over the world attend meetings onsite, and more than 6 000 additional participants join online.

The BIPM also coordinates the journal *Metrologia*, which is the leading international journal in pure and applied metrology, published by IOP Publishing on behalf of the BIPM. Since January 2026 it has been a fully open access journal.

The work programme relating to this coordination role is described below.

C01 To improve and promote the mutual recognition of national measurement standards and of calibration and measurement capabilities (CMCs) issued by NMIs, particularly by operation of the KCDB and supporting the JCRB.

C01-1 JCRB Chairing the Joint Committee of the RMOs and the BIPM (JCRB) and providing the JCRB Secretariat.	
C01-1.1 JCRB Executive Secretary (Secondee position) provided to support the following.	🏃
C01-1.2 Support the JCRB to organize annual meetings (online or in person).	🏃
C01-1.3 The JCRB CMC review process proactively monitored.	🏃
C01-1.4 Ensure the efficiency and effectiveness of the JCRB CMC review.	🏃
C01-1.5 The CIPM MRA documents suite, JCRB database and DI registry maintained.	🏃
C01-1.6 Assistance to CIPM MRA participants and RMOs in the practical implementation of the CIPM MRA provided on request.	🏃
C01-2 The Key Comparison Database (KCDB) Providing the technical infrastructure for the KCDB, continuously updating to align with the requirements of the CIPM MRA and the users, assisting users.	
C01-2.1 The KCDB updated to a fully machine-actionable version (KCDB 3.0), including automated processing of comparison data.	
C01-2.2 Continuous maintenance and minor updates of the KCDB carried out.	
C01-2.3 Comparison data and CMCs continuously processed and published.	
C01-2.4 Advice provided to users of the KCDB.	
C01-3 CBKT in support of CIPM MRA Providing capacity building and knowledge transfer to CMC writers, comparison participants/pilots, QMS personnel, and RMO secretariats on the implementation and processes of the CIPM MRA, including the use of the KCDB.	
C01-3.1 In-person training on CIPM MRA processes organized.	
C01-3.3 Technical exchanges to support participants in CIPM MRA processes conducted.	
C01-3.4 e-learning modules and case studies on CIPM MRA processes completed.	🏃
C01-3.5 KCDB-CBKT on-line tool provided and maintained.	🏃

C02 To build mutual support between the BIPM and the RMOs.

C02-1 RMO support

Giving strategic and administrative support to RMOs as required.

C02-1.3 Collaboration between secretariats fostered, specifically in the areas of capacity building, digital transformation, communication, and career development for young metrologists through a common web platform, on-line meetings and one workshop on-site the BIPM.	
C02-1.4 Participation in the CIPM MRA enabled for Member States that are unable to join an RMO.	

C03 To liaise with Member States, Associates and potential Observers as well as candidates and support them in application procedures.

C03-1 Metre Convention participation

Liaising and advising Member States and Associates as well as candidates on participating in the Metre Convention.

C03-1.1 Procedures under the Metre Convention coordinated and monitored.	
C03-1.2 Metre Convention participation promoted to potential Member States and Associates.	
C03-1.3 RMOs kept up to date on the activities of the BIPM and the support available.	
C03-1.4 An annual meeting for Member States representatives and NMI Directors organized at the BIPM in collaboration with the RMOs.	
C03-1.5 Member States and Associate supported to settle their contributions and subscriptions.	

C03-2 Universal Adherence to the Metre Convention

Implementing Resolution 1 of the 28th meeting of the CGPM on Universal Adherence and supporting potential Observers.

C03-2.1 Metre Convention participation promoted to potential Observers.	
C03-2.2 Support and advice provided to Observers.	

C03-3 Capacity building for Observers

Drafting joint proposals, promoting proposals to funding partners where necessary, and implementing collaborative activities to enable capacity building for Observers without a financial burden on Member States and Associates.

C03-3.1 Collaborations with potential partners (including UNIDO) explored and formalized.	
C03-3.2 Training activities jointly organized with Observers and RMOs.	
C03-3.3 Quality Infrastructure related e-learning courses developed (in collaboration with OECD, UNIDO and other relevant organizations).	

C04 To develop and implement best practice in the support of the Consultative Committees, Joint Committees and Working Groups through the provision of Executive Secretaries.

C04-1 Publication of Reports

Drafting, editing, translating and typesetting reports and documents, ensuring best practice for publication.

C04-1.1 Meeting reports and other official documents published for BIPM, CIPM, CGPM, CCs and Joint Committees.	
C04-1.2 Scientific publications of the BIPM edited.	
C04-1.3 DOIs for BIPM documents published to ensure findability and accessibility of documents.	

C04-2 JCGM

Ensuring the ongoing relevance and authority of the GUM and VIM by providing a chair and executive secretary to the Joint Committee for Guides in Metrology (JCGM)

C04-2.1 Chair, executive secretary, and rapporteur for the JCGM provided.	
C04-2.2 Secretariat services and representation at the JCGM working groups provided as required.	

C04-3 Administrative effectiveness of the Consultative Committees

Providing executive secretaries for CCAUV, CCEM, CCL, CCM, CCPR, CCQM, CCRI, CCT, CCTF, and CCU.

C04-3.1 Plenary meetings arranged and attended, working groups and task groups supported.	
C04-3.2 CC processes and coordination supported including membership of and the selection of chairs for working groups and task groups.	
C04-3.3 Web presence managed, providing access to and supporting updates to all meeting and operational documents of the CCs and their working groups and task groups.	
C04-3.4 CC Presidents supported in reporting to the CGPM and CIPM, and development and updating of strategy documents.	

C04-4 JCTLM

Ensuring the continuity of the JCTLM process and database for identifying Reference Methods, Materials and Services and promoting metrological traceability in laboratory medicine.

C04-4.1 Annual JCTLM Executive and WG meetings organized.	
C04-4.2 Biennial JCTLM Stakeholder meetings organized.	
C04-4.3 Workshops organized with stakeholders, focusing on reference measurement systems for disease-specific biomarkers and promoting metrological traceability and its benefits on patient care.	
C04-4.4 Annual JCTLM DB nominations/review publication process completed.	
C04-4.5 JCTLM database updated including supporting documentation and media and investigation of application of AI to increase efficiency of JCTLM processes.	
C04-4.6 JCTLM Membership model and supporting processes updated.	
C04-4.7 A JCTLM strategy for metrology in support of accurate results in laboratory medicine published.	

C04-5 CIPM STGs and Forums

Supporting the management and activities of CIPM sectorial task groups and forums in promoting metrological traceability in sector specific areas.

C04-5.1 Meetings of the STGs and Forums organized.	
C04-5.2 Executive secretary services provided to meetings of STGs and Forums as described for Consultative Committees in C04-3.	
C04-5.3 Summary documents such as recommendations compiled and published.	

C05 To plan, organize and deliver different types of meetings for Member States and Associates representatives and to provide them access to related working documents.

C05-1 Meetings information

C05-1.1 Database of contact details and details of participants attending all meetings hosted by the BIPM kept up to date and integrated into the delivery of the new website.	
C05-1.2 Access to working documents for all meetings controlled.	

C05-2 Meetings logistics

Planning, organizing, supporting, and managing the logistics and delivery of the meetings at the BIPM and on-line (Consultative Committees, Joint Committees, Forums, CBKT, Member States representatives and NMI Directors, CGPM, Workshops, Working Groups, Task Groups and Summer Schools).

C05-2.1 Convocations, nomination forms, and registrations managed for on-site, hybrid and on-line meetings.	
C05-2.2 Attendance of participants and speakers facilitated including invitation letters, *notes verbales*, payment management and reimbursements.	
C05-2.3 On-site services including catering and suitable meeting rooms provided for meetings at the BIPM headquarters.	
C05-2.4 Technical support for on-site and on-line meetings provided.	

C06 To ensure that *Metrologia* remains the most important scientific journal for metrology by flipping it to a "gold" open access standard.

C06-1 *Metrologia* sustainability

Providing leadership and support ensuring that the journal remains the leading international journal in pure and applied metrology by responding to current and future shifts in the publication landscape.

C06-1.1 *Metrologia* edited and published regularly.	
C06-1.2 Success of *Metrologia* ensured through maintenance of a robust editorial team and appropriate publishing partner.	
C06-1.3 Topics of interest and publications of interest for Guides, Standards and Conventions section identified with the CIPM and CCs.	
C06-1.4 Focus Issues on key topics of interest produced.	
C06-1.5 Publication of review papers and research papers in *Metrologia* by BIPM senior scientists encouraged.	
C06-1.6 Provision of external Deputy Editor support.	

Digital Transformation

The continuing digital transformation of society, together with advances in digital technologies and artificial intelligence, has significantly changed expectations of the BIPM in its role as guardian of the International System of Units (SI) and coordinator of the international measurement system.

The 27th meeting of the CGPM (2022) mandated the CIPM to:

- ensure that the Metre Convention naturally extends its role as the globally accepted anchor of trust for metrology into the digital era
- develop an SI Digital Framework that assures that measurements are FAIR, machine-readable, machine-actionable, and support digital metrological traceability.

In response, the Forum for Metrology and Digitalization (FORUM-MD) was established, with eight task and working groups. This Forum coordinates digitalization activities across the world-wide measurement system and aligns them with the needs of BIPM stakeholders.

The BIPM has begun implementing the SI Digital Framework, centred on a digital representation of the SI. Digital identifiers are being introduced progressively for relevant terms, enabling existing services such as the Key Comparison Database (KCDB), the Joint Committee for Traceability in Laboratory Medicine (JCTLM) database, and the Time Department database to become machine accessible.

During the 2028-2031 work programme, the BIPM will continue developing the SI Digital Framework as a central platform supporting all BIPM digital services. This work includes extending ontologies of digital identifiers that underpin the work of the BIPM and the wider metrology community. Future developments will include extending digital references to vocabularies that are beyond the SI and enabling conversion between the SI and other vocabularies **(C07-1/2/3**).

A major milestone will be the launch of the KCDB 3.0, a machine-actionable version of the database that will ensure all data created under the CIPM MRA conform to Findable, Accessible, Interoperable, and Reusable (FAIR) principles **(C01-02)**.

Additional digitalization activities are being undertaken within scientific departments. These include automation and improvement of digital data processes in the Time Department **(S06-4)**, development of a digital twin for the global network of primary ozone standards **(S09-1.2)**, development of a database for definitions and realizations of isotope ratio scales **(S09-3.3)**, exploration of artificial intelligence applications in JCTLM processes **(C04-4.5)**, comparison of digital standards for qNMR **(S10-04**), development of digital electronics in ionizing radiation metrology **(S13-2)** and automation of BIPM ionizing radiation services **(S13-3).**

In parallel, the BIPM will adopt modern digital tools to improve internal procedures and services across the organization. A major milestone will be the update and restructuring of the BIPM website **(R01-1)**. This will include a new document repository and improved tools to support remote collaboration among committees and working groups. The new BIPM website will be fully machine accessible.

The BIPM will constantly monitor emerging technologies, especially those based on AI, and evaluate their potential to improve both BIPM services and internal procedures **(A03-1).**

The activities described below have been developed in close collaboration with the FORUM-MD while activities in other sections were planned according to the strategies of the concerned Consultative Committees of the CIPM (CCs), many of which have established dedicated working groups for digitalization.

C07 To underpin the SI Digital Framework with a coordinated and modular data architecture that allows machine-actionable and FAIR access to all reference data curated by the BIPM while ensuring data integrity.

To support the work of the CIPM FORUM-MD and Consultative Committees by, for example, developing and promoting new tools.

C07-1 SI Digital Framework

Maintaining and constantly updating existing identifiers and ontologies, developing additional ontologies, and implementing external vocabularies in the SI Digital Framework. Supporting the CIPM to expand the SI Reference Point to serve as a comprehensive and authoritative digital framework that allows machine-actionable conversion between the SI and other systems of units, as well as between different digital representations of units.

C07-1.1 Ontologies of the SI Digital Framework maintained and updated.	
C07-1.2 In collaboration with the FORUM-MD, the CCs and NMIs/DIs, new ontologies developed and existing vocabularies implemented in the SI Digital Framework to ensure full compatibility with other systems used in the application of the CIPM MRA and concepts of metrological traceability.	
C07-1.3 Full version control and data integrity for the SI Reference Point ensured so that it can be used as an authoritative reference to define the SI.	
C07-1.4 Capacity building and knowledge transfer provided to support users of the SI Digital Framework and BIPM digital services.	

C07-2 Platform for BIPM services

Providing a common platform and harmonized architecture for all BIPM services including databases, APIs and software tools and extending the available services on a needs basis and with the support of NMIs.

C07-2.1 Needs of NMIs/DIs and CCs with regards to BIPM digital services assessed regularly.	
C07-2.2 Technical infrastructure maintained and extended to host all services, including access to databases, API and other software tools using a microservices structure.	
C07-2.3 Web interface as a single entry point for experts and non-experts and a Github repository maintained.	
C07-2.4 New web services developed for the KCDB which support, among other things, the use of digital certificates and the application of large sensor networks.	

C07-3 Digital Transformation of QI

Collaborating on the digital transformation of quality infrastructure with the stakeholders of the FORUM-MD, the Signatories of the Joint Statement of Intent and the RMOs.

C07-3.1 Webinars and conferences held in collaboration with the FORUM-MD, the CCs, the Joint Signatories and the RMOs.	
C07-3.2 Interoperability of the SI Digital Framework with other frameworks ensured through collaboration with liaison organizations.	
C07-3.3 Global initiatives for harmonization in the area of digital measurement data continuously monitored, information shared with the metrology community and new strategic collaborations initiated.	

Capacity Building and Knowledge Transfer

Capacity Building and Knowledge Transfer (CBKT) is central to the mission of the BIPM. It supports the maintenance of measurement comparability at the highest levels, facilitates the implementation of international measurement infrastructures, and promotes the application of sound metrology to emerging fields.

The BIPM CBKT Programme supports two of the organization's primary objectives: scientific and technical cooperation and the coordination of the world-wide measurement system. Its purpose is to strengthen the ability of Member States and Associates to participate effectively in the international metrology system.

The CBKT programme was launched in 2016 and has expanded steadily. Its projects are delivered through workshop-based activities organized at the BIPM headquarters and at National Metrology Institute (NMIs), remote-learning activities, on-line short courses, on-line technical exchanges, and an e-learning platform as well as placements for scientists at the BIPM laboratories and partner NMIs.

To ensure the most effective use of resources and to maximize impact, the BIPM will develop and implement an integrated "All-of-BIPM" CBKT framework during the 2028-2031 period **(C08-1)**. This framework will ensure that the activities are closely aligned with the needs of the Member States and Associates and will include monitoring mechanisms to support continuous improvement through participant feedback and evaluation of delivery methods.

The framework will also facilitate closer coordination with other organizations. Integrated programmes are planned with the United Nations Industrial Development Organization (UNIDO) and United Nations Educational, Scientific and Cultural Organization (UNESCO) **(R02-2, C03-3)**, allowing the BIPM to reach a broader range of potential participants while minimizing the additional resource burden on the organization.

Many CBKT activities are closely linked to projects carried out in the BIPM laboratories and within Consultative Committees. For example, e-learning courses or workshops are often developed following pilot studies or joint technical projects. Hosting scientists from emerging NMIs within the BIPM laboratories also plays an important role in knowledge transfer.

CBKT activities focusing on specific areas of measurements are described in the corresponding chapters of the scientific departments of the BIPM. In particular, they include knowledge transfer activities on electrical quantum standards **(S03-1)** and Kibble balances **(S05-2)**; improving Coordinated Universal Time (UTC) and national time scales UTC(*k*) **(S08-1)**; CBKT activities for gas standards **(S09-5)**, small organic standards **(S10-8)** and large molecule standards **(S10-9)**; assuring traceability of the RMO SIRTIs **(S12-1.3)**; supporting the global framework for monitoring and maintaining of the Regional Metrology Organization (RMO) International Reference System Transfer Instrument (SIRTI) network **(S14-1.2)**; providing CBKT webinars and workshops, delivered with the support of the Consultative Committee for Ionizing Radiation (CCRI) Communication Working Group **(S14-3)**; and organizing a summer school on radionuclide metrology **(S14-4)**. Some of the activities above also include the development of e-learning courses based on the materials developed.

In addition, the BIPM provides support to participants in the CIPM Mutual Recognition Arrangement (CIPM MRA), including Calibration and Measurement Capability (CMC) Writers; comparison pilots and participants; RMO Technical Committees (TCs); and NMI quality management personnel. Activities include e-learning courses, regular on-line technical exchanges and in-person workshops at the BIPM headquarters and in collaboration with the RMOs. These activities are described in deliverable **C01-3**.

Multidisciplinary CBKT activities, spanning several areas of measurement, are described in **C08-2**. These include summer schools held in conjunction with scientific societies or laboratory placement programmes at collaborating NMIs.

In support of BIPM digital transformation activities, capacity building and knowledge transfer initiatives will be provided to assist users of the SI Digital Framework and BIPM digital services, ensuring that the international metrology community can fully benefit from and effectively utilize these evolving tools **(C07.1-4)**.

C08 To reinforce the international metrology system and support its efficient operation through capacity building and knowledge transfer.

To ensure a balanced participation in the system and especially to support effective engagement with the international metrology community in developing countries.

C08-1 Development of "all-of-BIPM" CBKT framework

Engaging all departments in a common CBKT programme to increase the effectiveness with which Member States and Associates engage in the world-wide coordinated metrological system.

C08-1.1 All activities of the BIPM CBKT programme are planned based on a systematic needs assessment of NMIs, DIs and RMOs.	
C08-1.2 All CBKT activities evaluated against the same impact indicators.	
C08-1.3 Availability, stability and continuous improvement of the e-learning platform maintained.	

Stewardship of Resources

The BIPM is committed to the transparent and efficient use of the public funds invested in it. In addition to delivering a work programme which explicitly addresses its three objectives, the BIPM will continue to protect and develop the resources that will support its long-term effectiveness.

A01 To protect the health and safety of BIPM staff.

To protect the quality of BIPM services.

A01-1 Health and Safety	
A01-1.1 Workplace injuries and incidents prevented through strong culture and regular assessment and mitigation of risks.	
A01-1.2 Health and safety policy, documentation and processes kept up to date and compliant with international standards.	
A01-2 Quality	
A01-2.1 Services consistently met the needs of our customers.	
A01-2.2 Services and processes continually improved.	
A01-2.3 Quality system and its implementation audited and maintained in compliance with relevant standards.	

People

The largest part of the BIPM annual budget is invested in its staff, whose expertise and engagement in its mission are critical to the success of the organization. The CIPM Strategy 2030+ identifies a "transition in the balance of staff skills to best address future priority requirements (for example, coordination of cross-cutting activities and representational actions)". Achieving this balance, while continuing to underpin the scientific nature of the organization, will require increased clarity around roles and greater flexibility to respond to change.

A02 To develop the BIPM organizational structure to enhance its agility and improve its efficiency in delivering on its mandate and objectives.

To broaden the skills-mix and experience available among the BIPM staff whilst achieving long-term improvements in efficiency.

A02-1 Clarity and Flexibility for Staff	
A02-1.1 Talent management framework and organizational structure continuously evolved to support the mandate of the BIPM through optimal utilization of capabilities.	
A02-1.2 Capacity and capability of personnel enhanced through growth in the number of joint projects and breadth of knowledge base and experience of NMI secondees at the BIPM with greater contributions from their home institutes.	

Digital Infrastructure

Given the rapid evolution of digital technologies and increasing cybersecurity risks, the BIPM will maintain a highly responsive and fit-for-purpose digital infrastructure. The BIPM needs to be in a position to take advantage of technologies that allow improved efficiency or transform working practices (for example artificial intelligence or cloud services), enable best-practice operations, and ensure the protection of the data assets entrusted to the organization.

A03 To develop and implement rules and procedures for the use of AI in the BIPM that respect the mission and the legal framework of the organization.

A03-1 Use of AI at the BIPM

Ensuring that the BIPM services support AI applications and implementing AI-based solutions to make BIPM services more efficient while maintaining data integrity and data security.

A03-1.1 A BIPM AI policy drafted and kept updated in line with the evolution of AI applications.	
A03-1.2 Research tools to improve user experience of BIPM databases, the document repository, website and digital services implemented in line with BIPM's AI policy.	
A03-1.3 AI tools to support effective meetings evaluated and implemented in line with the BIPM's AI policy.	

A04 To develop the IT infrastructure to support the mission of the BIPM.

A04-1 IT infrastructure

Maintaining the IT infrastructure to enable secure data storage, efficient workflows, support for digitalization of processes and collaborative approaches.

A04-1.1 Network storage and virtualization infrastructure upgraded and web application architecture and load balancing systems enhanced to improve resilience, performance, scalability, and security.	
A04-1.2 Roadmap for the upgrade and modernization of the Local Area Network completed.	
A04-1.3 Server infrastructure and cloud services modernized and expanded to ensure a secure, up-to-date centralized environment for enhanced collaboration and information sharing.	

A05 To implement "state of the art" cyber-security measures.

A05-1 Cyber Security

Putting in place effective cyber security systems to ensure the continuous functioning of the BIPM and the protection of its data.

A05-1.1 Zero Trust–compliant security infrastructure implemented across the network and adopting practical, easily deployable Post-Quantum Cryptography (PQC) techniques, systems and protocols to strengthen the BIPM's long-term resilience.	
A05-1.2 Regular IT security audits, phishing simulations, and security awareness programmes implemented.	

Built Environment and Meeting Facilities

The BIPM occupies a historically significant site in the southwest of Paris. Over many years, its buildings have been adapted to meet the high specifications required for metrology laboratories while also accommodating thousands of visitors every year. These include: onsite meeting participants; official delegations from Member States and Associates or potential new members; representatives from local authorities; and visitors who enjoy discovering the BIPM history and metrology during the annual opening for the European Heritage Days (approximately 300 visitors each year). In addition, there are those who come for specific visits as part of the BIPM contribution to promote metrology within educational activities.

Long-term maintenance of the buildings, technical services, security and access to the site are monitored and addressed as required and managed as part of the BIPM's stewardship.

As an international organization committed to universal participation, the BIPM will continue to provide high-quality meeting infrastructure supporting in-person, hybrid and on-line events. Modern communication technologies will be used to ensure effective participation and broad accessibility for all BIPM stakeholders.

A06 To develop the built environment to sustain the BIPM work programme as it evolves.

A06-1 Buildings, Security and Grounds Maintenance Supporting the BIPM's work programme through modernizing and optimizing the physical environment.	
A06-1.1 Building integrity and operational efficiency maintained.	
A06-1.2 Longevity and continuous accessibility of facilities evaluated and ensured.	
A06-1.3 Accessibility, safety, and security strengthened through access renovation, entry control, and enhanced surveillance.	
A06-1.4 Landscape preserved, and environmental sustainability and resilience ensured.	

A07 To ensure that the BIPM meeting facilities, which support the CCs and WGs, continue to follow "best practice" amongst IOs.

A07-1 Hybrid Meetings	
A07-1.1 Audiovisual systems for hybrid meetings upgraded to support improved participation.	
A07-1.2 Meeting platforms and tools for engagement continuously improved to provide best possible experience for all participants.	
A07-2 Meeting facilities	
A07-2.1 Fit-for purpose solutions for on-site hospitality ensured to support effective meetings.	
A07-2.2 Furniture in meeting rooms replaced to allow increased participation and flexibility.	

Annex - Additional Priority Work Areas for the BIPM

Although not directly funded by the dotation agreed at the CGPM 2026, the deliverables below are considered high priority by Member States. The BIPM will develop a diversity of mechanisms to allow these deliverables to be reintroduced to the Work Programme. These may include direct funding by Member States or other stakeholders, or cost savings achieved through efficiency measures introduced by the Organization.

Modernization and Digitalization of Time Services

S06-4 Automation and improvement of digital data processes Developing and upgrading of processes and tools to improve efficiency of operations and to provide a wider range of services to support NMIs, the CCL and the CCTF in their roles.	
S06-4.3 On-line API tool delivered to provide direct access to clock characteristics such as clocks phase, frequency, drift and weight.	
S06-4.4 Updates and developments of on-line API tool delivered in response to CCL and CCTF requests.	
S06-5 Evolution of *Circular T* to address the increasing needs of NMIs Underpinning the NMIs and RMOs to identify and address the needs of their users for traceable and resilient time synchronization in an equitable and efficient way.	
S06-5.1 Report published on future needs and suitable modification of *Circular T* and its implementation plan, in consultation with NMIs and RMOs.	
S06-5.2 Guidelines published for laboratories realizing back-up UTC(*k*) sites, developed in full cooperation with NMIs and with their support for shared understanding and testing.	

Comparison of Optical Clocks with a Transportable Instrument

S07-1 Extended use of OFS in time scales Supporting NMIs in the use of OFS in national time scales and UTC by defining data exchange format and protocols, adapting data treatment algorithms.	
S07-1.3 Coordinated the efficient shared exploitation of a donated OFS to pilot a new key comparison of optical frequency standards.	

Coordination of Lunar Time

R02-4 Uptake of UTC Reinforcing the liaisons with IOs representing timing users (e.g. ITU-R, ITU-T, IEEE, ICG), organizations related to timekeeping and time and frequency metrological standards (e.g. IAG, IGS, IERS), scientific bodies (e.g. SKAO) and space agencies to ensure UTC is recognized as the consistent and useful time reference, or suitable time scales traceable to UTC are identified.	
R02-4.3 International agreement on lunar timing actively supported through provision of scientific advice, facilitation of special sessions and participation in discussions of committees (such as ICG WG-D on time standards and WG-L on Moon timing).	

S06-6 Evolution of BIPM timing products to support NMIs in their roles in space projects Supporting NMIs' contributions to space projects of national or international space agencies. Possible establishment of a joint project to support this activity.	
S06-6.2 Report published on needs and feasibility for the BIPM to acquire a new role in coordinating the national realizations of Lunar time and joint project set up.	

qNMR reference method development

S10-1 Small Organic primary reference material comparisons Coordinating comparisons underpinning NMI capabilities for delivering and value assigning equivalent primary small organic reference materials for establishment of SI traceable measurements.	
S10-1.3 Method developed for a CCQM-K148.c series comparison on an organic, with molar mass of (500 to 1000) $gmol^{-1}$	
S10-2 qNMR reference method development Developing and validating the application of candidate internal standard reference materials for heteronuclear qNMR to facilitate primary reference material value assignment at NMIs.	
S10-2.1 Methodology improved and published for ^{19}F qNMR reference method with cross-validation studies using both ^{19}F qNMR and ^{1}H qNMR in various solvents.	
S10-2.2 Methodology optimized and published for ^{31}P qNMR reference method with cross-validation studies using both ^{31}P qNMR and ^{1}H qNMR in various solvents.	
S10-2.3 Three internal standard reference documents published for heteronuclear internal standards.	
S10-3 Small Organic Primary Reference Solution Comparisons Coordinating comparisons underpinning NMI capabilities for delivering and value assigning equivalent primary small organic calibration solutions for establishment of SI traceable measurements.	
S10-3.2 Purity assignment completed of analytes for a CCQM-K78.b series comparison on non-polar organic multicomponent calibration solutions.	
S10-4 Digital standard comparisons for qNMR Developing and validating the application of digital standards for qNMR to facilitate SI traceable value assignment at NMIs.	
S10-4.2 Evaluation completed of digital standard-based qNMR and evaluation of performance across different model systems and published.	

International Liaison and Communication

R01-2 Communication Strategy

Ensuring a coherent communication strategy and representation of the BIPM over the different communication channels, maintaining and expanding the social media presence, providing the newsletter and the annual report.

R01-2.3 Communication campaigns with RMOs including promotional material developed and implemented.	
R01-2.4 Joint messaging and shared communication campaigns run with liaison organizations for targeted user communities.	

R01-3 World Metrology Day

Collaborating with UNESCO, the OIML and the RMOs to run an annual campaign including poster, in-person events and webinars to promote the work of the BIPM and the relevance of metrology.

R01-3.3 Contribute to World Metrology Day events of the NMIs and RMOs.	

R02-1 QI promotion

Ensuring close coordination with other international QI bodies to continuously improve the international system and to promote quality infrastructure as one of the pillars supporting the Sustainable Development Goals (SDGs). Identifying common interests with other international organizations such as UNESCO, UNIDO, UNECE, UNFCCC, OECD, WTO and collaborating to profile the role of scientific metrology.

R02-1.3 Joint documents (e.g., studies, policy briefs) published on key topics.	
R02-1.4 Joint events delivered for stakeholders such as policy makers, industry representatives and scientists.	

S08-1 CBKT in time and frequency to support (inter)national timekeeping

Improving UTC and the national time scales UTC(*k*) by allowing UTC labs to validate the data contributing to UTC, providing software tools and exchanging best practice.

S08-1.1 e-learning courses delivered with interactive software, user manual, and open access source code for the UTC labs to validate and understand their data contributing to UTC.	
S08-1.2 GIT service with open access software modules made available.	
S08-1.3 Summer school and seminars delivered in collaboration with RMOs.	

C01-3 CBKT in support of CIPM MRA

Providing capacity building and knowledge transfer to CMC writers, comparison participants/pilots, QMS personnel, and RMO secretariats on the implementation and processes of the CIPM MRA, including the use of the KCDB.

C01-3.2 On-line webinars tailored to RMO needs on the implementation of the CIPM MRA organized.	

C02-1 RMO support Giving strategic and administrative support to RMOs as required.	
C02-1.1 Designated contact points for each RMO established.	
C02-1.2 Administrative support for secretariats provided where necessary, e.g., by providing webspace.	
C08-2 CBKT Multidisciplinary metrology Creating opportunities for young metrologists to gain in-depth knowledge and experience through summer schools and research placements.	
C08-2.1 Summer schools organized in collaboration with the scientific societies of Member States to support emerging metrologists with strong scientific potential.	
C08-2.2 Joint technical projects organized with NMIs, dedicated to young metrologists to gain in-depth knowledge and experience through research placements at partner NMIs and the BIPM.	

Co-60 irradiator

S11-3 Long-term sustainability of the international reference system for dosimetry Strengthening and maintaining the international equivalence of national dosimetry standards to respond to the growing and emerging needs of Member States.	
S11-3.2 New ^{60}Co beam facility established at the BIPM.	

List of acronyms

ac	Alternating Current
AI	Artificial Intelligence
API	Application Programming Interface
BIPM	Bureau International des Poids et Mesures/International Bureau of Weights and Measures
CBKT	BIPM Capacity Building and Knowledge Transfer Programme
CC	Consultative Committees of the CIPM
CCAUV	Consultative Committee for Acoustics, Ultrasound and Vibration
CCEM	Consultative Committee for Electricity and Magnetism
CCEMRI	Consultative Committee for Standards of Ionizing Radiation
CCL	Consultative Committee for Length
CCM	Consultative Committee for Mass and Related Quantities
CCPR	Consultative Committee for Photometry and Radiometry
CCQM	Consultative Committee for Amount of Substance: Metrology in Chemistry and Biology
CCRI	Consultative Committee for Ionizing Radiation
CCT	Consultative Committee for Thermometry
CCTF	Consultative Committee for Time and Frequency
CCU	Consultative Committee for Units
CGPM	Conférence générale des poids et mesures/General Conference on Weights and Measures
CIPM	Comité international des poids et mesures/International Committee for Weights and Measures
CIPM MRA	CIPM Mutual Recognition Arrangement
CIPM-STG-CENV	CIPM Sectorial Task Group on Climate and Environment (CIPM-STG-CENV)
CMC	Calibration and Measurement Capabilities
CRM	Certified Reference Material
CTBTO	Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization
dc	Direct Current
DDEP	Decay Data Evaluation Project
DI	Designated Institute
DNA	Deoxyribonucleic acid
DOI	Digital Object Identifier
ESIR	Extended International Reference System
FAIR	Findable, Accessible, Interoperable, and Reusable
FAO	Food and Agriculture Organization
FORUM-MD	Forum on Metrology and Digitalization
GaAs	Gallium arsenide
Global ACI	Global Accreditation Cooperation Incorporated
GNSS	Global Navigation Satellite Systems
HDR	High dose rate
IAEA	International Atomic Energy Agency
IAG	International Association of Geodesy
ICG	International Committee on Global Navigation Satellite Systems
ICRM	International Committee for Radionuclide Metrology
ICRU	International Commission on Radiation Units
ICSH	International Council for Standardization in Haematology
IDMS	Isotope Dilution Mass Spectrometry
IEEE	Institute of Electrical and Electronics Engineers

IERS	International Earth Rotation and Reference Systems Service
IFCC	International Federation of Clinical Chemistry and Laboratory Medicine
IGO	Intergovernmental Organization
IGS	International GNSS Service
IMEO	International Methane Emissions Observatory
IO	International Organization
IOC	Intergovernmental Oceanographic Commission
IPCC	Intergovernmental Panel on Climate Change
IPK	International Prototype of the Kilogram
IRWG	CCQM Working Group on Isotope Ratios
ISO	International Organization for Standardization
IT	Information Technology
ITU	International Telecommunication Union
ITU-R	ITU Radiocommunication Sector
ITU-T	ITU Telecommunication Standardization Sector
JCGM	Joint Committee for Guides in Metrology
JCRB	Joint Committee of the Regional Metrology Organizations and the BIPM
JCTLM	Joint Committee for Traceability in Laboratory Medicine
JVS	Josephson Voltage Standard
KCDB	Key Comparison Database
KCRV	Key Comparison Reference Value
MoU	Memorandum of Understanding
NMI	National Metrology Institute
OECD	Organisation for Economic Co-operation and Development
OFS	Optical Frequency Standard
OIML	International Organization of Legal Metrology
PSFS	Primary and Secondary Frequency Standard
QHR	Quantum Hall Resistance
QI	Quality Infrastructure
QMS	Quality Management System
qNMR	quantitative Nuclear Magnetic Resonance
RCNP	Research Center for Nuclear Physics
RMO	Regional Metrology Organization
RNA	Ribonucleic acid
SDG	Sustainable Development Goal
SDR	Software Defined Radio
SI	The International System of Units
SIR	International Reference System
SIRTI	International Reference System Transfer Instrument
SKAO	Square Kilometre Array
SSDL	Secondary Standards Dosimetry Laboratories
STG	Sectorial Task Group
TAI	International Atomic Time
TC	Technical Committee
TDCR	Triple-to-double coincidence ratio
TT	Terrestrial Time
TWSTFT	Two-Way Satellite Time and Frequency Transfer
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme

UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
UTC	Coordinated Universal Time
UTCr	Rapid UTC
VPDB	Vienna Pee Dee Belemnite
VSMOW-SLAP	Vienna Standard Mean Ocean Water - Standard Light Antarctic Precipitation
WG	Working Group
WHO	World Health Organization
WMO	World Meteorological Organization
WTO	World Trade Organization
XRCD	X-ray Crystal Density

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