

BIPM Headquarters Work Programme (2024 – 2027)

Progress report

1 January 2025 – 31 December 2025

Contents

Key achievements (<i>1 January 2025 – 31 December 2025</i>).....	3
Key figures (<i>as of 31 December 2025</i>).....	4
I. Physical Metrology	5
II. Time Metrology	11
III. Chemical Metrology	17
IV. Ionizing Radiation Metrology	23
V. Coordination and institutional liaison.....	28
VI. Communication and promotion.....	43
VII. Digital Transformation and New Digital Services.....	47
VIII. IT services	52
IX. Capacity Building and Knowledge Transfer.....	55

This report is published annually and covers the calendar year.

Key achievements (1 January 2025 – 31 December 2025)

The Work Programme for 2024-2027 is described in terms of 9 major activities, including 82 projects and 145 tasks (deliverables) for the BIPM Headquarters. Some of the key activities during the reporting period are highlighted below:

LABORATORY WORK CARRIED OUT BY THE BIPM • Physical Metrology – Completion of the first two on-site comparisons of Josephson voltage standards at AC, with PTB and CENAM (BIPM.EM-K10). – Completion of two on-site comparisons of quantum Hall resistance standards with PTB and CEM (BIPM.EM-K12). First successful comparison implying a graphene-based QHR standard. – Organization and completion of the third CCM key comparison of kilogram realization experiments (CCM.M-K8.2024) and determination of third consensus value of the kilogram. • Time Metrology – Update of the Rapid UTC algorithm to better follow UTC at the nanosecond level. – Development, publication, and dissemination of an extended CBKT program with e-Learning modules and interactive software for the evaluation of UTC(k) measures and two summer schools. – Support to the CCTF hot topics related to the redefinition of the second, the continuous UTC, and the Lunar reference time scale. • Chemical Metrology – Implementation of new ozone cross section worldwide for surface ozone measurements underpinned by BIPM.QM-K1 – Results reported for comparison of quantification methods for PTH(1-84) in solution standards, CCQM-K155.d comparison coordinated by BIPM – 1st results published for new on-going comparison (BIPM.QM-K2) on binary gas standard mixtures (CO₂/N₂). • Ionizing Radiation Metrology – Validation of the medium-energy x-ray facility. – Successful current measurements with the SIR 2.0 system using the ultra-low noise current amplifier (ULCA) down to 0.03 pA. – Start of the first BIPM.RI(II)-K5 comparison with the ESIR. – Production of long-term BIPM IR department strategy report for the CIPM.	INTERNATIONAL LIAISON – A Memorandum of Understanding was signed with UNESCO on 15 December 2025 at UNESCO headquarters to replace the 1949/1952 CIPM-UNESCO Agreement. – A Memorandum of Understanding was signed with the International Commission on Illumination (CIE) on 15 July 2025 to replace the 2007 CIPM-CIE Agreement. – In the light of the 150th Anniversary celebration, thematic session on <i>Technical Assistance – Role of Metrology in facilitating Trade</i> was organized on 11 November 2025 at the WTO. COORDINATION – The CIPM Strategy 2030+ has been completed and made available to the stakeholders for consultation. Recommendations from the Young metrologists' 2050+ vision project have been included in the Strategy. – The BIPM Strategic work plan based on the CIPM Strategy was developed, shared and feedback from 18 NMIs was received. CAPACITY BUILDING AND KNOWLEDGE TRANSFER – Five e-learning courses have been published on the BIPM e-learning platform: – Validating clock data format with BIPM convention – Time scale algorithms basics to applications – Nominating higher-order references to the JCTLM database – Hybrid comparisons (developed by APMP) – Pilot's Guide to Measurement Comparisons (BIPM ILC Department). COMMUNICATION AND PROMOTION – The 3-Day event for the celebrations of the 150th anniversary was successfully held at UNESCO HQ (620 attendees) and Versailles (450 attendees). – The BIPM150 communication campaign included multiorganizational coordination, website upgrades, more than 37 promotional videos, 34 articles, LinkedIn campaigns, and external media coverage. – 76 national and RMO posters for world metrology day, and details of 23 national events were published on the world metrology day website. DIGITAL TRANSFORMATION AND NEW DIGITAL SERVICES – The versioning of the source code of the SI Reference Point has been almost completed, and it is intended to make the source code publicly available in the next step. Provenance information was incorporated into the knowledge base. – The other services of the SI Digital Framework are being improved to better integrate with the digital references of the SI Reference Point – The API for CMCs in the KCDB has been improved and extended; it now includes greyed out CMCs. The mapping of quantities against service categories by the CCs is in the final stages of review.
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Key figures *(as of 31 December 2025)*

- Member States and Associates

- 64 Member States* and
- 36 Associates of the CGPM
(States and Economies)

**The official term is "States Parties to the Metre Convention"; the term "Member States" is its synonym and used for easy reference.*

- KCDB data

258 institutes in the CIPM MRA

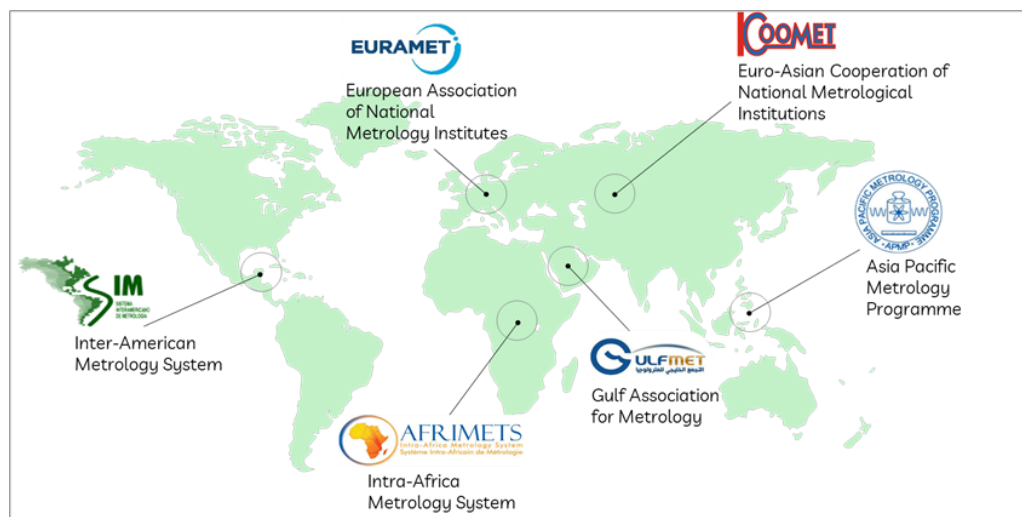
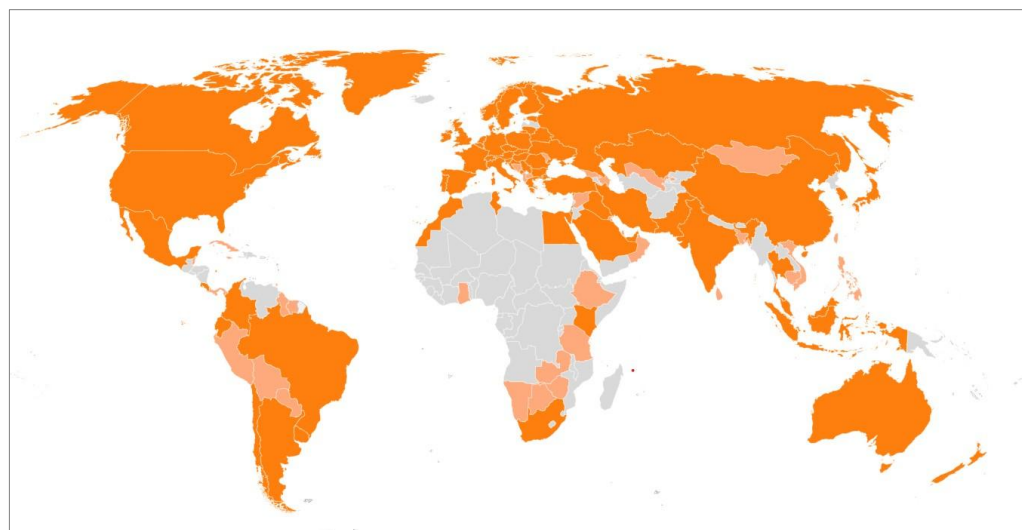
The CIPM MRA has been signed by representatives of institutes from:

- 64 Member States
- 36 Associates States of the CGPM, and
- 4 international organizations

and covers a further 157 institutes designated by the signatory bodies.

2 010 comparisons
1259 KCs, 751 SCs

26 157 CMCs
Peer-reviewed declarations



Report on the BIPM Headquarters Work Programme for 2024-2027

I Physical Metrology		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
1. PMD-E1: INTERNATIONAL REFERENCE STANDARD FOR VOLTAGE		
E1.1: Bilateral on-site comparisons of Josephson voltage standards (JVSs) <i>NMI Participations: 7 (comparisons)</i>	Direct comparison of JVSs at dc and/or ac using the BIPM transportable JVSs to obtain the lowest possible uncertainty 1) Bilateral on-site comparisons at dc and/or ac as part of BIPM.EM-K10.a/b with relative uncertainty of 1×10^{-10} at dc and less than 1×10^{-7} at ac. 2) Maintenance of the transportable Josephson voltage standards, supporting also bilateral comparisons of Zener voltage standards (E1.2) and calibrations of Zener voltage standards for NMIs (E1.3).	• The first two BIPM.EM-K10 key comparisons of AC measurements with Josephson voltage standards with PTB (Germany) and CENAM (Mexico) were successfully completed, extending the series of on-site comparisons of the realization of the volt based on the Josephson effect at DC (1 V and 10 V) to AC for voltages of 0.75 V and 7 V RMS at frequencies ranging from 62.5 Hz to 1250 Hz. The final comparison reports are published for PTB and in Draft-A stage for CENAM. • The results obtained for these two first comparisons confirm the results obtained during the program of pilot studies performed in the past years. With the differential sampling technique uncertainty levels of a few 10^8 to a few 10^7 can be obtained at frequencies up to 1 kHz. • The collaboration work with KRISS and NIST on investigations on the uncertainty components of AC measurements continues and a paper is being prepared.
E1.2: Bilateral voltage comparisons using Zener diode transfer standards <i>NMI Participations: 8 (comparisons)</i>	For NMIs not possessing JVSs, and as a first step before an on-site comparison of JVSs (E1.1) 1) Bilateral comparisons of Zener voltage standards as part of BIPM.EM-K11.a/b with relative uncertainty of 5×10^{-8}. 2) Participation in related RMO comparisons to link them to BIPM.EM-K11. 3) Maintenance of the BIPM secondary voltage standards (Zeners), also supporting the calibration of Zener voltage standards for NMIs (E1.3).	• Finalization of the BIPM.EM-K11 comparison with SMD (Belgium). • Draft B stage for the BIPM.EM-K11 comparisons with EMI (UAE) and BEV (Austria). • Organization of a BIPM.EM-K11 comparison with FTMC (Lithuania). • The BIPM Zener secondary voltage standards operated for BIPM.EM-K11 were maintained traceable to the BIPM primary voltage standard.
E1.3: Calibrations of Zener diode secondary standards <i>NMI Participations: 12 (calibrations)</i>	For NMIs not possessing a primary voltage standard, as for most of the new Member States, using measurement systems already in place for comparison activities 1) Calibration of Zener diode secondary standards for NMIs without a primary realization and for	• Eight Zener voltage standards calibrated for INM (Colombia), METROSERT (Estonia), ICE (Costa Rica), SIRIM (Malaysia), GUM (Poland) and IR department (BIPM). • The Zener standards calibration setup instrumentation now benefits from a complete backup of the main instruments (biasing source, programmable RF source and multiplexer) to ensure the continuity of the service even in the case of potential failure of these crucial instruments.

Report on the BIPM Headquarters Work Programme for 2024-2027

I		
Physical Metrology		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	internal customers (Ionizing Radiation Dept. and Kibble balance).	The collaboration research work with NIST on PJVS leakage current continued and a paper is being prepared.
2. PMD-E2: INTERNATIONAL REFERENCE STANDARD FOR RESISTANCE		
E2.1: Bilateral on-site comparisons of quantum Hall resistance (QHR) standards <i>NMI Participations: 6 (comparisons)</i>	Direct comparison of QHR standards using the BIPM transportable standard, to obtain the lowest possible uncertainty 1) Bilateral on-site comparisons of quantum Hall standards (including new graphene samples) as part of BIPM.EM-K12 with relative uncertainty of 1×10^{-9}. 2) Providing the basis for the realization of the capacitance unit farad (E3). 3) Maintenance of the transportable standard and related measurement chain, also supporting bilateral resistance comparisons using resistance transfer standards (E2.2) and calibrations of secondary standards for NMIs (E2.3).	- Organization and preparatory measurements for two BIPM.EM-K12 comparisons at PTB and CEM. In particular, the low-frequency and power dependencies of the travelling resistors dedicated to the comparison were re-evaluated before each comparison. - On-site BIPM.EM-K12 comparison measurements at PTB (Germany) and CEM (Spain). At PTB, the BIPM GaAs-based QHR was compared with the PTB GaAs- and graphene-based QHRs. This was the first time in this comparison program that a graphene-based QHR was used. - Analysis of comparison results and writing of the comparison reports: report of the comparison with PTB has been published, and the one with CEM is at draft B stage. - A dual current source has been fabricated to equip a new 1 Hz bridge for the comparison of resistance standards. The test of the source is ongoing. - A new cryogenic current comparator (CCC) has been assembled and the one currently in use for services has been refitted. The new CCC shows performances as good as the old one. CCC superconducting coils equipping the new CCC were made in collaboration with LNE (France). - A new QHR probe for dc-QHR has been assembled but remains to be tested. - Maintenance of the helium liquefier for impedance and voltage service activities (calibrations and comparisons).
E2.2: Bilateral resistance comparisons using resistance transfer standards <i>NMI Participations: 8 (comparisons)</i>	As a first step before an on-site comparison and for NMIs not possessing a QHR standard 1) Bilateral comparisons of resistance transfer standards as part of BIPM.EM-K13.a/b with relative uncertainty of 5×10^{-8}. 2) Participation in related RMO comparisons to link them to BIPM.EM-K13. 3) Maintenance of BIPM secondary resistance standards and related measurement chain, also for the calibration of resistance secondary standards for NMIs (E2.3).	- The calibration of the BIPM resistance reference base from a QHR standard was carried out twice, in January and July. This reference is the basis for the calibration of resistance working standards and for the realization of the farad from the ohm (E3.1). - Maintenance of the measurement bridges and standards. In particular, several repairs were necessary to keep the old CCC bridge in working order. BIPM.EM-K13.b comparison with TÜBITAK UME (Türkiye) started in late 2024 were completed in May 2025. The comparison report has been published.

Report on the BIPM Headquarters Work Programme for 2024-2027

I		
Physical Metrology		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
E2.3: Calibrations of resistance secondary standards <i>NMI Participations: 40 (calibrations)</i>	For NMIs that do not possess a primary resistance standard, as for most of the new Member States, using measurement systems already in place for comparisons 1) Calibration of resistance secondary standards for NMIs without primary realizations and for internal customers (Mass, Ionizing Radiation, Kibble balance).	54 resistance standards calibrated for 13 NMIs: NMC (Singapore), MSL (New Zealand), INM (Colombia), BIM (Bulgaria), CENAM (Mexico), NMISA (South Africa), IPQ (Portugal), ICE (Costa Rica), SMD (Belgium), Metrosert (Estonia), DEFNAT (Tunisia), EIM (Greece), GUM (Poland). 1 internal calibration for Kibble Balance. - Maintenance of the quality system associated with resistance services.
E2.4: Development of a graphene-based QHR standard	For a more compact and economic QHR standard, operating at higher temperature (5 K) and lower magnetic field (< 5 T) 1) Development of a QHR standard based on a graphene sample, replacing the GaAs QHR standard to simplify QHR implementation during on-site comparison and to reduce costs.	Four graphene-based QHRs were supplied to the BIPM by the PTB in February 2025, two of which are dedicated to AC measurements. No characterization measurements at low temperature were performed during the current work period, but the variation in their sheet resistance was nevertheless monitored to track the variation of their carrier density over time (which depends on the storage conditions).
3. PMD-E3: INTERNATIONAL REFERENCE STANDARD FOR CAPACITANCE		
E3.1: Bilateral capacitance comparisons using capacitance transfer standards <i>NMI Participations: 4 (comparisons)</i>	For NMIs wishing to demonstrate their capabilities in capacitance calibrations 1) Bilateral comparisons of capacitance transfer standards as part of BIPM.EM-K14.a/b with relative uncertainty of 5×10^{-8}. 2) Maintenance of the measurement systems to derive the capacitance unit from the quantum Hall effect and/or the calculable capacitor, also supporting the calibrations of capacitance secondary standards (E3.2).	- Two realizations of the farad from the ohm in January and July 2025 to ensure the traceability of the capacitance reference base used for services. - Monthly measurements for the surveillance of the capacitance bank of 10 pF capacitors. - Maintenance of measuring bridges and standards used for capacitance services. Repair of the capacitance and quadrature bridges power source and evaluation of a new power system. - Study for the design and fabrication of new transfer capacitance standards for the BIPM multifrequency quadrature bridge, based on a series-parallel assembly of surface-mount ceramic capacitors. The selection of suitable capacitors from a set of commercially available ones is underway. Their main characteristics are being studied, with and without initial thermal stabilization cycling. The assembly of the new capacitance standards is expected for 2026. - Measurement of 15 capacitance standards during 9 weeks for the central loop of the EURAMET.EM-K4 comparison. BIPM is pilot of this central loop and is part of the steering group for the entire comparison.

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I Physical Metrology		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
		• BIPM.EM-K14.a and K13.b comparisons with CENAM (Mexico). The comparison report has been published.
E3.2: Calibrations of capacitance secondary standards <i>NMI Participations: 40 (calibrations)</i>	For NMIs that do not possess a primary capacitance standard, as for most of the new Member States 1) Calibrations of capacitance secondary standards for NMIs without primary realizations.	• 23 capacitance standards calibrated for 7 NMIs: NMC (Singapore), NMISA (South Africa), ICE (Costa Rica), EMI (United Arab Emirates), EIM (Greece), DEFNAT (Tunisia), RSE "KazStandard" (Kazakhstan). • Maintenance of the quality system associated with capacitance services.
E3.3: Development of the ac quantum Hall effect into an impedance standard	To develop a primary method to realize ac impedances according to the revised SI 1) Development of the ac quantum Hall effect into an operational primary standard of impedance, to reduce the uncertainty of the realization of the capacitance unit. 2) Direct comparison of the ac quantum Hall effect and the calculable capacitor, for verification of the validity of the equation for the von Klitzing constant at the 10^{-9} level, supporting the <i>mise en pratique</i> for the electrical units.	• Finite element analysis of alignment tolerances for the BIPM calculable capacitor electrodes, performed in collaboration with LNE (France).
4. PMD-M1: MASS DISSEMINATION		
M1.1: Calibration of 1 kg national Pt-Ir prototypes and stainless steel mass standards <i>NMI Participations: 32 (calibrations)</i>	1) Calibration of existing 1 kg national Pt-Ir prototypes in air or under vacuum. 2) Calibration of 1 kg stainless steel national mass standards, including volume and centre-of-gravity determination, if requested. 3) Monitoring of the mass evolution of the BIPM working standards. Providing stable linkage between successive key comparisons (M1.3) to allow the calculation of the consensus value. 4) Calibration of pressure gauges, as an internal service necessary to support mass calibrations at the required uncertainty, and for other BIPM departments (Chemistry, Ionizing Radiation).	• Completed two mass calibration campaigns with the calibration of five prototypes and eighteen stainless steel mass standards for thirteen NMIs. • Four center-of-mass determinations of mass standards from NMIs. • Establishment of the link of working standards for current use with those for limited use in February 2025. • Executed one internal calibration campaign for pressure gauges for the mass, electricity and chemistry laboratories (7 certificates).

Report on the BIPM Headquarters Work Programme for 2024-2027

I		
Physical Metrology		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
M1.2: Provision of 1 kg Pt-Ir prototypes <i>Fabrication for: 2 NMIs</i>	1) Fabrication in the BIPM workshop of 1 kg Pt-Ir prototypes for Member States. 2) Calibration of new 1 kg Pt-Ir prototypes including volume determination.	Fabrication of 1 kg Pt-Ir prototypes discontinued in 2024 in agreement with CCM President.
M1.3: Organization of two CCM key comparisons of kilogram realizations <i>NMI Participations: 18 (comparisons); plus stainless steel mass comparison participation 16 NMIs</i>	1) Organization of two key comparisons of kilogram realizations with Kibble balances, joule balances and the XRCD method, CCM.M-K8. 2) Calculation of a new consensus value after each comparison.	- Comparison weighings for key comparison CCM.M-K8.2024 of kilogram realizations with ten participants and 18 travelling standards completed. - Data analysis for CCM.M-K8.2024. - Writing of the report on CCM.M-K8.2024. - Publication of final report on the KCDB - Determination of the third consensus value of the kilogram and preparations for its implementation on 1 March 2026.
5. PMD-M2: KIBBLE BALANCE Developing and maintaining the Kibble balance. International reference facility for realization of the new definition of the kilogram on a long-term cost-shared basis		
M2.1:	1) Evaluate the performance improvement to the Kibble balance by use of an equal-arm balance mechanism in order to reach a target uncertainty of 2×10^{-8} at the 1 kg level (see also new application for this technology in M2.5).	More suitable position sensors have been designed for a better characterization of the beam behaviour of the equal-arm balance during the moving phase.
M2.2:	1) Maintain and refine operation of the BIPM Kibble balance on the established design to sustain “turn-key” performance as an international reference facility for realization of the new definition of the kilogram at 5×10^{-8} and as the platform for the improved equal-arm balance design (see M2.1).	- Upgrading of the PJVS bias-source provided by the NIST was started. - Implementation of an ac mode operation for position sensors was delayed due to the failure of a control device. Once operational, this mode would allow us to reduce the type A uncertainty in coil position detection. - A simulation-based study of measurement noise in the moving phase was conducted. Preliminary results confirm that our current method for analyzing experimental data is appropriate.

Report on the BIPM Headquarters Work Programme for 2024-2027

I	Physical Metrology	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
		• A collaboration initiated with OST university in Switzerland to evaluate measurement uncertainty by simulation. As a first step, it was agreed to assess the suitability of the Modelica simulation tool for our needs.
M2.3:	1) Contribute the results of an independent Kibble balance determination to the biennial comparison of realizations of the kilogram (CCM.M-K8) and host the meeting of the international Kibble balance collaboration of NMIs on one occasion during the period of the work programme.	• The BIPM successfully participated in the 3rd key comparison of kilogram realizations with a standard uncertainty of 36 μg for a 1kg Pt/Ir mass standard. The reduction of uncertainty from the 41 μg obtained in the 2nd comparison was mainly due to an improvement in the interferometer laser verticality alignment. The main uncertainty component (27 μg) arose from parasitic coil vertical rotation. • The BIPM hosted the international Kibble balance technical meeting (KBTM) in November. For the first time, an additional day was dedicated to CBKT activities. This session included six presentations on key topics essential for developing a Kibble balance experiment.
M2.4:	1) Determine the gravitational acceleration in the Kibble balance laboratory in collaboration with NMIs. This will require absolute gravimeter(s) to be brought to the BIPM from NMIs that have successfully participated in the most recent comparison of absolute gravimeters, CCM.G-K2.XXXX. To verify the stability of the spatial gravity gradient in the laboratory; the replacement of the relative gravimeter is planned.	• The BIPM continued the collaboration with the LNE on a new determination of the absolute gravitational acceleration in the laboratory. Measurement results using an AQG-B01 quantum gravimeter, conducted in partnership with LNE-OP & Pgravi, agreed with the values measured in 2009 (ICAG 2009) and 2019 (by METAS) with FG5 absolute gravimeters.
M2.5:	1) Design and construct a prototype apparatus that implements the equal-arm balance (see M2.1) design as the basis for a compact Kibble balance for use at masses of 500 g and below. (For planned CBKT activities see PMD-CBKT2).	• The design of the BIPM compact Kibble balance continued to progress. Notably, a suspension was designed and is being fabricated at the BIPM mechanical workshop. Additionally, the design of optical sensors, including a homodyne interferometer, was completed. • We completed the selection of critical commercially available devices and components. Among these, time interval analyzers were tested for detecting the interferometer signal. While the initial tests were promising, some modifications were required to meet our specifications. Following the modifications, tests of the TIA yielded satisfactory results. Its performance was validated by measurements carried out in the experiments. A meeting was scheduled for early 2026 to share experiences with other Kibble balance groups interested in acquiring similar devices. • PCB drawings of interfacing cards were completed. New electronic cards will be fabricated by an external company.

Report on the BIPM Headquarters Work Programme for 2024-2027

II	Time Metrology	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
1. TIME-U1: GENERATION OF TAI/UTC, STABLE AND ACCURATE INTERNATIONAL REFERENCES		
U1.1: Computation of UTC, UTC_r, TT, and KC for Time and Frequency transfer <i>Participating laboratories in UTC: 83 (2022), 86 (2025)</i> <i>Participating laboratories in UTC_r: 58 (2022), 64 (2025)</i>	<i>Monthly</i> provision of the international reference time scale UTC, through the computation of International Atomic Time, and the distribution and publication of all the related reference data, continuously improving the metrological quality. The results giving the differences between UTC and the local real time realizations UTC(k) of the contributing laboratories are published in the monthly BIPM <i>Circular T</i>. Data are also provided to the KCDB for the key comparison CCTF-K001.UTC. The process to obtain UTC and its validation is part of the BIPM Quality System. <i>Weekly</i> provision of a rapid solution called UTC_r computed and published on Wednesdays on a subset of UTC laboratories sending data daily. <i>Annual</i> provision of the Terrestrial Time, TT(BIPM), with optimized long-term accuracy, <i>a posteriori</i>, for the studies requiring the best performance over the long term.	• The monthly UTC and the weekly rapid UTC computation have been processed and published regularly. A new laboratory entered UTC in 2025: AZ (Azerbaijan). An automatic plot allows to visualize the current number of participating laboratories, https://webtai.bipm.org/database/participant.html • The KCDB has been updated accordingly on a monthly basis. • Terrestrial Time 2024 has been computed and published. • The Time Department is highly involved, with the support of a secondee, in the development of CBKT e-learning tools and software modules for the analysis of UTC(k) data quality. In 2024 and 2025 six course were developed and 2025 was dedicated to disseminating and explaining the tools by organization of 2 summer schools, with SIM at CENAM, Mexico, and at the BIPM. The IEEE UFFC society kindly sponsored these events. • The Department is also involved in the progress toward continuous UTC, supporting the CCTF and participating to several user events to explain the potential and the current risk of a negative leap second and collecting feedback. • The Department participated to the 150th anniversary of the BIPM by a poster on possible future development for UTC • An online survey was sent to the UTC labs to evaluate possible obsolescence of BIPM products and the needs of new ones. Results were discussed at the CCTF WG TAI meeting in September and will be implemented in agreement with the WG • The Time Department has supported and chaired a CCTF task group devoted to the study of time reference on the Moon and its traceability to UTC. Space agencies asked BIPM to help with the interoperability of future Positioning, Navigation, and Timing systems around the Moon. <i>Publications and presentations:</i> • G. Panfilo, P. Tavella, A. Harmegnies, F. Meynadier, G. Tagliaferro, F. Collini, L. Tisserand, "A long-term vision for UTC", poster presented online for the 150th anniversary of the BIPM, https://thebipm150.org/posters-online/ • G. Panfilo, F. Collini, A. Harmegnies, L. Tisserand "Enhancing the UTC_r algorithm: performance improvements and optimization", to be published in <i>Metrologia</i> 2026.

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II	Time Metrology	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
		• F. Meynadier., F. Collini, A. Harmegnies, G. Panfilo, P. Tavella, J. Tagliaferro, and L. Tisserand, "UTC updates", IAU symposium on Advancing Reference Systems, Ephemeris, and Standards: From the Earth and the Moon to Solar System Bodies, La Plata, Argentina, Aug. 2025. • G. Panfilo, F. Collini, A. Harmegnies, L. Tisserand and P. Tavella, "UTCr algorithm updated", presentation at the Joint EFTF IFCS congress, Queretaro, May 2025 • P. Tavella, J. Levine, "CCTF work towards a continuous UTC", Joint EFTF IFCS congress, Queretaro, May 2025. • G. Petit and G. Tagliaferro (2025). "Comment on 'A proposal to change the leap-second adjustments to UTC'". In: <i>Metrologia</i> 62.4, p. 048001. • A. Sen Gupta, P. Tavella, "A Report on the Recent Advances at the Consultative Committee for Time and Frequency (CCTF): Updates on the Redefinition of the Second and Continuous UTC" URSI AP RASC 2025. • A. Sen Gupta, P. Tavella, "A Report on Recent Activities on the Lunar Reference Time at the Consultative Committee for Time and Frequency (CCTF)" URSI AP RASC 2025. • A. Bourgoin, P. Defraigne, F. Meynadier, "Lunar Reference Timescale" 2025, https://doi.org/10.48550/arXiv.2507.21597, submitted to <i>Metrologia</i>. • P. Defraigne, A. Bourgoin, F. Meynadier and the CCTF Task Group on Lunar Timing, "Lunar Time, Different options for a reference", Joint ICG-IOAG Multilateral Cislunar PNT Workshop, Feb. 2025 Vienna. • P. Defraigne, F. Meynadier, P. Tavella and A. Bourgoin, "Lunar Time", IAU symposium on Advancing Reference Systems, Ephemeris, and Standards: From the Earth and the Moon to Solar System Bodies, La Plata, Argentina, Aug 2025 Guests collaborating to the different dept activities: The Department had guests for collaboration on different scientific and CBKT activities: – Tara Fortier, Sept 2024 – Aug 25, NIST secondee for the CCTF CBKT program – Roxanne Siadat March and Sept – October 2025, NPL PhD student – Jiang Guo, April 2025 – March 2026, Post Doc student – Bharath Vattikinda, guest scientist from NPL India, 1 – 17 September 2025 – Seitzhan Abdrakhmanov, 9 – 20 Dec. 2024, student internship – Bernardo Giulio Moretti, 10 June – 31 July student internship – Jordan Lopes, July 2025, student internship.

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II	Time Metrology	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
		Gianna Panfilo spent two weeks at NPL in July 2025. Patrizia Tavella was awarded the I. I. Rabi award by the IEEE UFFC Society in 2025 for “For excellence in leadership in the coordination and realization of UTC, and advances in the statistics of precise timekeeping.”
U1.2: Development and optimization of the algorithms and tools for UTC and other time product computation	The algorithms developed, maintained, and continuously improved by the Time Department are devoted to: – the ensemble time scale formation, – the accurate processing of the time and frequency transfer measures, – the steering by the use of primary and secondary frequency standards. The main goals for the development are related to the jump detection, link comparison and switching, redundant and multi-constellation GNSS time transfer, with optimal processing of GNSS phase measurements, as well as optimization of the individual clock statistical model. The use of a GIT(*) laboratory capability will be consolidated within the CCTF-WGTWSTFT for collaborative work on the SDR software development and validation. A similar tool will be used for the CBKT programme. The experience on time transfer based on optical fibres, their calibration, and comparison with other time transfer techniques will be consolidated. The contribution of a secondees would be fundamental to ensure the necessary progress of all these activities. The continuous improvement of UTC, UTCr, and related products is also based on the development of appropriate software tools, ensuring reliability of	• The Time Department is engaged in continuous improvement of the algorithm for the data treatment and the computation of UTC, UTCr, and TT. • In 2025 the algorithm and relative software implementation of Rapid UTC was updated to improve its accuracy versus UTC. After 6 months of real time testing, the UTCr update had been implemented in the operational production in June 2025. UTCr remains close to UTC within 1 ns. Two main changes were introduced: – The weekly recalculation of the clock weights and – a gentle steering that slowly changes the frequency of UTCr instead of applying an abrupt time step. • The algorithm for the estimation of the frequency values to be used as secondary representation of the second, based on a graph model solving the fit of several frequency ratio measures has been refined, in collaboration with the Joint CCL CCTF WG to estimate the secondary representations of the second for the recommendation of the CCTF in Sept 2025. • The work on the development and understanding of the GNSS Integer Precise Point Positioning (IPPP) algorithm and software adapted to time transfer has continued with the long-term goal to provide a reliable platform for the routine use in the monthly computation of UTC. The features of different open-source software and the validation versus optical fiber time transfer links were carried out. The work is in progress. • The N-cornered hat, a method to estimate individual clock instability from comparison measurement, has been revised and the minimization in the space of possible solutions has been studied analytically. An open-source software is under development. • The IT system of the Department based on a network of virtual machines with automatic back up is continuously maintained and improved, also allowing working space for secondees and CCTF WGs. • A GIT repository for open-source software modules, prepared with the support of secondees, has been published and continuously maintained.

Report on the BIPM Headquarters Work Programme for 2024-2027

II	Time Metrology	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	the available computational resources. To this aim the main goals are: – further automation of the computation system to augment the automatic checks on input and output data to improve the reliability of the results, – Use of a redundant and secure ensemble of servers based on virtualization technology, – Use of a database structure for the time transfer and calibration data to provide machine readable access to the results to the contributing NMIs. <i>*GIT is a free and open-source distributed version control system</i>	• The Time Department has prepared and configured a shared server (from an external provider) to allow the use of online tools of the CBKT for UTC labs. • The study of time transfer based on optical fibres, their calibration, and comparison with other time transfer techniques was limited to a comparison versus IPPP, as no secondees was obtained to support this activity. Publications and presentations: • A. Baudiquez, P. Defraigne, M. Gertsz, J. Guo, B. Jian, F. Meynadier and G. Tagliaferro, "Comparison between four integer ambiguity resolved PPP GNSS time transfer software solutions", 2025 <i>Metrologia</i> 62 025009 • G. Tagliaferro, P. Tavella; "A Revised Look to the N-cornered Hat", Joint EFTF IFCS congress, Queretaro, May 2025 • F. Collini and G. Tagliaferro (2025). "Use of VMF-Based Tropospheric Model for Pseudorange-Based Time Transfer in UTC" Proceedings of the 2025 Joint IEEE International Frequency Control Symposium & European Frequency and Time Forum (IFCS-EFTF)
2. TIME-D1: CHARACTERIZATION OF DELAYS IN TIME TRANSFER EQUIPMENT OPERATED IN UTC CONTRIBUTING LABORATORIES		
D1.1: Maintenance of BIPM travelling receivers, measurement reference, and procedures for calibration. Realization of delay measurement campaigns for specific laboratories (GNSS G1, TWSTFT, others)	A set of (absolutely) calibrated reference GNSS receivers is maintained to ensure the overall coherency of the time transfer delay calibration in the UTC time links (GNSS, TW, others, ...) of all the contributing laboratories. Some of these reference receivers are continuously travelling to selected laboratories for on-site delay comparison. This activity requires: 1) Characterization, study, and experimental tests of equipment compatible with those operated in NMIs. 2) Guidance documents for the travelling box installation and measurement for the delay measurement of UTC laboratory equipment (G1 GNSS, TW, others). 3) Organization of the travelling campaigns (requiring the shipping of the BIPM travelling	• In 2025 the G1 calibration campaign started in June by visiting the EURAMET G1 labs. The calibration of world G1 labs will last approximately 3 years. The CCTF WG on GNSS has in fact extended to 3 years the periodicity of the G1 calibration campaigns. • In collaboration with the CCTF WG GNSS, a study on the stability of the GNSS delays has been carried out leading to a recommendation by CCTF 2025. Also the possible evolution and dismission of GPS transmission frequencies has been addressed leading to a CCTF recommendation in 2025. • The provision of reference frequency to the BIPM labs has been ensured with the issue of internal calibration certificates when requested in agreement with the BIPM Quality System. • The possible fibre connection to the French Time laboratories has not yet started for economical reasons

Report on the BIPM Headquarters Work Programme for 2024-2027

II	Time Metrology	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	system without staff) to about 10-15 selected laboratories, usually every other year. 4) data analysis, uncertainty evaluation, publication of the report and application to UTC computation. Access to a “dark fibre” will be rented to connect the BIPM to the nearest point in the NMI network to facilitate improved calibration of receiver delays, high-stability measurement of PSFS, and comparison with other high-stability time transfer techniques. The establishment of this link involves operational costs that will depend on telecom suppliers in the Sèvres area. It will only be realized if a good balance between costs and benefits can be reached. The time laboratory also ensures the provision of a frequency reference to the other BIPM laboratories. The dissemination of this frequency signal and the related internal calibrations are part of the BIPM Quality System.	
D1.2: Coordinating measurement campaigns with the RMOs for GNSS G2, linking results to the BIPM G1 reference, and other BIPM coordinated campaigns	For the UTC laboratories subsequently visited by the previous group of G1 laboratories, the BIPM has the role to: – Provide guidelines, – Validate the calibration reports and their application in UTC computation.	• The calibration of the G2 labs is supported. • In 2025, 4 G2 calibrations started and 6 were validated. • Results are available at https://webtai.bipm.org/database/calib.html

Report on the BIPM Headquarters Work Programme for 2024-2027

II	Time Metrology	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
3. TIME-O1: USE OF VERY ACCURATE OPTICAL FREQUENCY STANDARDS - SUPPORT TO THE REDEFINITION OF THE SI SECOND		
O1.1: Optimal use of optical standard measurements in TAI/UTC, support to NMIs and CCTF in the development of optical frequency standards and advanced time and frequency transfer techniques in TAI/UTC	New optical standards as well as a new time and frequency comparison in the optical domain call for an update of the TAI/UTC data processing to optimize the contribution of these new measures. In particular: (a) Development of the statistical treatment of measures that may have peculiarities (dead time, long period of missing data, only frequency comparison...) and the uncertainty evaluation. (b) Adaptation of the TAI algorithm for the optimal introduction of the optical frequency standard measurements. (c) Collaborate with NMIs and the CCTF for standardization of measurement process, data format, and to set up calibration techniques and guidelines. These additional activities would require additional effort that the BIPM staff could ensure only at a very basic level. To face the new challenges with appropriate resources and optimizing the use in TAI/UTC, the support of a full time secondee is necessary. In case this support should not be available, only a limited activity can be ensured. The department will also contribute to the activities illustrated in the CCTF roadmap for the redefinition of the second.	• The algorithm and software of the dept for the estimation of the values of the secondary representations of the second from the comparison measurements has been used and compared with 2 other algorithms (NPL and NIST) leading to the list of recommended frequencies adopted by the CCTF in Sept 2025 • The Department is strongly involved in the CCTF Task Force for the redefinition of the second offering support particularly in the understanding of option 2 for an ensemble redefinition and for the evaluation of the fulfillment indices of the redefinition criteria. The dept contributes to several presentations to international congresses and meetings, and to CCTF documents • A new time transfer data format has been proposed to the community with the aim of general purpose and flexibility • For further development the support of a secondee is still needed. <i>Publications and presentations:</i> • T. Ido, P. Tavella, N. Dimarcq, "Recent steps towards the redefinition of the second", Joint EFTF IFCS congress, Queretaro, May 2025.

Report on the BIPM Headquarters Work Programme for 2024-2027

III		
Chemical Metrology		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
1. Chem-G1: SURFACE OZONE AND AIR QUALITY GAS STANDARD COMPARISONS		
Coordination of comparisons to determine and improve the international equivalence of gas standards for air quality monitoring		
G1.1: <i>NMI participations: 20</i>	20 ozone standards bilateral comparisons as part of BIPM.QM-K1 coordination (2020-2023), based on the unique triad of standards at the BIPM, which will maintain consistency of calibration services for surface ozone measurements for local, regional, national and global air quality monitoring networks.	2 bilateral comparisons performed in BIPM laboratories for NIST (March 2025), CHMI (Sept. 2025), and one study note for LNE (March 2025). 4 key comparison reports published for EAA (August 2023), KRISS (Sept. 2024), UBA (July 2023), and UNAL-CALAIRE (Nov. 2023).
G1.2:	Installation and validation of new SRP electronics systems for National Ozone Standards , on request from NMIs participating in BIPM.QM-K1.	No requests in 2025.
G1.3: <i>NMI participations: 30</i>	Coordination of reactive gas/air quality comparisons (development and implementation of on-going comparison on NO₂ standards, BIPM.QM-K6), based on state-of-the-art dynamic standard reference facilities at the BIPM, enabling NMIs to demonstrate equivalence of their standards for air quality and vehicle emission verification measurements.	- The comparison protocol of the BIPM.QM-K6 completed, including result forms and additional information documents, and is ready for distribution. - BIPM NO2-10_Quant software upgraded with an uncertainty-calculation module including a GSL computational library. The upgrade fully automates post-processing of data from DyGest, which controls the dynamic standards generation system, eliminating manual steps and improving efficiency and accuracy. - Three bimonthly measurements against the BIPM MSB reference facility completed as part of the quality assurance of the BIPM facility in preparation for the BIPM.QM-K6 comparison at 10 µmol/mol.
2. Chem-G2: INTERNATIONAL REFERENCE FACILITIES AND COMPARISONS OF GHGs		
G2.1: <i>NMI participations: 20</i>	Coordination of BIPM.QM-K2.a and b on Carbon dioxide in air and nitrogen, based on a unique manometric reference comparison facility maintained at the BIPM, providing on-demand comparisons of gravimetrically prepared NMI standards for greenhouse gas and emissions measurement calibrations, and core comparisons for NMIs developing binary gas mixtures.	- First report of BIPM.QM-K2 series written for E+E ELEKTRONIK (Austria, measurements December 2024), Draft B report reviewed by the CCQM/GAWG in June 2025 and final report published in July 2025. - Third series of CO₂ in air amount fraction measurements completed on the 18 standards constituting the BIPM scales with the BIPM PVT-CO₂ facility, demonstrating good stability of the mixtures. - Measurements performed for the second participant SMU (Slovakia) in Sept. 2025 and final report published in December 2025. - A one-year series of monthly measurements on a CO₂ in nitrogen mixture of VSL completed, while following its pressure decrease to less than 100 kPa, in order to study the

Report on the BIPM Headquarters Work Programme for 2024-2027

III		Chemical Metrology			
Project		Deliverables		Work performed in the period (1 January 2025 – 31 December 2025)	
				adsorption of CO ₂ on the cylinder wall and observe the pressure threshold for its desorption.	
G2.2: NMI participations: 12		Establishment and coordination of BIPM.QM-K5 on CO ₂ in air GHG Scale comparisons, providing on-demand comparisons for NMIs developing and maintaining GHG scale standards for background, emission and flux determinations, based on scales and facilities maintained at the BIPM, with SI value assignment provided through the BIPM manometric facility and a database consultable for scale and standard relationships.		• Database for GHG Scale measurements and reference data finalized and two web-based interfaces completed and installed by NOAA staff on BIPM servers in March 2025. BIPM staff have been using the internal interface to enter data and working on the data treatment for the public interface. • Measurements performed for two participants in the comparison, on nine mixtures for NOAA and six mixtures for NIES in January 2025. • Third series of CO₂ in air amount fraction measurements completed on the 18 standards constituting the BIPM scales with the CRDS analyzer chosen for BIPM.QM-K5, demonstrating good repeatability and reproducibility of the measurements. • Python algorithm implementing an Error-In-Variable least-square regression including correlations between the input quantities provided by VSL and included in the comparison data treatment. • Instrumentation moved to a larger laboratory centralizing all GHG scale measurement instruments in one facility for increased efficiency. Analyzers connected and method re-validated after the move.	
G2.3: NMI participations: 20		Coordination of CH ₄ , N ₂ O GHG comparisons, and completion of CCQM-K82.2023 on methane at ambient levels, based on comparative measurements undertaken at the BIPM, and supporting NMI standards for greenhouse gas and emissions measurement calibrations.		CCQM-K82.2023 on methane standards: • First Draft A report distributed in March, followed by Draft A.2 report in July after comments received during the GAWG in April. • Draft B distributed in October with new comments received in December. Final version to be distributed in February 2026.	
3. Chem-G3: INTERNATIONAL REFERENCE FACILITIES AND COMPARISONS FOR ISOTOPE RATIOS					
Coordination of comparisons to support the international infrastructure for isotope ratio standards including for measurements on radiative forcing gases.					
G3.1: NMI participations: 40		Establishment and coordination of BIPM.QM-K3 on CO ₂ isotope ratios in pure CO ₂ gas, based on dedicated CO ₂ gas sample generation facilities and an IRMS-based comparison facility with traceability to carbonate reference methods and international standards, supporting NMIs providing carbon isotope ratio scale standards, highest accuracy CO ₂		• Mark II version of the Stable Isotope Reference Mixture Generation system (SIRMGEN) constructed, installed and tested. All parts of the mark II system were assembled by fusion welding to remove fittings components of the mark I system. The system is ready to prepare CO₂ pure gas isotopic research samples. • Publication of Stable isotope reference materials and scale definitions—outcomes of the 2024 IAEA experts meeting, F Camin, J. Viallon, R. Wielgosz et al., Rapid Communications in Mass Spectrometry 39 (14), e10018, 2025.	

Report on the BIPM Headquarters Work Programme for 2024-2027

III Chemical Metrology		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	amount fraction standards with on demand comparison and calibration services.	
G3.2: <i>NMI participations: 12</i>	Establishment and coordination of BIPM.QM-K4 on CO ₂ isotope ratios in CO ₂ in air mixtures, based on cryogenic separation and IRMS reference facilities maintained at the BIPM with traceability to carbonate reference methods and international standards, supporting NMIs providing CO ₂ in air isotope ratio standards and amount fraction standards, with an on-demand comparison service.	- Measurement for the pilot study CCQM-P239 completed in March 2025 (pre-comparison to the future BIPM.QM-K4 on-demand comparison). 41 CO₂ in air mixtures shipped back to the participants in June 2025. 15 final reports with values from participants received in Sept 2025. - Data treatment completed, and Draft A report circulated in October 2025. Online meetings to discuss the result with participants, to be held in January 2026, organized in December 2025 with selection of speakers and areas of discussion.
G3.3:	Develop methods for reduced uncertainties for isotope ratio measurements and comparisons of CO ₂ , based on preparation of CO ₂ mixtures with well-established equilibration properties, and characterization by IRMS and IRIS methods as pure gases and in air matrix, and development of models to deal with non-stoichiometric distributions of isotopes in standards samples. Methods to be applied to on-going comparisons for CO ₂ isotope and amount fraction, and support of NMI activities in development of reduced uncertainties in SI traceable values.	- Last 2 months of 6-month secondment from NIM completed for the development of calibration methods of optically based instruments for CO₂ isotope ratio measurement, with measurements and data treatment completed with 2 different analyzers and 6 samples, demonstrating better accuracy and precision than our 2017 publication. - First phase of development of the standard method to calibrate ¹³C and ¹⁸O isotope-delta measurements in gas by IRMS using carbonate reference materials completed in June 2025: repeatability and reproducibility of the method demonstrated ($\delta^{13}\text{C-CO}_2$ measurements stabilized with SDs < 0.01) during a 3-month secondment from NPL and 1-month second from JSI (Slovenia). - Carbonate reaction system upgraded with stirring system for 6 reaction vessels in water bath built and installed. - First 2 months of 1-year secondment from NIM completed, with knowledge transfer (KT), on carbonate-acid reference method and initiation of reproducibility studies.
International equivalence of organic primary calibrators for clinical chemistry and laboratory medicine, food analysis, environmental analysis, forensics and pharma		
4. Chem-O1: SMALL MOLECULE ORGANIC PRIMARY REFERENCE COMPARISONS (PURE MATERIALS)		
Coordination of comparisons to determine and improve the international equivalence of organic primary calibrators for clinical chemistry and laboratory medicine, food analysis, environmental analysis, forensics and pharma.		
O1.1: <i>NMI participations: 20</i>	Completion of purity comparison CCQM-K148.c (MW 500-1000 Da) with, Draft A, B and Final Reports completed and providing a core comparison enabling NMIs to demonstrate capabilities and	CCQM-K148.b/K179 (oxytetracycline hydrochloride and salt purity comparison) Final report of both comparisons approved for equivalence and published.

Report on the BIPM Headquarters Work Programme for 2024-2027

III		
Chemical Metrology		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	continued improvement in providing SI traceability for small molecule organic analytes.	CCQM-K148.c Digitoxin purity comparison - Study protocol and call for participation prepared, presented and approved by spring meeting of OAWG. 17 NMIs/DIs registered for key comparison and 2 NMIs/DIs and 1 guest lab invited for pilot study. - Comparison samples shipped to study participants. Comparison ongoing.
O1.2: <i>NMI participations: 20</i>	Coordination of CCQM-K148.a.1 (Non-polar organic (MW 75-500 Da) with mass-balance and qNMR value assignment at the BIPM, and homogeneity and stability analysis, providing a core comparison enabling NMIs to demonstrate capabilities and continued improvement in providing SI traceability for small molecule non-polar organic analytes.	Quinidine discussed as a potential candidate material in spring OAWG meeting. Agreed in OAWG as comparison material after consultation with OAWG clinical measurements task group. Comparison material sourced.
O1.3:	Development of purity evaluation guidelines for pesticide, drug and mycotoxin samples, supporting knowledge transfer and BIPM on-line e-learning, modules and comparisons for NMIs with developing programmes in metrology on organic analysis in support of food safety.	Purity evaluation guidelines maintained on BIPM website – no additional document published in this period.
5. Chem-O2: SMALL MOLECULE ORGANIC PRIMARY REFERENCE COMPARISONS (CALIBRATION SOLUTIONS) Coordination of comparisons standards and methods for organic calibrants.		
O2.1: <i>NMI participations: 20</i>	Coordination of calibration solution comparison CCQM-K78.a.1 (Multi-component aqueous solution), based on BIPM gravimetrically prepared samples with multi-component polar analytes, with the mass fractions of primary reference materials quantified within the BIPM purity measurement facilities, providing a core comparison for polar organic calibration solutions for NMIs.	CCQM-K78.a.202x planning - Six-month secondment of INM scientist completed for the development and validation of LC-DAD-CAD methods for polar-pesticide multicomponent solution quantification - Six-month secondment of GLHK scientist started for the finalization of the development and validation of LC-DAD-CAD methods for polar-pesticide multicomponent solution quantification. - QNMR measurements and evaluation for pure base materials partly completed.
O2.2: <i>NMI participations: 20</i>	Coordination of calibration solution comparison CCQM-K78.b.1 (Multi-component, non-polar), based on BIPM gravimetrically prepared calibration solutions with multi-component non-polar analytes,	CCQM-K78.b (Methoxychlor and Trifluralin: Pesticide Calibration Solution Comparison) Final Report has been approved and was published in the KCDB and <i>Metrologia</i> .

Report on the BIPM Headquarters Work Programme for 2024-2027

III		
Chemical Metrology		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	with the mass fractions of primary reference materials quantified within the BIPM purity measurement facilities, providing a core comparison for non-polar organic calibration solutions for NMIs.	CCQM-K203 (Calibration solution comparison) - Twelve-month secondment of NIM scientist completed for the development and validation of LC-DAD-CAD methods for non-polar pesticide multicomponent solution quantification. LC-hrMS method confirmation method developed. Two related peer reviewed papers published. - QNMR measurements and evaluation completed. Mass fraction values and uncertainty assignments for pure base materials proposed and under discussion. - Adoption, development and validation of LC-DAD-MS/MS method in progress for non-polar pesticide multicomponent solution quantification for homogeneity and stability studies.
O2.3: <i>NMI participations: 20</i>	Coordination of CCQM-K154.e (Ochratoxin A), and development of calibrant assessment guidelines, and qNMR internal standard reference documents, providing support to NMIs developing and providing measurements standards in support of food safety and extending the scope of applicability of qNMR for SI traceable measurements on organic analytes, and support for NMI measurement services and their comparisons.	CCQM-K154.e (Ochratoxin A Calibrants) - Measurements of homogeneity study samples with LC-UV-MS/MS completed - Study protocol prepared, presented and approved by spring OAWG. - Mass fraction and uncertainty values assigned to study and training solutions and communicated to potential CBKT participants - Study and training samples shipped to potential CBKT study participants. - Study c registration finalized with. 12 NMIs/DIs registered for key comparison.
6. Chem-O3: LARGE MOLECULE ORGANIC PRIMARY REFERENCE METHOD DEVELOPMENT AND COMPARISONS Coordination of comparisons to determine and improve the international equivalence of organic primary calibrators for clinical chemistry and laboratory medicine, forensics and pharma		
O3.1: <i>NMI participations: 15</i>	Completion of CCQM-K155.d Primary peptide calibrator (5 kDa to 10 kDa), based on mass-balance and protein impurity corrected amino acid analysis characterization performed at the BIPM, providing a core comparison of capabilities for value assignment of primary reference material straight chain peptides with molecular weights between 5 kDa to 10 kDa at NMIs, and underpinning reference measurement systems for parathyroid hormone (PTH) measurements and their development for diagnosis and patient monitoring.	- Draft A1 with CCQM-K155.d / P55.2.d (PTH 1-84 calibration solution) comparison results completed and distributed to participants. Comparison results reviewed in CCQM-PAWG meeting at NIST in September. - LC-MS method based on quantification of proteotypic peptides for PTH(1-84) quantification in solution developed and used for BIPM value assignment of the comparison material. - Three meetings held with different participants about the three main measurement challenges encountered in CCQM-K115.d: structurally related impurities, host cell proteins and intact PTH 1-84 LC-MS analysis. KCRV options to be discussed in a fourth meeting before April 2026. - Four technical meetings held with stakeholders involved in the global standardization of PTH 1-84 measurements to coordinate efforts: CRM production, traceability via WHO international standard, commutability studies.

Report on the BIPM Headquarters Work Programme for 2024-2027

III Chemical Metrology		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
O3.2: <i>NMI participations: 15</i>	Coordination of peptide/protein purity key comparison CCQM-K115.e , intact proteins MW > 10 kDa, based on methodologies developed in running CCQM-P216, on SARS-CoV-2 monoclonal antibody quantification, and providing a core comparison of capabilities for value assignment of primary reference methods for proteins with molar masses of greater than 10 kDa at NMIs, and underpinning reference measurement systems diagnosis and therapeutics.	- Discussions organized within PAWG meeting at NIST on the most relevant measurands for an IgG candidate material for CCQM-K115.e key comparison. - Joint Technical Project drafted for production a candidate IgG material for CCQM-K115.e KC and role of comparison co-coordinator. - Survey about relevant measurands to be included in the CCQM-K115.e KC conducted among previous participants in CCQM-P216.
	O3.3: <i>NMI participations: 15</i>	Coordination of peptide/protein purity key comparison CCQM-K115.a.2, 1 kDa < peptide < 5 kDa, based on mass-balance and protein impurity corrected amino acid analysis characterization performed at the BIPM, providing a core comparison of capabilities for value assignment of primary reference material peptides with molecular weights between 1 kDa and 5 kDa, and underpinning reference measurement systems for protein diagnostics. - Cyclosporin A candidate comparison material for CCQM-K115.c.2026 received at BIPM through collaboration with the NML at LGC. NMR and LC-MS analyses performed by BIPM confirmed material suitability for key comparison and with analyses at LGC. 4 months of 12month secondment of scientist from EXHM (Greece) on high resolution mass spectrometry analysis of impurities in cyclosporin A (development finished, measurements ongoing) and PICAA (development planned for second part of the secondment). - Update on comparisons given at PAWG meeting in September. 3-month secondment of visiting scientist from NPL, analysing candidate peptides from de novo proteins using qNMR and DVS for future comparison studies.

Report on the BIPM Headquarters Work Programme for 2024-2027

IV		Ionizing Radiation Metrology
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
1. IR-D1: RADIATION DOSIMETRY International reference system for x-ray dosimetry Underpinning the international equivalence of national standards for radiotherapy, diagnostic x-rays, mammography and radiation protection, through the provision of comparison and calibration services. <i>NMI Participations: Objectives 24 (comparisons); 16 (calibrations). 8 comparisons and 11 calibrations have been completed.</i>		
D1.1:	Validation of national primary standards through bilateral comparisons and traceability of national secondary standards through calibrations: air kerma for low energy (BIPM.RI(I)-K2), medium energy (-K3) and mammography (-K7); absorbed dose to water for medium energy (-K9).	3 comparisons performed, all for ENEA (Italy): K2, K9, and K7W. - comparison reports in preparation 6 calibrations and corresponding certificates completed for the IAEA and the CRRD (Argentina) corresponding to 3 NMI participations.
D1.2:	Quality assurance to demonstrate the high accuracy and long-term stability of the BIPM primary standards and reference x-ray beams for air kerma and absorbed dose to water. Continual improvement of the BIPM standards and x-ray facilities to assure long-term reliability and compliance with evolving regulations and norms.	- Quality assurance checks continued all through the year. - Improvement of the medium energy x-rays facility: validation of the new radiation beams performed by comparing the calibration coefficients of different ionization chambers calibrated in both the existing reference facility and the new facility. The results thus obtained agreed well within the standard uncertainties demonstrating the equivalence of the radiation qualities of both facilities and ensuring the continuity of the BIPM services.
D1.3:	Development of a new reference low energy x-ray facility to improve the efficiency and ensure the long-term provision of the existing service.	- Design of a new calibration bench - Testing of a new-generation generator, including technical exchanges with the manufacturer to enhance its performance and achieve capabilities as close as possible to those of the previous generation.
2. IR-D2: INTERNATIONAL REFERENCE SYSTEM FOR GAMMA-RAY DOSIMETRY Underpinning the international equivalence of national standards for radiotherapy, brachytherapy, radiation protection and radio-sterilization through the provision of comparison and calibration services. <i>NMI Participations: Objectives : 30 (comparisons); 30 (calibrations). 8 comparisons and 18 calibrations have been completed.</i>		
D2.1:	Validation of national primary standards through bilateral comparisons and traceability of national secondary standards through calibrations: BIPM ⁶⁰Co beam: air kerma (BIPM.RI(I)-K1), absorbed dose to water (-K4),	3 comparisons performed: K5 for KRISS (Rep. of Korea) and BFKH (Hungary), K4 for NPL (UK) 5 comparison reports published in 2025: K1 and K4 for NIST (USA), K5 for LNHb (France) and KRISS (Rep. of Korea) and K8 for NIM (China).

Report on the BIPM Headquarters Work Programme for 2024-2027

IV		
Ionizing Radiation Metrology		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	- Off-site ^{137}Cs beam (IAEA): air kerma (-K5), - Off-site ^{192}Ir HDR source: travelling instrument for comparisons of reference air kerma rate standards (-K8).	11 calibrations and corresponding certificates completed for the SMU (Slovakia), SNSU (Indonesia – new user), CIEMAT (Spain), SSM (Sweden) and CMI (Czech Republic) corresponding to 8 NMI participations.
D2.2:	Quality assurance to demonstrate the high accuracy and long-term stability of the BIPM primary standards and reference gamma-ray beams for air kerma and absorbed dose to water. Continual improvement of the BIPM standards and gamma-ray facilities to assure long-term reliability and compliance with evolving regulations and norms.	- Quality assurance checks continued all through the year. - To follow recommendation from CCRI(I) ongoing provision of a second BIPM well chamber to provide improved robustness of the BIPM-RI(I)-K8 comparisons as a clear outcome from the discussions during the CCRI Workshop on Brachytherapy Standards (15 September, Japan) was that the BIPM.RI(I)-K8 based on bi-lateral comparisons between NMIs/DIs and the BIPM should continue in its current form.
3. IR-D3: INTERNATIONAL REFERENCE SYSTEM FOR HIGH-ENERGY RADIATION DOSIMETRY Underpinning the international equivalence of national standards for high-energy radiation beams to meet the expanding and emerging needs in dosimetry for radiotherapy, through the provision of comparison and calibration services. <i>NMI Participations: Objectives: 5 (comparisons); 10 (calibrations). 2 comparisons and 2 calibrations have been completed.</i>		
D3.1:	Validation of national primary standards through bilateral comparisons and traceability of national secondary standards through calibrations at the off-site DOSEO facility: absorbed dose to water for high-energy photon beams (BIPM.RI(I)-K6).	1 comparison performed for NPL (UK). 1 comparison report published in 2025 for GUM (Poland).
D3.2:	Quality assurance to demonstrate the high accuracy and long-term stability of the BIPM primary standard (graphite calorimeter) and transfer instruments for absorbed dose to water. Continual improvement of the BIPM standards and equipment to assure long-term reliability.	- Quality control checks continued throughout 2025 to ensure that the BIPM standards and radiation beams are stable. - Supporting calibrations for DOSEO in the BIPM Co-60 facility.
D3.3:	Development of a new calorimeter standard for high-energy photons, with a smaller core aimed to reduce uncertainties.	This project has been cancelled – see 2024 report- The allocated resources have been assigned to the modernization of the low-energy x-ray system at the BIPM (D1.3).
D3.4:	Extension of the comparison and calibration services to high-energy electrons at the off-site DOSEO facility, using the new calorimeter.	This project has been extensively discussed during the last CCRI(I) meeting. The CCRI(I) concluded that there is no pressing need for the BIPM to develop a high-energy electron standard but has a role to play in defining the KCRV for a future comparison.

Report on the BIPM Headquarters Work Programme for 2024-2027

IV Ionizing Radiation Metrology		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
		This work was initially intended to be mostly carried out by a secondee, that has been cancelled. As a replacement activity, the BIPM will participate from 2026 in CCRI initiatives through a dedicated task group aimed at launching a high-energy proton comparison.
Radionuclide Metrology		
4. IR-R1: INTERNATIONAL REFERENCE SYSTEM FOR ACTIVITY MEASUREMENTS OF GAMMA-RAY EMITTING RADIONUCLIDES (SIR) Underpinning the international equivalence of national standards of gamma-ray emitting 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. <i>NMI Participations: Objectives 32 (comparisons). 20 comparisons have been completed.</i>		
R1.1:	Provision of BIPM key comparisons (BIPM.RI(II)-K1) of national activity standards of gamma-ray emitting radionuclides using the high precision, high stability, SIR ionization chambers.	9 comparison measurements performed corresponding to 9 NMI participations in 2025: Mo-99 (PTB), Cs-134 (NPL), Eu-152 (POLATOM), Tb-161 (POLATOM), Yb-175 (PTB), Lu-177 (IRA), Pb-212 (NPL and CMI) and Ac-225 (NRC). 1 report of K1 comparisons has been published in 2025 for the following radionuclides: Mn-54 (POLATOM-2024).
R1.2:	Quality assurance and continual improvement to demonstrate the high precision and long-term stability of the SIR services and assure compliance with evolving regulations and norms.	- Quality control checks continued throughout the period. Due to the discovery of an effect caused by the angular position of the source holder in the SIR a thorough study of this positional impact has been carried out throughout the year indicating that past SIR measurement results were affected only negligibly, except for very low-energy emitters and very high energy beta emitters, for which more measurements are needed. - Mathematical modelling to transfer KCRVs from the SIR ionization chamber to the backup chamber to avoid the need to measure samples of every radionuclide covered by the SIR: project was successfully achieved in collaboration with the NPL and published. - Transition to Ho-166m as reference sources has started showing a measurement repeatability down to 1.1×10^{-4} for high currents.
R1.3:	Transfer of the SIR services to the updated SIR device and measurement method, based on state-of-the-art instrumentation for measuring low currents, assuring the long-term continuity of the international equivalence of national standards.	SIR2.0 update: During a six-month secondment, Takahiro Tanaka (NMIJ) developed and optimized a LabView interface for the Keysight digital voltmeter connected to the ULCA, improved the signal-to-noise ratio and successfully calibrated the ULCA using a second ULCA on loan from PTB and a Zener voltage standard. The “back-to-back” connection of the new ionization chambers, polarized in opposition, was tested, allowing continuous subtraction of background current and demonstrating the potential for comparisons at activity levels about 10 times lower than the current SIR. These accomplishments mark significant milestones in improving the SIR system's performance, precision, and flexibility for future radionuclide comparisons.

Report on the BIPM Headquarters Work Programme for 2024-2027

IV		Ionizing Radiation Metrology	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)	
5. IR-R2: INTERNATIONAL REFERENCE SYSTEM FOR ACTIVITY MEASUREMENTS OF SHORT-LIVED GAMMA-RAY EMITTING RADIONUCLIDES (SIRTI)			
Underpinning the international equivalence of national standards of short-lived gamma-ray emitting radionuclides for particular applications in nuclear medicine and other domains, through the provision of BIPM key comparisons. <i>NMI Participations: Objectives 25 (comparisons). 4 comparisons have been completed.</i>			
R2.1:	Provision of BIPM key comparisons (BIPM.RI(II)-K4) of national activity standards of short-lived gamma-ray emitting radionuclides using the high precision, high stability SIRTI scintillation counter, in remote or on-site modes.	1 comparison measurement in hybrid mode (partly on-site and partly in remote mode) at the NIM (China) for ¹⁸F. The planned SIRTI comparison of ^{99m}Tc at IRA was cancelled at the request of the participant. - The draft A report of the first remote SIRTI comparisons, at the PTB, has been prepared for ¹⁸F, ⁶⁴Cu and ^{99m}Tc.	
R2.2:	Quality assurance and continual improvement to demonstrate the high precision and long-term stability of the SIRTI services and assure compliance with evolving regulations and norms.	Quality control checks continued throughout the period.	
R2.3:	Duplication of the SIRTI to a second device equipped with dedicated digital electronics, assuring the long-term continuity of the SIRTI services, and transfer of the SIRTI method to several RMOs.	- APMP and SIM NMIs involved in the development of RMO SIRTI were informed of the tests carried out with a digital electronic acquisition system for the SIRTI with CAEN module using a F-18 solution showing promising results up to 20 000 s⁻¹ counting rates. - Knowledge transfer about the SIRTI setup to LNMRI/IRD and NIM staff at the BIPM. - Detailed technical discussions with NMIJ about their version of a SIRTI. - Participation in a meeting of the RMO SIRTI APMP working group. - First discussions with EURAMET NMIs about a possible EURAMET SIRTI.	
R2.4:	Extension of SIRTI services to new (3) radionuclides requiring metrological studies and cross-calibration with the SIR.	- Finalization of the link to the SIR for Sm-153 and I-123 postponed to 2026 - First measurements of the link to the SIR for Sc-47 and Pb-212 - Resources allocated to the study of the effect caused by the angular position of the source holder in the SIR (see R1.2)	
6. IR-R3: INTERNATIONAL REFERENCE SYSTEM FOR ACTIVITY MEASUREMENTS OF ALPHA- AND BETA-PARTICLE EMITTING RADIONUCLIDES (ESIR)			
Underpinning the international equivalence of national standards of alpha- and beta-particle emitting radionuclides for applications in nuclear medicine, environmental protection, radiation protection and nuclear forensics, through the provision of BIPM key comparisons. <i>NMI Participations: Objectives: 20 NMIs (comparisons). 2 comparisons have been completed.</i>			
R3.1:	Provision of BIPM key comparisons (BIPM.RI(II)-K5) of national activity standards of medium- and high-energy beta-particle emitting radionuclides using	- Comparison protocol has been updated. - Start the BIPM.RI(II)-K5 service for a few among the 11 selected isotopes: Measurements on-going with Tc-99m and Pm-147.	

Report on the BIPM Headquarters Work Programme for 2024-2027

IV	Ionizing Radiation Metrology	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	the high precision, high stability ESIR liquid scintillation counter based on the TDCR method.	
R3.2:	Quality assurance and continual improvement to demonstrate the high precision and long-term stability of the ESIR services and assure compliance with evolving regulations and norms.	• Continuous update of the quality system. • Periodic quality controls ensured during the period. • Ongoing studies on liquid scintillation cocktails to optimize source production for different isotopes.
R3.3:	Extension of the services to cover additional radionuclides, low energy beta and alpha emitters, thanks to digital pulse processing systems.	• Start of a PhD (co-direction by BIPM and LNE-LNHB) on 17 March to study the corrections for impurities of ESIR measurements allowing the use of additional radionuclides at the next Working Plan. • One paper published improving the knowledge of the ballistic dependence in triple-to-double coincidence ratio (TDCR) using a surrogate optical model • <u>Advance in the digital transformation of radionuclide metrology, modernizing legacy techniques</u>: the growing use of algorithms and software solutions for processing data from digital acquisition systems has led to the development of a new type of comparison: “comparison of digital algorithms for radionuclide standardization”. This initiative, carried out by the BIPM in collaboration with several NMIs through secondments, will provide benchmark digital signals within a Radionuclide Metrology Algorithm Comparison Platform. Also, reference list-mode digital datasets were generated using Geant4 Monte-Carlo simulations and published. These benchmarks will allow metrology institutes to compare their digital data analysis methods against the international consensus, enhancing consistency and reliability in radionuclide measurements worldwide. Complementing these advances, the scintiPulses Python package, a versatile tool for simulating scintillation detector pulse signals has been developed and a related paper published. In parallel, the BIPM and NIM (China) modernized the Selective Sampling technique, originally developed at the BIPM in the 1980s, by upgrading a $4\pi\beta(\text{LS})$-γ detection system with a high-speed CAEN digitizer and in-house software. This digital transition simplifies operation, improves signal processing and background correction, and ensures more reliable results for nuclear medicine, environmental monitoring, and radiation safety, making a previously complex method accessible to a wider range of NMIs.

Report on the BIPM Headquarters Work Programme for 2024-2027

V	Coordination and institutional liaison	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
SUPPORT for CCs (including provision of Executive Secretaries)		
PMD-C1:	Provision of CCEM (Electricity and Magnetism) Executive Secretary to support: 1) Two CCEM meetings 2) Annual working group meetings 3) Pro-active interaction on strategy and communication 4) Coordination of CCEM processes.	• Organization of the CCEM and its working group meetings in March 2025. • Organization of a CCEM Workshop during the CCEM meeting. • Participation in the review of CCEM and RMO comparison reports. • Participation in the CCEM-TG for the revision of guidelines for reliable measurements of QHRs (inclusion of guidelines for the use of graphene-based QHRs).
PMD-C2:	Provision of CCM (Mass and Related Quantities) Executive Secretary to support: 1) Two CCM meetings 2) Annual working group meetings 3) Pro-active interaction on strategy and communication 4) Coordination of CCM processes.	• 20th CCM meeting and WG meetings in June 2025 (including the organization of a CCM Workshop, the organization and co-chair of the WGS meeting). • Organization and co-chair of online WGS meetings. • Organization of additional online WG & TG meetings and a CCM webinar. • Meetings of TGPfD-kg to discuss the guidance note on the Consensus Value (CV) and the calculation of the next CV based on the results of CCM.M-K8.2024. • Organization of the first meeting of the newly established TG on Dynamic measurements • Member of the Steering and Program Committees of the International Conference of Weighing (meetings for the conference in 2026). • Coordination of the registration, approval and publication of the final reports of KCs.
PMD-C3:	Provision of CCT (Thermometry) Executive Secretary to support: 1) Two CCT meetings 2) Annual working group meetings 3) Pro-active interaction on strategy and communication 4) Coordination of CCT processes.	• Coordination of the CCT WGs for the Royal Society event “The redefined kelvin: progress and prospects”. • Coordination of the CCT WG meetings during the Tempmeko Conference (October 2025). • Preparation for the organization of the CCT meeting in May 2026.
PMD-C4:	Provision of CCU (Units) Executive Secretary to support: 1) Two CCU meetings 2) Annual working group meetings	• Preparation and publication of version 3.02 of the 9th edition of the SI Brochure in August 2025. • Discussions about the future treatment of non-SI units in v4.01 of the SI Brochure. • Online meeting of CCU WGS in February 2025.

Report on the BIPM Headquarters Work Programme for 2024-2027

V	Coordination and institutional liaison	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	3) Pro-active interaction on strategy and communication 4) Coordination of CCU processes.	
Time-C1:	Provision of CCTF (Time and Frequency) Executive Secretary to support: 1. Organizing the CCTF bi/triennial meetings and more frequent meetings of the CCTF WG on Strategic Planning 2. Providing secretariat for CCTF and WGs 3. Pro-active interaction on strategy and communication 4. Key comparisons in time and frequency and other MRA activities 5. Contribution to the estimation of the recommended frequencies for the secondary representations of the second.	The Department is deeply involved in supporting CCTF, its 9 WGs, and the special task force and task groups created on the 5 hot topics: 1. Updating the Roadmap for the redefinition of the second 2. Leap seconds in UTC - building a consensus for a continuous timescale 3. Promoting the mutual benefit of UTC and GNSS 4. Sharing resources to improve international timekeeping 5. Lunar reference time scale The time dept ensures the activity of the executive secretariat but also chairs some groups and strongly supports all of them and the CCTF President. The CCTF WG on Strategic Planning meets every two months (online). Almost all the groups related to hot topics met every 2-3 months The CCTF and almost all working groups met at the BIPM in the period sept 12-19, 2025 with the participation of several colleagues from all RMOs and quite active discussion on all the topics dealing with the adoption of 3 draft recommendations for the next CGPM 2026: 1. Draft CGPM Resolution B – On the future definition of the second 2. Draft CGPM Resolution C – On the continuous nature of UTC 3. Draft CGPM Resolution D – On the definition of a timescale on the moon and 4 CCTF recommendations toward the NMIs, UTC labs, and CCTF groups: 1. CCTF 24-2: Updated list of recommended values of standard frequencies for the secondary representations of the second 2. CCTF 24-3: Actions to progress on the roadmap for the redefinition of the second 3. CCTF 24-4: Preparation for the possible discontinuation of GPS signals semi-codeless tracking 4. CCTF 24-5: Monitoring of GNSS hardware delays variations During 2025 contributions to the RMO TCTF meetings (online) with updates on CCTF and time dept activities were carried out.

Report on the BIPM Headquarters Work Programme for 2024-2027

V	Coordination and institutional liaison	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
Time-C2:	Provision of CCL (Length) Executive Secretary to support: 1. CCL meetings 2. Participation in WGs 3. Pro-active interaction on strategy and communication 4. Coordination between NMIs for length related activities. Key comparisons in length, support to comparisons of stabilized lasers piloted by NMIs 5. Recommendation of standard frequencies and wavelength for the practical realization of the metre.	• The CCL Working Group meetings in November 2025 were supported.
Chem-C1:	Provision of CCQM (Chemistry and Biology) Executive Secretary to support: 1) Annual CCQM meetings (four plenary meetings) and meetings of eleven WGs (in presence and on-line) 2) Pro-active interaction on strategy and communication 3) Coordination of review of CC and RMO comparison reports before publication 4) Development and review of CCQM documents and guidelines 5) Organization and coordination of CCQM workshops.	• Organization of CCQM meetings (7 days) at BIPM in April 2025, with 10 WG meetings and plenary session. • Organization of the CCQM Online Workshop on Protein Structure and Activity. • Organization of online Stakeholder Workshop of the CCQM Task Group of Food Measurements. Several virtual meetings hosted. • Organization of the online CCQM-TG-NMMS Workshop on micro and nanoplastics metrology: • Organization of CCQM SPWG online meetings and coordination of publication of CCQM 2030+ strategy documents.
Chem-C2:	Provision of CCPR (Photometry and Radiometry) Executive Secretary to support: 1) Two CCPR plenary meetings and associated WG meetings 2) Pro-active interaction on strategy and communication	• Support provided for the organization of CCPR working meetings (2 days) at BEV (Vienna) in July 2025, and half-day workshop on digitalization issues in Photometry and Radiometry. • Communication with CCPR contact persons maintained on meetings announcements, strategy documents, update of MoU with CIE, and availability of WG-CMC chair position. • Support provided for the communication between participants in 2 CCPR comparisons. • Support provided to update the CCPR strategy document.

Report on the BIPM Headquarters Work Programme for 2024-2027

V	Coordination and institutional liaison	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	3) Coordination of review of CC and RMO comparison reports before publication 4) Development and review of CCPR documents and guidelines.	
IR-C1:	Provision of CCRI (Ionizing Radiation) Executive Secretary to support: • Biennial CCRI and sections I, II and III meetings; • Regular meetings of seven working groups; • Development of strategic plans; Co-ordination of engagement with RMOs.	• Biennial CCRI and sections I, II and III meetings. Section 3 organized at the IAEA and Section 1 in Fukushima District (Japan). • CCRI webinar series: 5 organized webinars: 23/01 - <i>Accelerator Neutron Source for BNCT</i>, 26/02 – <i>The role of radioactive sources in ionizing radiation metrology</i>, 28/03 – <i>Radionuclide Reference Materials</i>, 24/04 - <i>Updates on X-ray Imaging Dosimetry Practices</i>, 15/10 - <i>Challenges with Monte Carlo Simulation in Ionizing Radiation Metrology</i>. • 7 CCRI (and co-organised) workshops: <i>Mass Spectrometry in Radionuclide Metrology</i> (16/05 - NPL), <i>Neutron Beams at High Energy: Applications and Metrology</i> (7-8/07– IAEA), <i>Brachytherapy Standards</i> (for CCRI(I) only) (15/09 – Minamisoma, Japan), <i>Metrology for Proton and Hadron Therapy</i> (16/09 – Minamisoma, Japan), <i>Medical Applications of Radiation and Metrology Standards</i> (16/09 – Minamisoma, Japan), <i>Future of Radionuclide Metrology and CCRI(II): Meeting Evolving Applications at Near-Trace Levels</i> (05/11 – BIPM), <i>Past and Future of Ionizing Radiation Metrology</i> (06/11 – BIPM). • Chair of the CCRI Communication Working Group (5 meetings in February, April, May, June and December): above webinars and <i>Past and Future of Ionizing Radiation Metrology</i> workshop preparation, 7 newsletters (one published in IAEA SSDL newsletter). • One meeting was held in June of the CCRI Radionuclide Therapy and Quantitative Imaging Working Group (CCRI-RTWG). • One meeting held in October of the CCRI RMO Working Group on IR CMCs (CCRI-RMOWG). • Two meetings in June and November of the Key Comparisons Working Group of CCRI Section II (CCRI-KCWG(II)). • Chair of the Task Group on Digital Transformation (CCRI-DT-TG) with 5 meetings in January, April, June, September, December and the organization of the October webinar. • Mass spectrometry Task Group: 8 meetings and the organization of the Workshop in May at the NPL. Launch of two new CCRI(III) task groups: the BNCT-TG (2 meetings: October and December) and the High energy neutrons TG (2 meetings: September and December).

Report on the BIPM Headquarters Work Programme for 2024-2027

V	Coordination and institutional liaison	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
IR-C3 (Time-C3):	Provision of CCAUV (acoustics, ultrasound and vibration) Executive Secretary to support: 1. Biennial CCAUV meetings and three WG meetings 2. Pro-active interaction on strategy and communication 3. Development of strategic plans 4. Coordinate review of CC and RMO comparison reports before publication Related liaisons with RMOs and CTBTO.	• Coordination between the new CCAUV President and Executive Secretary. • Preparation for the October 2025 meetings of the CCAUV.
CIPM MRA COORDINATION AND PROVISION OF THE KCDB		
ILC-C1:	1) Coordination of the CIPM MRA mechanisms through the JCRB 2) Provision of the KCDB database and API (including Exec. Sec. of the JCRB) 3) Maintenance and minor updates for KCDB 4) Publication of comparison data and interventions on CMCs Advising the CIPM MRA participants and mining the data for stakeholders.	As of December 2025, the CIPM MRA has been signed by representatives of 64 Member States, 36 Associates, and four international organizations – and covers a further 157 institutes designated by the signatory bodies. • A new JCRB Executive Secretary, seconded from NMJJ, Japan was appointed in May 2025. • During the reporting period around 4468 CMCs were processed and 1425 published in the KCDB (including greyed-out CMC). • 33 key and 14 supplementary comparisons were published in the KCDB. • The 49th meeting of the JCRB in September 2025 was organized as a hybrid meeting and was attended by participants representing all six RMOs. The CIPM took also part in the meeting. • KCDB reports to the JCRB in March and September 2025 have been published and presented; KCDB reports have been made publicly available through the BIPM and JCRB websites. • An evaluation of the JCRB review performance in the KCDB web platform has been conducted and included in the two KCDB reports to the JCRB. • Continuous support was provided to RMOs in operation of the CIPM MRA processes, including support for RMOs TC Chairs, CMC Writer and Reviewers and Comparison pilots. • The statistics on CMC review performance section of the KCDB web platform were improved, adding information regarding the total number of CMCs reviewed within the past year by RMO and metrology area.

Report on the BIPM Headquarters Work Programme for 2024-2027

V	Coordination and institutional liaison	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
		- The KCDB was updated to ensure collection of Metadata for publication of comparison reports. - The KCDB users satisfaction survey was conducted and was followed by an internal audit of the KCDB Office in June.
ILC-C2:	Provision of JCRB Executive Secretary (Secondee position) to support: 1) Organization and participation in biannual JCRB meetings 2) Pro-active monitoring the JCRB CMC review process 3) Analysis and reporting on the efficiency and effectiveness of the JCRB CMC review process 4) Maintenance of the CIPM MRA documents suite, JCRB database, DI registry etc. 5) Interface with the KCDB office Provision of assistance to CIPM MRA participants and RMOs.	- Handover of the JCRB Executive Secretary (secondee) was successfully completed in May. - As the March 2025 meeting was skipped after a unanimous decision by JCRB members in the 48th meeting, interim reports from the RMOs were collected as an alternative. - The 49th meeting was held at the end of September in Uzbekistan. An extensive follow-up of comparisons older than 5 years was conducted triggered by the Action JCRB/48-2 and reported at the 49th JCRB meeting. - The JCRB CMC review process was monitored daily, and various stakeholders were alerted including the KCDB Office for appropriate mitigations whenever there was departure from the CIPM MRA expectations. - The JCRB review process was analyzed especially on CMCs review durations, loss of CMCs review rights, CMCs that have overstayed the status “revision requested” and CMCs that slipped through the regular JCRB review process. This was continually done, and the statistics were reported to the JCRB, CCs, CBKT Technical Exchanges and other relevant stakeholders. - The KCDB reports to the JCRB in March and September 2025 were published; KCDB reports have been made publicly available through the BIPM and JCRB website. - The 6 policy and guidance documents on CIPM MRA and associated documents were well maintained in a central repository. Upon responding to Action/Resolution agreed at the 49th JCRB meeting, documents P-12, P-13 and G-11 have been updated and further informed to the CCs and RMOs. - The JCRB database and the NMI/DIs database were maintained to reflect the current status. As of December 2025, the CIPM MRA has been signed by representatives of 101 institutes – from 64 Member States, 36 Associates, and 4 international organizations – and covers a further 157 institutes designated by the signatory bodies. - One DI of Thailand (Bureau of Quality and Safety of Food, Department of Medical Science, Ministry of Public Health (BQSF, DMSc)) was withdrawn from the CIPM MRA. Scopes of designation were updated for MIRS/Jozef Stefan Institute (Slovenia), NSC IM (Ukraine) and SE “Ukrmetrteststandard” (Ukraine). A DI of Brazil Observatório Nacional / Laboratório de Gravimetria (ON/LabGrav) was nominated. Continuous support was provided to RMOs in

Report on the BIPM Headquarters Work Programme for 2024-2027

V	Coordination and institutional liaison	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
		the operation of the CIPM MRA processes, including support for RMOs TC/WG Chairs and CMC writers. It was ensured with the Head of Digital Transformation that all listed NMIs/DIs participating in the CIPM MRA are digitally identified except for three from Cuba and one from Pakistan that are in the process. As an initial consideration, started the exploration of the CIPM MRA logo by revisiting the background and practices adopted by bodies such as ILAC, IAF and OIML.
JCGM		
ILC-C3:	Provision of JCGM and JCGM WG2 Executive Secretary and rapporteur (JCGM - one annual meeting, JCGM WG2 - two annual meetings), general support to JCGM, representation in JCGM WG2.	- The BIPM provides the Executive Secretary, who acts as rapporteur, for both the JCGM and JCGM-WG2: VIM. - The 27th meeting of the JCGM (23 January 2025) was successfully organized with 16 participants. The report of the meeting was drafted and published during the period. - A JCGM webinar on “Measurement Uncertainty” was organized on 2 July 2025. The webinar was livestreamed and had more than 2 000 participants across Zoom, YouTube and LinkedIn.
IR-C2:	Provision of the Scientific Secretary for JCGM WG1 and support including: 1) Rapporteur; 2) Two annual meetings.	- JCGM-WG1 plenary meeting in June - Review of the minutes of the December 2024 and June 2025 meetings.

Report on the BIPM Headquarters Work Programme for 2024-2027

V	Coordination and institutional liaison	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
JCTLM		
Chem-C3:	Support for: • JCTLM Executive and WG meetings (in presence and on-line) • JCTLM Database entry/nomination review process • Maintenance and continued development of the JCTLM Database • JCTLM Stakeholder meetings • Development of on-line programmes on JCTLM nomination and review processes.	• Organization of the 27th Executive Committee and associated JCTLM DB and TEP WG meetings. • Organization of the JCTLM Members' and Stakeholders' meeting and Workshop on 'Result harmonization in medical laboratories: accomplishments and challenges'. Summary publication on the workshop drafted and currently under internal revision. • Publication of the JCTLM Newsletter Issue 11 with Special report celebrating the 150th Anniversary of signing of the Metre Convention • Release of videos on JCTLM submission processes and 3 videos on the review processes using the BIPM eLearning platform an developed by the JCTLM Task Group for Knowledge Transfer • Report of the 26th Executive Committee meeting drafted and published. • Report of the December 2024 DBWG meeting drafted and distributed. • Videoconference of JCTLM Executive held in July 2025. • Call for experts' process completed resulting in 14 new experts appointed to JCTLM Review Teams. • Preliminary review of 132 JCTLM database nominations completed and distributed to the DBWG review teams. • 62 new entries published in the JCTLM database. • Technical specifications for the new JCTLM web platform completed and tests of the first version of the prototype initiated. • Organized two meetings of the JCTLM Task Group on JCTLM Membership with new model submitted to CIPM and management boards of other JCTLM Executive Committee organizations • Two papers published: - Time to refresh and integrate the JCTLM database entries for total bilirubin: the way forward, M. Panteghini, W.G. Miller, R. Wielgosz, Clinical Chemistry and Laboratory Medicine (CCLM) 63 (3), e73-e75, 2025. - Supporting prioritization efforts of higher-order reference providers using evidence from the Joint Committee for Traceability in Laboratory Medicine database., M. Panteghini, R. Wielgosz, Clinical Chemistry & Laboratory Medicine 63 (8), 2025.

Report on the BIPM Headquarters Work Programme for 2024-2027

V	Coordination and institutional liaison	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
INSTITUTIONAL LIAISON		
LIAISON WITH MEMBER STATES, ASSOCIATES, THE CIPM AND RMOs		
ILC-L1:	1) Support to Member States and Associates, CIPM and the BIPM Director 2) Promotion of the Metre Convention and support to potential Member States and Associates 3) Supporting the CIPM in its activities towards universal adherence to the Metre Convention 4) Support for and representation to RMOs (AFRIMETS, APMP, COOMET, EURAMET, GULFMET and SIM).	• As of December 2025, the BIPM has 64 Member States and 36 Associates: – The BIPM provided necessary support/advice to the governments of Member States and Associates with outstanding contributions and subscriptions to avoid suspension and exclusion. – Many States with emerging metrology systems (<i>Dominican Republic, Venezuela, Sudan, Bahrain, Jordan, Guatemala, Armenia, Kyrgyzstan, PNG, Fiji, DR of Congo, Uganda, Somalia</i>; also current Associate States – <i>Albania, Azerbaijan, Bolivia, Latvia, Luxembourg, Panama, Peru, Philippines, Uzbekistan</i>) were advised on the process to become an associate or member of the BIPM and a signatory to the CIPM, during visits to the respective countries, visits of delegations to the BIPM and at online meetings. – To implement Resolution 6 <i>On universal adherence to the Metre Convention</i> adopted at the 27th meeting of the CGPM in November 2022, a concept note and a resolution was drafted. Appropriate actions will be proposed for consideration by the CGPM at its 28th meeting scheduled for October 2026. • BIPM participated in all RMO annual meetings online or in person.
PMD-L1:	1) Representation of the BIPM in the CODATA Task Group on Fundamental Constants (4 meetings) 2) Representation of the BIPM in the Executive Committee of the CPEM (Conference on Precision Electromagnetic Measurements) (4 meetings) 3) Representation of the BIPM in RMO Technical Committee meetings in Mass, Electricity and Thermometry (8 meetings).	• Participation in two online meetings of the CPEM Executive Committee planning CPEM 2026. • Organization of and participation in the CODATA-TGFC meeting, 4-5 September in Warsaw • Online presentation of the CCM news at the EURAMET TC-M contact person meeting, 16 October. • Online presentation of CCEM news at the APMP TC-EM contact person meeting.

Report on the BIPM Headquarters Work Programme for 2024-2027

V	Coordination and institutional liaison	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
Time-L1:	Coordination and promotion of time activities for the advancement in the understanding, development, and applications of time scales. Importance of a unique world-wide reference time scale and the correct implementation in all applications, including scientific projects, and industrial systems, for example digital networks and satellite systems. 1) Work with scientific organizations such as the IGS, and ICG in the GNSS field, and the IAU, IUGG, IERS, URSI 2) Work with industrial application organizations as the ITU.	The Time Department is very active in proactively supporting the relationship with the liaison organizations, particularly concerning the continuous UTC and the risk of a negative leap second, and the definition of a Lunar reference time scale. • The BIPM participates in the IGS Governing Board, in the limit of available time, and, regularly, to the activity of the IGS WG on clock and ambiguity resolution. • The collaboration with IAU is quite active as F. Meynadier is Chair of an IAU WG on timing standards. Also, a collaboration is in progress for the definition of a Lunar Time. The dept participated to the IAU Symposium in La Plata, Argentina, in Aug 2025 on reference frames • The liaison with ITU and the related discussion on the continuous UTC is very important and it is proactively followed by participating in the meetings of ITU R WP7A and submitting input documents. In 2025 for the first time the time dept was invited to the meeting of the ITU-T SG15Q13 group devoted to the synchronization of telecom network to discuss the potential impact of a negative leap second • The dept collaborates with the ICG, international committee on GNSS, concerning timing aspects by supporting the organization of the scientific session and workshops. In 2025 an invited contribution is ensured in the plenary session on Continuous UTC, and a joint session on Moon time was prepared and chaired at the meeting of the ICG in October 2025 in Busan (Korea). The dept was invited to an online session of ICG WG-L meeting, devoted to Lunar projects, to report on the activities on Lunar time. • A workshop on Moon PNT (Positioning, Navigation, and Timing) was organized in Feb 2025 in Vienna by the ICG and IOAG (Interagency Operations Advisory Group) and the BIPM was invited to chair a session on Moon timing. • A second workshop on Moon PNT is under preparation by ICG and IOAG and the BIPM is invited to chair the Moon timing session again. A great effort was devoted to the understanding of the relativistic framework on the Moon for the definition and realization of a reference time scale. In addition, the Time dept has also worked to build consensus among the different space agencies involved in Moon projects as well as the International Organizations that may have an impact on Lunar conventions as IAU, ITU, IAG, and ICG. Several sessions and meetings were organized in collaboration with the other organization. This activity, in the frame of all contributions from the CCTF task Group on Moon Timing has led to the draft of the CGPM Resolution D. • A workshop (online) was organized together with IERS and expert on Earth rotation to assess the probability of a negative leap second. The discussion put together experts from different fields and was very interesting and efficient. A stochastic model for the prediction

Report on the BIPM Headquarters Work Programme for 2024-2027

V	Coordination and institutional liaison	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
		of UT1-UTC was agreed and validated with past data and it was used to estimate the probability of a negative leap second in the next 10 years. The results were presented to user fora and meetings of other International Organizations leading to the decision to update UTC “as soon as possible” by extending the tolerance between the Earth rotational angle UT1 and UTC, so to avoid the discontinuities of the leap seconds for centuries. This activity has contributed to the CGPM 2026 draft resolution C. • The IERS is supporting the CCTF activities on Continuous UTC and a formal statement was sent where IERS, among other items, take commitment to update its internal procedure in the evaluation and announcement of the leap second, according to the CGPM decision in 2026. • The Time Department supports the French network in time and frequency metrology called FIRST TF. • The Time Department supported the organization of the Summer School of the Italian Physics Society, “COURSE 217 - FUTURE NEEDS FOR METROLOGY: CLIMATE SCIENCE, QUANTUM TECHNOLOGIES AND THE DIGITAL TRANSFORMATION”, in Varenna, Italy in July 2025 by ensuring 3 lectures and the participation of 2 students. • The time dept contributes to the European Frequency and Time Seminar (EFTS) in Besancon, by ensuring two lectures on Time scale and General relativity Publication and presentations: • P. Tavella, “Timekeeping and navigation systems and their mutual benefits” SIF summer school, July 2025 • G. Tagliaferro, “Handling the Problem of Non-Estimability in Metrology”, SIF summer school, July 2025 • P. Tavella, “Working with time-varying quantities: some useful statistical and mathematical tools”, SIF summer school, July 2025 • F. Meynadier, “time scales” and “general relativity in time and frequency” EFTS Besancon June 2025
Chem-L1:	1) Maintain working relationships with IFCC, ICSH, ISO TC 212, WHO, IUPAC, IAEA, WMO, ISO TC 207, ISO TC 146, WADA, Codex in support of CCQM and JCTLM activities 2) Support liaison activities required for the CCQM Task Group for Ozone Cross Section to facilitate	• Active liaison with ISO TC 212 maintained. Leading to final draft versions of ISO 15193 and 15194 that are the basis of the JCTLM review process for reference methods and materials. • Active liaison with ISO TC 207/SC7/WG17 on "Greenhouse gas emission measurements in urban environments" with contributions to ISO WD 14070-1:2024, Greenhouse Gas (GHG) Emission Measurements in Urban Environments— Part 1: GHG Emission Measurements in Urban Atmospheres with Surface-Based Observing Networks.

Report on the BIPM Headquarters Work Programme for 2024-2027

V	Coordination and institutional liaison	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	global implementation of CCQM recommended cross section values for surface ozone monitoring world-wide 3) Support liaison activities required for the CCQM-GAWG Task Group on GHG Scale Comparisons to facilitate expansion of the global measurement infrastructure for atmospheric GHG measurements in support of emission inventory verification 4) Support liaison activities required in support of CIPM Sector Task Group initiatives in the field of: health, food safety, and environment and climate.	- Promotion of activities of the CCQM-GAWG-TG on Ozone Cross-Section implementation, including campaign on implantation on the international day for clean air and blue skies. - Active liaison with IFCC and presentation on JCTLM at the IFCC General Conference. - Organization and hosting of meetings of CCQM-GAWG Task Group on GHG Scale Comparisons. - Publication of 1st CIPM-STG-CENV stakeholder meeting report (Rapport BIPM 2025-01) - Reports provided to ISO TC 334 on CCQM and JCTLM activities.
IR-L1:	1) International Commission on Radiation Units (ICRU) (Commissioner and sponsor of Report Committees) 2) International Atomic Energy Agency (IAEA) (SSDL Scientific Committee) 3) International Committee for Radionuclide Metrology (ICRM) 4) ISO (TC 85/SC 2 and working group meetings).	- Participation in the preparation of the iDOS 2026 conference - Preparation of scientific cooperation between IAEA and BIPM to support involvement of IAEA in CCRI supplementary comparisons on reference materials. - Participation in the advisory board of the European provider of medical radionuclides (PRISMAP). - Vice presidency of the ICRM, organization of the ICRM2025 conference and participation to the scientific committee. - Production of a BIPM IR Department long-term strategy report for the CIPM. - Co-organization of an IAEA-CCRI(III) Workshop and participation to the scientific committee. - Co-organization of a CCRI-NMIJ workshop in Japan.
SUPPORTING NMI DIRECTORS MEETING AND RMO CHAIRS/SECRETARIAT		
ILC-L2:	1) To work with the panel of NMI Directors to organize an annual meeting at the BIPM 2) Development of a global perspective on key issues 3) Provide focused support for states with emerging metrology systems 4) Facilitate annual meetings of the BIPM and RMO Chairs.	- The annual meeting of the Directors of National Metrology Institutes and Member State Representatives was organized in cooperation with EURAMET on the topic of "Tackling global challenges with metrology in a coordinated way". - The CIPM Strategy 2030+ has been completed and made available to the stakeholders for consultation. Recommendations from the Young metrologists' 2050+ vision project have been included in the Strategy. - The BIPM Strategic work plan based on the CIPM Strategy was developed, shared and feedback from 18 NMIs was received.

Report on the BIPM Headquarters Work Programme for 2024-2027

V	Coordination and institutional liaison	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
		BIPM and RMO Chairs met during the JCRB meeting. No separate meeting was held.
LIAISON WITH STRATEGIC PARTNERS		

Report on the BIPM Headquarters Work Programme for 2024-2027

V	Coordination and institutional liaison	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
ILC-L3:	Institutional liaison with International/intergovernmental organizations/Quality Infrastructure players: – INetQI, OIML, UNIDO, UNESCO, ILAC, ISO, OECD, WTO, World Bank, – institutional liaison with other international organizations as required.	• BIPM-UNESCO cooperation: – Over several months, the ILC Department worked with UNESCO Section for Basic Sciences, Research, Innovation and Engineering on a daily basis to organize a high-level symposium for the 150th anniversary of the Metre Convention. • BIPM-WTO cooperation: – In the light of the 150th Anniversary of the signing of the Metre Convention and the creation of the BIPM, the BIPM supported the Australian Delegation in the organization of a thematic session on <i>Technical Assistance – Role of Metrology in facilitating Trade</i> on 11 November 2025 at the WTO. The session explored the role of metrology in facilitating trade and supporting the effective implementation of the TBT Agreement. – The BIPM statement was submitted to the WTO TBT Committee; the BIPM was represented remotely at the WTO TBT Committee meetings in March and June 2025 and in person in November 2025. • BIPM-UNIDO cooperation: – The BIPM continued liaising with UNIDO to prepare a concept note for a project on impact of metrology (to be implemented in 2026). • BIPM-OECD cooperation: – The BIPM supported finalization of the QI-Regulation study; the report has been published on 15th September 2025. The BIPM participated in a panel discussion at the 11th IO Partnership Annual Meeting held in September 2025 at OECD headquarters • BIPM-IPCC cooperation: – The BIPM (ILC Department as a Focal Point) supported the participation of metrology experts at panel sessions and WG meetings of the Intergovernmental Panel on Climate Change in February 2025 and supported NMI nominations to the IPCC AR7 authors as well as to the IPCC TG DATA in April 2025. • Formalization of institutional liaison: – A Memorandum of Understanding (MoU) with the International Commission on Illumination (CIE) was signed to replace the 2007 CIPM-CIE Agreement; the MoU was signed on 15 July 2025. – The BIPM signed a MoU with UNESCO to replace the 1949/1952 CIPM-UNESCO Agreement on 15 December 2025.

Report on the BIPM Headquarters Work Programme for 2024-2027

V	Coordination and institutional liaison	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
YOUNG METROLOGISTS' FORESIGHTING EXERCISE		
ILC-L4:	Facilitating visionary ideas for future opportunities and challenges via workshops, debates and interviews with young metrologists to encourage strategic thinking on long-term issues and challenges. This exercise will be conducted bottom-up in collaboration with RMOs before being brought into a common perspective for presentation at the 150th anniversary of the signing of the Metre Convention (20th May 2025).	• The Young Metrologists Vision 2050+ project was successfully completed with the participation of more than 380 young metrologists worldwide. The final report was published on the BIPM website and formally presented to the CIPM and NMI Directors meeting. Several strategic insights and proposals derived from the project have been incorporated into the CIPM Strategy 2030+. • One of the young metrologists, Mr Cristhian Paredes of the NMI of Colombia, was invited to present visionary ideas during the poster session at the 150th Anniversary of the signing of the Metre Convention in May 2025. • A peer-reviewed article reflecting the outcomes was published in <i>Nature Physics</i> (C Kuanbayev, K. Sung, <i>Young Metrologists' Vision. Nat. Phys.</i> 21, 861 (2025). https://doi.org/10.1038/s41567-025-02903-y).

Report on the BIPM Headquarters Work Programme for 2024-2027

VI	Communication and promotion	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
PROMOTION, REPORTING, PUBLICATIONS AND THE BIPM WEBSITE		
ILC-CP1:	Provision of BIPM internet: 1) Continue to adapt effectively to the rapidly changing world of electronic media to ensure that the website continues to deliver services effectively and portrays an up-to-date image of the BIPM. 2) Develop web services as required to meet the needs of the BIPM, CIPM and CCs. 3) Adapt the site to display landing pages for documents published by the BIPM and identified with DOIs (see ILC-DT1.2).	• The BIPM website continues to be the BIPM's primary means of communication and is supplemented by specialized sites (KCDB, JCTLM database, SI Digital Reference, BIPM e-learning platform, BIPM Time Department database, BIPM SharePoint, BIPM YouTube channel and LinkedIn profile). • Seventy-five news stories were published on the front page of the BIPM website in 2025. • Following Decision CIPM 113/29 (2024), specifications were developed to publish the final reports of key and supplementary comparisons (along with pilot studies) on a new specific webpage on the BIPM website. The new system and webpages were ready for January 2026 (date on which the reports will no longer be published in <i>Metrologia</i> Technical Supplements): https://www.bipm.org/en/comparison-reports. • The project to implement and maintain digital object identifiers (DOIs), and their associated landing pages, for key publications (official and CC reports, Rapports BIPM) to ensure long-lasting references and reliable document access by humans and machines began during the last quarter and will be fully implemented in 2026. • DOIs were assigned to the nine editions of the SI brochure.
ILC-CP2:	Promotion and Enhancement: 1) Creation of newsletters, posters, and videos in support of the BIPM's programmes. 2) Creation of a repository of BIPM images. 3) Work with the Communications teams of the RMOs to pool resources and maximize the impact of both regional and world-wide campaigns. 4) Develop the BIPM's presence on social media such as YouTube and LinkedIn.	• As part of the BIPM150 campaign, four BIPM-affiliated websites were developed. The campaign was promoted through newsletters, LinkedIn, YouTube and various external media outlets, and culminated in the in-person 3-day event in UNESCO and Versailles - and subsequent "wrap up" features and videos. • The following activities were carried out in promotion of this campaign: – Coordinated with UNESCO to produce compelling and aligned messaging, visuals and videos for BIPM150 events. – Collaborated with OIML to maintain the World Metrology Day website and posters. – Shared media materials with external broadcast and digital print outlets. – Updated bipm.org to include a "catch-all" Anniversary tab with information related to the Anniversary, the Metre Convention, Media and Resources, Communications Toolkits, Key Events, and a new "Common Metrological Terms" page. – Increased the volume and quality of video content, producing 37 promotional and topical videos related to the Anniversary. • Communications activities, between January and December 2025: – 83 videos on our YouTube channel were published, generating more than 37 779 views and increasing followers by more than 28,3 %.

Report on the BIPM Headquarters Work Programme for 2024-2027

VI	Communication and promotion	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
		– Increased the BIPM's presence and engagement with the global metrology community on LinkedIn, publishing 247 posts - which have resulted in: 611,781 impressions (+67% more than the previous period), 53,676 engagements (+ 104 %) and an 46 % increase in followers. – Published 12 e-Newsletters (one-a-month). – Published 75 news items, updates and features on bipm.org. – On social media and the homepage live-streaming was introduced for select high-profile webinars. A "This week in focus" video campaign was created. Campaigns were run related to high profile international days and a weekly Did You Know article. These helped to highlight key topics and areas of work and have improved communications workflows and outputs - in line with current communications best practices and organizational needs. – In line with needs for image repository a new "media bank" solution was set up to store, access and tag all BIPM-related video and photo media assets in one place, for better and more coordinated access moving forward.
ILC-CP3:	Publications: 1) Publish meeting reports - including drafting/minuting, editing, translation into French, typesetting, and printing as required – for the BIPM, CIPM, and CGPM as well as the Joint Committees. 2) Editing, translation into French if required, typesetting and publication of other key reports and documents. 3) Editing of papers by the BIPM staff for publication in the scientific literature. 4) Register the BIPM's publications in an external repository, to improve their Findability and Accessibility (see ILC-DT7).	Official Publications • The report of the 113th meeting of the CIPM (2024) was typeset and published in English and French. • The reports of Sessions I and II of the 114th meeting of the CIPM (March and June 2025) were drafted, edited, typeset and translated in English and French. • The report of Session III of the 114th meeting of the CIPM (October 2025) was drafted and published in English, • The BIPM Annual Review 2024/2025 was drafted, edited, typeset and published. • The Financial Report 2024 was published in French and English. • The Notification 2026 was published in French and English. • Version 3.02 of the SI Brochure was prepared and published. • The first drafts of the Convocation, Special Procedure /and Draft Resolutions were proofread, edited and translated into French. Reports of Consultative Committees • The report of the 30th CCQM meeting (2025) was edited and published. • The report of the 34th CCEM meeting (2025) was edited.

Report on the BIPM Headquarters Work Programme for 2024-2027

VI	Communication and promotion	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
		Other publications • The <i>News from the BIPM laboratories 2024</i> was drafted, edited and published in <i>Metrologia</i>. • The <i>CIPM Strategy 2030+</i> was edited, typeset and published. • The agenda for the 150th anniversary events at UNESCO and Versailles was designed, typeset and edited entirely in-house. • The 150th anniversary book, <i>The International Bureau of Weights and Measures, 150 Years of Measures for the World</i>, published by Gallimard, was proofread in French and English. • The Communications Team liaised with an external designer to produce the logos, graphics and other materials for the 150th anniversary events.
ILC-CP4:	1) Editing and publication of <i>Metrologia</i> 2) Ensure the success of <i>Metrologia</i> as the key scientific publication for high-level metrology, with a robust editorial team and appropriate publishing partner. 3) Liaise with the CIPM and CCs to identify topics of interest, as well as publications that should be included in the <i>Guides, Standards and Conventions</i> section. 4) Produce Focus Issues on key topics of interest. 5) Maintain the journal's viability taking account of evolving trends such as towards open-access publishing. 6) Encourage the publication in <i>Metrologia</i> of open-access review papers by senior scientists, through funding the Article Processing Charge for selected papers. 7) Celebrate the journal's 60th anniversary in 2025, alongside celebrations of the anniversary of the <i>Metre Convention</i>. 8) Provision of external Deputy editor support.	• <i>Metrologia</i> is published by IOP Publishing on behalf of the BIPM. The editorial team comprises an Editor-in-Chief and 2 Deputy Editors. Part of the Editor-in-Chief's time (RISE) and 1 of the Deputy Editors' time (INRIM) are financially supported by the named NMIs. • In the reporting period (January to December 2025): Five regular issues were published, comprising: 63 Papers, 1 Reviews, 3 Short Communication, 4 Letters and 5 Guides Standards and Conventions. • 84 abstracts were published in the Technical Supplement. • The Review paper was published Open Access. In total, 44 out of 76 (58%) items were published Open Access. • Following Decision CIPM/113-29 (2024), the BIPM has initiated with IOP Publishing the transfer of <i>Metrologia</i> from a hybrid journal to a fully Open Access journal (from 2026). A contract has been signed to reflect this change and the preparations for the flip have been completed in accordance with the agreed timeline. • Following also Decision CIPM/113-29 (2024) to create a separate entity to publish the comparison reports currently published <i>Metrologia</i>, the webmaster and the KCDB coordinator created a new website and a new form for the KCDB. They allowed to publish the comparison reports directly through the BIPM and not as a <i>Metrologia</i> article anymore starting from 2026.
ILC-CP5:	Journal subscriptions (on-line or hard copy); pay-per-view access (or rental) of individual scientific articles; reference books for BIPM staff.	• Five journal subscriptions will be renewed in the last quarter and a few books, articles and ISO standards were purchased.

Report on the BIPM Headquarters Work Programme for 2024-2027

VI Communication and promotion		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
WORLD METROLOGY DAY		
ILC-CP6:	Build on the success of World Metrology Day (WMD), doubling participation through all media (Project run jointly with OIML): 1) Provision of WMD Website content: – Poster (in consultation RMOs and with a selected NMI) – Directors' messages and press release – Poster and events listings for all participating countries 2) Participation in at least four national events and hosting events at the BIPM for Embassy Representatives. 3) Promoting World Metrology Day with International, Regional and National Stakeholders via social media.	• The poster for 2025 was designed for the BIPM by an external designer. The poster celebrated the 150th anniversary under the theme 'Measurements for all times, for all people.' • The 2025 OIML and BIPM Director's messages and press release were published on the WMD website. • The 76 national and RMO posters, along with the French and English versions, were published on the website. • Details of 23 national events were listed. • The BIPM participated online in WMD events of several NMIs of Member States and Associates (including video messages from the BIPM Director).
WORKSHOPS ON KEY TOPICS		
ILC-CP7:	1) To identify (with the CIPM and NMIs) topics of importance to the metrology community to be addressed at BIPM Workshops.	• A scientific two-day conference held in Versailles on the occasion of the 150th anniversary of the Metre Convention highlighted five important topics of the CIPM Strategy 2030+. • A JCGM webinar on "Measurement Uncertainty" was organized on 2 July 2025. The webinar was livestreamed and had more than 2 000 participants across Zoom, YouTube and LinkedIn. • This year, the BIPM organized a FORUM-MD Workshop on Emerging Topics of Digitalization in Metrology.

Report on the BIPM Headquarters Work Programme for 2024-2027

VII	Digital Transformation and New Digital Services	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
DEVELOPMENT OF SI DIGITAL REFERENCES The basis for the SI Digital Framework proposed by the CIPM will be the provision of the reference data in digital format that provide the essential definition of the SI. These data will be a digital representation of the data that are currently included in the SI Brochure which includes all of the decisions made by the CGPM and the CIPM that underpin the SI. Additionally, databases and associated APIs will be developed in collaboration with Working Groups of each of the CCs to facilitate machine access to the <i>mises en pratique</i> for the base SI units.		
ILC-DT1.1:	Development of the Unique SI Digital Reference Point. This will be the digital (machine-readable) resource from which all of the information about base units, derived units, prefixes and units accepted for use with the SI can be accessed digitally.	• The SI Reference Point at https://si-digital-framework.org/SI is currently prepared to go from beta-testing to the official version 1.0: – Extensive work is carried out by a team of internal and external experts to create a versioning of the source code for the SI reference point. The versioning includes provenance information that is incorporated into the knowledge base. In the next step, the source code will then be made publicly available on the BIPM GitHub (https://github.com/TheBIPM/SI_Digital_Framework). – In collaboration with the CCU, the unit “1” has been implemented in the reference point. • The server structure for the test and production servers of the SI Digital Framework has been optimized and simplified. The microservices architecture implemented improves scalability and long-term reliability of the services. • The experts involved in the development of the SI Reference Point are currently drafting a review paper that will provide guidance to the users. • Discussions are being held within the expert group to improve the semantic model of the SI Reference Point based on the community feedback.
ILC-DT1.2:	Development and maintenance of digital identifiers for key reference texts underpinning the Unique SI Reference Point (e.g., definitions, resolutions, CMCs, etc.)	• The quantities covered by the Service Categories in Physics and Ionizing Radiation have been identified and integrated into the knowledge base. The mapping of the quantities against the service categories is currently being verified by the CCs. • A reference point for Nuclides was released for beta-testing at https://si-digital-framework.org/nuclides. This reference point is underpinned by an ontology to ensure interoperability of the service. • Feedback has been received from some of the CCs regarding the quantities mapping. To incorporate the changes and updates requested by the CCs, a graphical user interface with controlled access was developed and integrated within the SIDF architecture • The resolutions of the CGPM and the decisions of the CIPM bearing directly upon definitions of the units of the SI are incorporated in the SI Reference Point and an associate ontology is being defined.

Report on the BIPM Headquarters Work Programme for 2024-2027

VII		
Digital Transformation and New Digital Services		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
Time-DT2:	Work with representatives of the CCL and the CCTF to provide machine-readable access to the standard frequencies that underpin the <i>mise en pratique</i> of the metre and the secondary representations of the second. The work will require the development of a special database and a custom API for each community.	- The CCL CCTF database and API for the secondary representations of the metre and the second is available and maintained. - The values of recommended frequency for the CCL and CCTF are updated after their respective meetings (at the end of 2024 for the CCL and at the beginning of 2026 for the CCTF).
PMD-DT2:	Work with representatives of the CCT to provide machine-readable access to the agreed data for the fixed points of the ITS-90 that are specified in the <i>mise en pratique</i> of the kelvin. The work will require the development of a special database and a custom API.	See ILC-DT2.
ILC-DT2:	Machine-readable access to the <i>mise en pratique</i> for the other base units will be put in place during the Work Programme. All of this activity will be undertaken in collaboration with working groups of each of the CCs involved to ensure that the facilities developed meet the needs of each user community.	- The CC-WG-Digitalization completed the testing of the APIs for: - Primary radiometric temperature measurements - Acoustic gas thermometry - High-temperature fixed point thermodynamic temperatures - The next step will be an open beta-testing, starting after the next CCT plenary meeting in May 2026. - The feedback provided by the CCT-WG-Dig is being discussed for the implementation before the open beta-testing - A new schema to produce machine-operable documents for the <i>mises en pratique</i> is being evaluated and discussed.
DEVELOPMENT OF NEW DIGITAL SERVICES The digital references developed by the activities above will provide the basis for new metrology services at the BIPM, in the NMIs and amongst sectors of society that use the SI. Such services will enable data to be available for analysis; they will improve data quality and increase reliability in its use. The projects below describe the actions planned to develop some of these new digital services at the BIPM.		
ILC-DT3:	Undertake actions necessary to ensure that the KCDB data environment can provide machine readable data.	- The KCDB API on CMCs was updated to extend the search to no-longer valid CMCs, and to include PIDs for NMI/DIs and KCDB Service Category Code. - Permanent access to CMC data, using the KCDB's persistent identifiers for the CMCs, has been enabled through a dedicated service on the SI Digital Framework. The KCDB identifiers have been made visible on the KCDB website (through the advanced search).

Report on the BIPM Headquarters Work Programme for 2024-2027

VII	Digital Transformation and New Digital Services	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	1) Upgrade of the KCDB database and creation of a back office to provide “Digital CMCs” (DCMCs) and support for DCCs. 2) Development and maintenance of an API for DCMCs.	
Time-DT4:	Undertake actions necessary to ensure that the UTC and UTC-rapid data, and other services currently available from the BIPM Time Department database are available in a machine-readable format.	• The Time Department provides the Executive Secretary for the Forum-MD. A Workshop, Working Group and Task Force meetings as well as a plenary meeting have been held in March 2025. • The Time Department has also supported the development of the SI reference point software and service, the coordination of the external expert group, and its illustration to the different CCs. Together with the external expert group a scientific paper has been prepared and will soon be submitted to <i>Metrologia</i>. • An online survey was sent to the UTC labs to evaluate possible obsolescence of BIPM products and the needs of new ones. Results were discussed at the CCTF WG TAI meeting in September and will be implemented in agreement with the Working Group. • A new time transfer data format has been proposed to the community with the aim of general purpose and flexibility and is under test in the time dept to ensure compatibility and possible input/output versus the standards of the legacy UTC computation software Publications and presentations: • F. Meynadier, G. Tagliaferro, P. Tavella, L. Tisserand, “TFEX : proposal for a flexible time and frequency data standard exchange format”, Joint EFTF IFCS congress, Queretaro, May 2025.
Chem-DT5:	Maintain machine readability of the JCTLM Database. Continue to deliver machine readability of the database with future operational updates.	• Completion of technical specifications for the extension of the JCTLM Database and contract with service provider for the development of a submission and review web platform. • Implemented an updated version of the JCTLM Database homepage to enable its AI visibility.
ILC-DT6:	Develop new digital services, as required by the CIPM and CCs, including an extension of the machine-readability for the KCDB to access the results of key and supplementary comparisons (Appendix B).	• Based on discussions at the 48th meeting of the JCRB, a concept was developed on the KCDB API for comparisons and submission of comparison results to meet the FAIR principles. • The submission forms of the KCDB were updated to provide more participants’ metadata in the comparisons report.

Report on the BIPM Headquarters Work Programme for 2024-2027

VII	Digital Transformation and New Digital Services	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
DEVELOPMENT OF NEW DATA PORTAL AND SUPPORT FOR COMPONENTS OF THE “INTEROPERABILITY AND REUSABILITY” RESOURCE LAYER In order to provide efficient user access to the new digital services described in the projects above, they will be accessible directly and through the International Metrology Resource Registry (IMRR). This is already hosted on the BIPM website as a result of a collaboration with NIST. The project work proposed here will greatly extend the functionality of the IMRR to enable direct access (via APIs) to data held within the resources in its registry. Additionally, this project will support the development of the interoperability and reusability resource layer of the SI Digital Framework. This layer includes the mapping, translation and ontology services needed to develop the “I” and the “R” of FAIR.		
ILC-DT7:	Strengthen the International Metrology Resource Registry (IMRR) through liaison with the CCs to identify key data that could usefully be shared across the metrology community; encourage the inclusion of supporting data for digital calibration certificates (DCCs); further develop the IMRR in accordance with the FAIR principles to provide direct mining of resources through APIs.	The previous version of the IMRR was withdrawn from service in 2022. Further development of IMRR or reincarnation were not prioritized by the FORUM-MD. The project is currently discontinued.
ILC-DT8:	Enable the interoperability of representations of units of measurement in the community through development of a unit mapping service between broadly adopted unit of measurement representation systems (UMRSs) aligned with SI units; enable semantic representation of core concepts in metrology through development of ontologies as appropriate; develop metadata and a metadata schema ('m-layer') in support of digital translation between units and quantity kinds; support the JCGM-WG2 in their revision of the annotated VIM to meet the demands of machine readability, and machine-actionability where possible/appropriate.	- The Unit mapping service has not been prioritized by the FORUM-MD, therefore the project has not been taken up. - The next edition of the VIM (VIM4, currently in its 3rd Committee Draft) will – like the Annotated VIM3 – be published in a machine-friendly form whereby reference can be made to the individual terms.

Report on the BIPM Headquarters Work Programme for 2024-2027

VII Digital Transformation and New Digital Services		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
OTHER DIGITAL TRANSFORMATION ACTIVITIES INCLUDING SUPPORT FOR THE CIPM		
PMD-DT9:	Development and support of DCCs for calibrations undertaken by all BIPM scientific departments (led by the Physical Metrology Department).	A trial has been run using the PTB-DCC format for a digital certificate. Until there is a demand from customers, no roll-out to other departments is planned.
ILC-DT9:	Coordination of the “Digital Discussion group” amongst BIPM staff working on Digital Transformation projects to ensure effective collaboration on these topics.	The BIPM Work Programme regarding the Digital Transformation projects of the BIPM headquarters is now coordinated by the TG-SI Digital Framework of the Forum-MD which also receives input from other relevant groups in the Forum-MD.
ILC-DT10:	Support for the work and meetings of the CIPM Digital EG and TG. External consultancy to support the digital transformation activities described above.	- The Digital EG and TG were closed at the end of 2023 and are now replaced by the Forum-MD and its nine Task and Working Groups. - The Time Department provides the scientific secretariat to the Forum MD. - A survey for consultation with NMIs and DI was launched to assess the priorities of the community in Digital Transformation for Metrology. Answers are expected by the end of January of 2026, and a survey report will be elaborated and discussed.

Report on the BIPM Headquarters Work Programme for 2024-2027

VIII		IT services
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
IT INFRASTRUCTURE; NETWORK, STORAGE AND SECURITY INFRASTRUCTURE		
1. INF-NNA: NETWORK INFRASTRUCTURE		
Due to product lifetime and warranty expirations, parts of the BIPM IT datacentre infrastructure will have to be renewed during the period 2024-2027. The network core and edge devices, installed in 2013, are running out of maintenance contracts and needed to be replaced in 2024.		
NNA.1:	Network core infrastructure	- The data and routing and distribution layers have been split in a multi-tiered architecture to increase performance, security and reliability. The network storage performs now with a 2x10Gb/s bandwidth from its network interfaces to the network backbone. - The two IT rooms (main one and backup) are now connected with 2x25Gb/s bandwidth. - The data synchronization performance between the two data network nodes have been largely improved. - All appliances such as firewalls, Internet routers, load balancers and other security devices have been completed without outage thanks to the redundancy of devices (active/active or active/passive modes). - Network core infrastructure supports any device (servers, appliances) with a 10 Gb/s Ethernet connection.
NNA.2:	Network Edge infrastructure	- The distribution layer (backbone to the buildings) performs now with a 2x10Gb/s bandwidth. - Each building has a set of new network switches which offers a PoE+ Ethernet ports.
NNA.3:	Licenses and services	- The network configuration has been completely reviewed to fit with current network protocol versions and network security recommendations. - The smooth switchover between the previous network architecture and the new one have been completed in early July.
2. INF-NSA: STORAGE INFRASTRUCTURE		
Taking into account the increased use of Cloud-based storage as a major solution to host external data, the internal network storage, which hosts the IT services and the internal network data, will have to be updated in 2027		
NSA.1/NSA.2:	Storage infrastructure	Planned Q1/Q2 2027
NSA.3:	Backup infrastructure	- Planned 2025 (Archive) – Study on needs for long term archiving ongoing. - The long-term archiving study is close to completion and is being updated to include cloud archiving as a potential option.
NSA.4:	Licenses and services	Yearly maintenance for 2024-2027.

Report on the BIPM Headquarters Work Programme for 2024-2027

VIII		IT services
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
3. INF-SEC: SECURITY INFRASTRUCTURE		
SEC.1:	Firewall Cluster and Intrusion Prevention System devices	- Large consultation of current firewalls solutions to determine whether we need to change the firewall platform provider in 2025. - The firewall solutions assessment has been finalized. The new firewall cluster has been deployed, with enhanced capabilities planned for rollout in 2026.
SEC.2:	Anti-virus Cloud Service	Yearly subscription for 2024-2027
SEC.3:	Multi-factor authentication services and devices	- Multi-factor authentication has been implemented for O365 administrator accounts and for managing the anti-virus cloud service. - Multi-factor authentication has been fully deployed across the BIPM, covering all staff members as well as complementary staff via hardware security keys.
SEC.4:	Licenses and services	Yearly subscription & maintenance for 2024-2027.
SEC5:	IT External Security review	Planned in 2026.
IT SERVICES; WEB, DATABASES, SCIENTIFIC AND CLOUD SERVICES		
4. SRV-SER: SERVERS AND VIRTUALIZATION PLATFORM FOR HOSTING SERVICES		
BIPM Web and all Intranet services rely on a virtualized platform that operates on dedicated hardware servers in a disaster recovery scheme. This allows redundancy of services as well as load balancer dispatch Web traffic among several virtual servers. As the five-year lifetime of hardware servers is the standard, they should be renewed in 2026.		
SER.1/2:	Virtualization platform and hardware hosts	- Many virtual servers have been set up in order to serve the new Web and API services - A complete Web design architecture have been implemented for the SI Digital Framework API services portal which relies on multiple virtualized servers. - The API services architecture has been enhanced with the addition of a back-office and a development platform.
SER.3:	Load balancer Servers	Planned for 2026.
SER.3:	Licenses and services	Yearly subscription & maintenance for 2024-2027.
5. SRV-PH: PHONE SYSTEM SERVICES		
In the framework of revamping its phone service in 2024, IT services will prioritize a strong interaction between the classic phone service and O365 services in order to get a full cloud-based telephony solution that will offer new business services.		
PH.1:	Core infrastructure	Phone/O365 integration Study in 2026.
PH.2:	Dedicated Data Link	The ISDN link over copper has been replaced by a Trunk SIP over optical fiber. We are now completely compliant with Voice Over IP technology.

Report on the BIPM Headquarters Work Programme for 2024-2027

VIII IT services		
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
PH.3:	Phone set	Planned in 2026
PH.4:	Licenses and services	Yearly subscription & maintenance for 2026-2027.
DATABASE, SCIENTIFIC AND CLOUD SERVICES Among other Web services, databases have a major role in serving the world-wide metrology community. The goal is to consolidate all these databases into a single repository which can be searchable and findable by the community. O365 cloud services have a key role in sharing information among BIPM stakeholders, such as working groups. It has improved communications and provides new services that offer productivity gains. Other Cloud services will be implemented such as long-term data archiving and on-line web firewalling.		
DB.1:	Database core infrastructure	A major upgrade of our Intranet database system has been carried out.
DB.2:	Database infrastructure integration	Many databases have been set up in order to serve the new API services and other database projects.
DB.3:	Licenses and support	Yearly maintenance for 2024-2027.
SRV-NI:	National instruments site license and other sitewide scientific software licenses	- The yearly National instruments sitewide license has been installed successfully. - A new licensing solution has been implemented to replace the National Instruments system, allowing licenses to be managed according to individual user needs.
O365.1:	O365 Development	- IT services support all O365 BIPM departments & services developments. - IT services have launched the new IT services SharePoint portal reflecting their commitment to comply with ITIL standards.
O365.2:	Licenses and support	Yearly maintenance for 2024-2027.
WEB.1:	Cloud Infinite archiving system	See NSA3
WEB.2:	Web service firewall and security	Study is ongoing
OTHER ACTIVITIES: USER HELPDESK AND APPLICATION SUPPORT - INFRASTRUCTURE ADMINISTRATION AND SUPPORT		
IT-HELP:	User helpdesk and application support	- In the framework of ITIL implementation at the BIPM, IT Services have completed the IT services catalog which lists technology resources and offerings available from the IT services. This catalog is intended to contribute to support the IT services efficiently and effectively manage and meet staff members expectations. - In the framework of ITIL implementation at the BIPM, a helpdesk platform integrated through O365 has been successfully installed and configured by IT Services. - Fully operational since October 2024, more than 500 tickets were processed in 2025, and the platform has enhanced the efficiency and responsiveness of IT request handling. - IT Services offer support for all BIPM applications such as Web applications (KCDB, JCTLM DB, API, etc), O365 services and Internal Services.
IT-ADM:	Infrastructure administration and maintenance	Yearly maintenance for 2024-2027.

Report on the BIPM Headquarters Work Programme for 2024-2027

IX	Capacity Building and Knowledge Transfer	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
1. BIPM CBKT PROGRAMME LEVEL STRATEGY, DEVELOPMENT, AND OPERATION, INCLUDING ASSOCIATED WEB AND E-LEARNING PLATFORMS AND COORDINATION WITH STAKEHOLDERS <i>Over 80 % participation of Member States and Associates (as participants and lecturers)</i>		
ILC-CBKT1: – 4 workshop-based activities (BIPM and RMOs) – 4 cycles of laboratory-based placements at partner NMIs – 30 remote learning on-line activities – 100 workshop-based participants (BIPM and RMOs) – 40 metrologists at laboratory-based placements at partner NMIs – 400 participants in on-line activities – 500 e-learning participants	1) Maintaining the CBKT strategy that aims to increase the effectiveness with which Member States and Associates engage in the world-wide coordinated metrological system: assessing needs of stakeholders; identifying appropriate CBKT instruments; implementing activities; evaluating the CBKT Programme activities; adapting/adjusting the Programme activities to the needs of stakeholders. 2) Technical aspects associated with the management, operation and maintenance of the CBKT remote learning capabilities (including licenses and contractor relations): – on-line KCDB 2.0 CBKT training platform – on-line short courses – on-line technical exchanges – CBKT webpage of the BIPM website – e-learning platform (including RMO e-learning sectors). 3) Developing and managing the BIPM/RMO CBKT framework (including cross-RMO on-line activities and e-learning). Liaison with RMOs to ensure coordinated CBKT delivery. – Operation and management of a BIPM/RMO advisory group for the CBKT Programme (including liaison with OIML CEEMS Advisory Group).	• The feedback / evaluation form is distributed after each CBKT event, and suggestions and ideas are incorporated into the planning of subsequent activities. • A survey to identify the needs of RMO TC Chairs was conducted prior to the TC Chairs event. All suggestions and ideas were taken into account, resulting in a successfully organized training activity with active involvement from the TC Chairs in discussions. Feedback was positive. • The award sponsorship provided by the National Metrology Institute of Switzerland (METAS) supported the participation and placements of four young metrologists at the 2025 edition of the Metrology Summer School, held from 9–18 July 2025 at the Italian Physical Society (SIF) in Varenna. • The project related to Metrology and the Sustainable Development Goals (SDGs) is currently under discussion with UNIDO. • All RMOs are participating in the e-learning initiative. However, only AFRIMETS has not yet submitted any courses. • The BIPM e-learning platform has been successfully upgraded from Moodle LMS version 4.1 to version 4.5. This upgrade enhances security to ensure the platform remains protected and compliant, expands functionality by introducing advanced productivity tools, AI capabilities, and improved course structures, improves user experience through a more responsive interface and streamlined workflows. • BIPM and RMO capacity building experts meeting was organized on 2 December 2025. It was agreed to continue this practice twice a year. Next meeting will be held by the end of April 2026. • COOMET roundtable alongside the JCRB in September 2025 was organized in order to support those states in the COOMET region that are not yet engaged with the BIPM. • The BIPM participates regularly to the OIML CEEMS Advisory Group, and when required, contribute / organize joint activities. • A BIPM/GULFMET joint initiative dedicated to the CMC Writers and Reviewers was organized in October 2025 in Qatar.

Report on the BIPM Headquarters Work Programme for 2024-2027

IX	Capacity Building and Knowledge Transfer	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	4) Exploring support from and liaison with appropriate international organizations with an interest in relevant capacity building and knowledge transfer activities.	The BIPM contributed to the OIML D 1 training seminar organized by the Asia-Pacific Legal Metrology Forum (APLMF). The aim of the seminar was to create an international platform for exchanging experiences across different stages of metrology infrastructure development and to discuss common challenges and opportunities.
2. PLANNING, COORDINATION, SUPPORT, LOGISTICS AND DELIVERY OF THE CORE CBKT ACTIVITIES (CIPM MRA, JCTLM AND UTC)		
ILC-CBKT2:	- Planning, coordination, support, logistics and delivery of the core CBKT activities (CIPM MRA, JCTLM and UTC): scheduling, course design, call and selection processes (liaising with stakeholders on prioritization of candidates), identification of speakers, funding of participants' costs where appropriate, provision of BIPM lecturers and sourcing of external RMO/NMI lecturers together with all associated logistics. - Delivery of the CIPM MRA courses (when necessary) to cover: - Future leaders (aimed at new and potential RMO TC/WG Chairs) - Sound beginning (aimed at new participants in the CIPM MRA) - Orientation for new RMO TC/WG Chairs - Participation in the activities of the <i>Metre Convention</i> (including orientation for 'newcomers'). - Supporting JCTLM and UTC CBKT initiatives through: - Workshop-based CB activities - Laboratory-based CB placements - Knowledge transfer activities	- Three technical exchanges on the KCDB (CIPM MRA) for Writers, TC Chairs and Comparisons pilots were organized, with a total participation of 662 NMI/DI experts: - KCDB 2.0 – Comparisons pilots (06.02.2025) - KCDB 2.0 - CMC Writers in General Physics, Ionizing Radiation (03.04.2025) - KCDB 2.0 - TC Chairs (19.06.2025) - Five e-learning courses have been published on the BIPM's e-learning platform: - Validating clock data format with BIPM convention (BIPM Time Department) - Time scale algorithms basics to applications (BIPM Time Department) - Nominating higher-order references to the JCTLM database (BIPM Chemistry Department) - Hybrid comparisons (developed by APMP) - Pilot's Guide to Measurement Comparisons (BIPM ILC Department). Cumulative overview of the CBKT, as of September 2025: 82 CBKT initiatives were organized: 41 projects at the BIPM and regions; 41 (+17 repeated) projects online and webinars organized with RMOs. More than 65 lecturers from NMIs/DI and IOs have been involved in delivery of the CBKT activities. - e-learning: there are 32 e-learning courses submitted by EURAMET, COOMET, GULFMET and the BIPM Scientific Departments available for metrology community. - Overall, 5233 participations from 125 countries in various CBKT initiatives: 748 participations at the BIPM and regions physically; 4485 participations in online sessions. About 2050 participants from 116 countries are registered on the e-learning platform. - CBKT participation by RMOs: 502 - AFRIMETS 1076 - APMP

Report on the BIPM Headquarters Work Programme for 2024-2027

IX	Capacity Building and Knowledge Transfer	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	4) Remote-learning on-line activities (on-line short courses, on-line technical exchanges, and provision of the e-learning platform).	– 664 - COOMET – 1395 - EURAMET – 417 - GULFMET – 1179 - SIM.
3. PLANNING, COORDINATION, SUPPORT, LOGISTICS AND DELIVERY OF THE TOPIC-BASED CBKT ACTIVITIES		
ILC-CBKT3:	1) Planning, coordination, support, logistics and delivery of the topic-based CBKT activities: finding sponsors, scheduling, course design, call and selection processes (liaising with stakeholders on prioritization of candidates), identification of speakers, provision of BIPM lecturers and sourcing of external lecturers. 2) Delivery, supporting of and lecturing in the topic-based CBKT initiatives through: – Workshop-based CB activities – Laboratory-based CB placements – Knowledge transfer activities – Remote-learning on-line activities (on-line short courses, on-line technical exchanges, and provision of the e-learning platform). 3) Delivery of joint Varenna metrology school for world-class young scientists/metrologists – in collaboration with the Italian Physical Society.	• Eighth cycles of the joint BIPM and TÜBİTAK UME initiative have been completed in December 2026. Ten young metrologists from ten countries (Azerbaijan, Colombia, Norway, Egypt, Ukraine, Malaysia, Bosnia Herzegovina, Albania, Uzbekistan, Vietnam) from all RMOs conducted their placements at the TÜBİTAK UME laboratories (for a period of 1 to 3 months). • Through the CBKT Programme, and with the support of METAS (the National Metrology Institute of Switzerland), four young metrologists have been sponsored to participate in the 2025 Varenna Summer School and complete short placements at METAS. During these two- to four-week placements, they received dedicated training and explored specific metrology topics of interest, further enhancing their professional skills and expertise. A total of 43 applications for sponsorship were received, of which these four participants were selected.
4. Laboratory-led capacity building and knowledge transfer activities		
PMD-CBKT1	Planning, coordination and delivery of the capacity building and knowledge transfer activities in the field of electricity.	• Some of the four on-site comparisons of electrical quantum standards had aspects of knowledge transfer during the intense collaborative work of the BIPM staff and the local staff.
PMD-CBKT2	Plan and deliver knowledge transfer activities using a compact prototype Kibble balance apparatus to NMIs seeking opportunities for scientists to	• A dedicated session on CBKT activities was organized during the bi-annual Kibble Balance Technical Meeting (KBTM) in November, hosted by the BIPM. This session included six presentations on key topics essential for developing a Kibble balance experiment, followed by an interactive Q & A session with audience.

Report on the BIPM Headquarters Work Programme for 2024-2027

IX	Capacity Building and Knowledge Transfer	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	experience hands-on involvement in Kibble balance technology.	
Time-CBKT:	Planning, coordination and delivery of the capacity building and knowledge transfer activities in the field of time metrology according to the CCTF plans by developing e-learning tools and GIT repository, and by the continuous day-to-day support to the UTC laboratories. This activity relies on the contribution of a secondee with the role of promoting the coordination and efficient use of the CBKT material. Without a secondee this activity will be limited.	The CCTF CBKT project, supported by a secondee from NIST and the support of previous secondees from NPLI and NICT, has reached a broad availability of 6 courses on the BIPM CBKT e-learning page and the organization of two summer schools; 1. In May 2025 at CENAM, Mexico with the support of CENAM and SIM for the organization, and the sponsorship of the IEEE UFFC society. About 20 students, mostly from SIM regions and 12 lecturers attended the school 2. In September 2025 at BIPM with the sponsorship of BIPM and of the IEEE UFFC society. 35 students and 11 lecturers from all RMOs attended the school • In 2025 the BIPM CBKT e-learning page https://e-learning.bipm.org/ has been enriched by 3 courses on: 1. Clock data checking 2. Time scale algorithms: basics to applications 3. Validating clock data format with BIPM convention • An additional course on the G2 calibration practice is under development.
Chem-CBKT:	Planning, coordination and delivery of the capacity building and knowledge transfer activities (including on-line activities) in the field of chemical metrology.	• Chemistry Department CBKT activities are planned and coordinated as indicated in the projects: Chem-CBKT1; Chem-CBKT2; Chem-CBKT3.
Chem-CBKT1 <i>Metrology for Safe Food and Feed</i>	Delivery of on-line material and knowledge transfer courses supported by short workshops at the BIPM related to: a. Mycotoxin standards b. Pesticide standards c. Drug residue standards.	• Questionnaire prepared and launched within CCQM and CCQM OAWG to gather information and interest in a repeat of the BIPM qNMR Summer School in 2027.
Chem-CBKT2: <i>Metrology for Clean Air</i>	Delivery of on-line material and knowledge transfer courses supported by short workshops at the BIPM related to: a. FTIR for gas standards and metrology b. Dynamic methods for reactive gas standards	CBKT on dynamic methods for NO₂ mixtures in nitrogen with amounts fractions below 1 µmol/mol • NO2_1_Quant software of BIPM permeation facility upgrade completed to enable piloting of PermaCal facility and coordination of comparison of mixtures generated by PermaCal and permeation facility using CAPS as comparator.

Report on the BIPM Headquarters Work Programme for 2024-2027

IX	Capacity Building and Knowledge Transfer	
Project	Deliverables	Work performed in the period (1 January 2025 – 31 December 2025)
	c. CO₂ isotope ratio traceable measurement. On-line support for a mentoring programme for the new coordinating laboratory for the CCQM-K137 repeat comparison on nitrogen monoxide standards.	- Characterization of operation of BIPM MSB facility over ranges (800 to 1100) nmol/mol completed, with Labview automation completed using FTIR and CAPS as a comparator. CBKT on gas standards 3-month secondment of visiting scientist from LACOMET completed, with initial training on methane analysis and construction of an autosampler completed and accompanied with publication of new eLearning module. Secondment sponsored by the NPL, UK.
Chem-CBKT3: <i>Metrology for Accurate Patient Care</i>	Delivery of on-line material and knowledge transfer courses supported by short workshops at the BIPM related to: - Peptide primary reference material value assignment methods, < 5 kDa - Peptide primary reference material value assignment methods, > 5 kDa and < 10 kDa.	Discussions held with collaborator from NIM on the different modules. Implementation on the e-learning platform ongoing.
IR-CBKT:	Planning, coordination and delivery of the capacity building and knowledge transfer activities in ionizing radiation.	Organization of the 5 CCRI webinars and 7 workshops (including IAEA-CCRI(III) Workshop and CCRI-NMIJ Workshop).



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