

# CCM President's Report

28th CGPM (2026)



Working together to  
promote and advance  
the global comparability  
of measurement

## Report by the President of the CCM

Ms G. Macdonald, President of the Consultative Committee for Mass and Related Quantities (*Comité consultatif pour la masse et les grandeurs apparentées*, CCM) reported on the activities of the CCM since the 27th meeting of the CGPM (2022).

### CCM Executive summary

The CCM has active technical working groups that span the following diverse areas of metrology: mass, density and viscosity, force and torque, pressure and vacuum, fluid flow, hardness and gravitational acceleration. The CCM Working Group on Strategy and MRA coordination (CCM-WGS) seeks to provide guidance on coordinating and harmonizing the working group activities.

Much of the present activity of the CCM is focused on the realization and the dissemination of the new definition of the kilogram by following a [detailed note](#) developed to manage this work.

However, not all the working groups are affected by this change. These working groups are tasked with the improvement of existing measurement techniques, and the development of new instruments and methods.

### Scope of the CCM

Present activities of the CCM concern matters related to the realization and dissemination of the mass unit following the 2019 redefinition of the kilogram in terms of the Planck constant and establishment and validation of international equivalence between national laboratories for mass and related quantities and advice to the CIPM on these matters.

### Strategy

The Working Group on Strategy and MRA coordination (WGS) prepared a fully revised CCM Strategy in 2026. The strategy document 2026-2036 was approved by the CCM by correspondence in August 2026 and is available on the CCM website.

The strategy document presents an overview of major scientific, economic and social challenges, which can be addressed by measurements of mass and related quantities relating to the evolving needs for metrology identified by the CIPM strategy. The revision of the SI in May 2019 enables the realization of the unit of mass and some related quantities directly from fundamental constants. Measurements directly traceable to the SI, dynamic measurements and measurements over a wider range and under wider conditions remain the main topics for research over the next decade.

The strategy foresees contributions to progressing measurement science across all technical areas covered by the CCM. To support global comparability of measurements, managing the transition from an internationally coordinated kilogram dissemination to the use of individual sovereign realizations remains the main focus. The CCM will continue to implement the CIPM MRA by efficiently organizing key comparisons and coordinating regional metrology organization (RMO) key and supplementary comparisons. The CCM will continue to support the introduction of the SI digital framework in mass-related metrology. The CCM aims to facilitate stakeholder engagement and knowledge transfer by continuing the organization of workshops and webinars and to seek extended collaborations with other Consultative Committees and involvement of external bodies.

The CCM oversees the work programme of the BIPM mass laboratories.

## Activities and achievements since the last meeting of the CGPM

### Main activities and achievements

Two CCM meetings were held during the period 2023-2026, one on 25-26 May 2023, and one on 26-27 June 2025. Online participation was possible for both meetings. The meeting reports and the majority of the presentations/working documents are publicly available on the CCM webpages. Workshops were organized during both meetings, covering new activities and developments in mass and related quantities, key comparisons, and digitalization. In 2023, the CCM issued a recommendation to NMIs having a realization experiment to address lack of agreement between the current realizations of the kilogram. The

Task Group on the Phases for the Dissemination of the kilogram following redefinition (TGPfD-kg) was tasked with developing a strategy to address this recommendation. During the 2025 meeting, the CCM further requested that the TGPfD-kg establish a detailed strategy for advancing towards Phase 3 of the kilogram dissemination process. Other major decisions of these two meetings include:

- creation of a Task Group on Dynamic Measurements
- appointment/re-appointment of the chairs and vice-chairs of the CCM working groups
- approval of new members of the CCM working groups
- approval of new CCM key comparisons
- approval of the shift of CMC entries for molar flow back from the Working Group on Fluid Flow to the Working Group on Pressure and Vacuum.

In addition to workshops, the CCM launched a series of webinars in 2024. Five webinars including eleven presentations have been held up to September 2026.

UME (Türkiye) and NIS (Egypt) became CCM Members in 2023. INM (Colombia) became a CCM Observer in 2025.

Regarding the realization and dissemination of the new definition of the kilogram, a roadmap was developed to address the CCM recommendation, with the TGPfD-kg overseeing the implementation and monitoring progress. The second and third key comparison of realization experiments, CCM.M-K8, were completed in 2023 and 2026, respectively, involving nine institutes in the second comparison and ten in the third. The second and third Consensus Values (CV) for the kilogram were calculated and adopted as the “international mean kilogram” for dissemination, effective March 2023 and March 2026, respectively. The second CV was 5  $\mu\text{g}$  lower than the first. While the agreed methodology for the third CV indicated a potential change of  $-8 \mu\text{g}$ , it was decided to limit the adjustment to  $-5 \mu\text{g}$  with respect to the second CV to maintain an acceptable stability. This decision was allowed for by the CCM detailed note on the dissemination process after the redefinition of the kilogram and should also ensure that changes in the value after subsequent key comparisons are small. A guide to the Consensus Value of the kilogram was produced by the TGPfD-kg.

A significant improvement in the agreement between the experiments, particularly the two with the smallest uncertainties, was achieved for the third comparison of realizations. This progress supports the transition from Phase 2 of the dissemination process, using a coordinated international kilogram, to Phase 3 using independent national realizations. The TGPfD-kg is drafting a document outlining the detailed criteria for transitioning to Phase 3 and detailing how the kilogram should be disseminated from individual experiments.

A completely revised CCM Strategy 2026-2036 was produced by the CCM-WGS. The WGS also establishes annual CCM action plans and monitors their progress. Regarding the CIPM MRA, the WGS reviewed the status of CCM comparisons, analyzed causes of delay and proposed actions for delayed comparisons. The WGS addressed several issues raised by NMIs and RMO TC-Ms, ensuring alignment with CIPM MRA requirements. Specific guidance documents for an “efficient and effective” approach to CMC reviews were developed or updated by the Working Groups on Force and Torque (CCM-WGFT), on Mass (CCM-WGM) and on Pressure and Vacuum (CCM-WGPV). A note on comparisons of absolute gravimeters was prepared by the Working Group on Gravimetry (CCM-WGG).

#### Challenges and difficulties

The redefinition of the kilogram in May 2019 represented a step change in the way the SI unit of mass is defined, maintained and disseminated at the NMI level. The most critical issue for the CCM is to manage the dissemination phase from the Consensus Value as requested by CCM Recommendation G1 (2017), and the transition to dissemination from individual realizations.

The CCM covers a diverse range of measurements. The technologies applied to the measurements in these areas vary greatly, as do the scientific and industrial areas which rely on these measurements. Adding the diversity of the mass related measurement area to the fact that the measurement of dynamic quantities is becoming increasingly important in a number of these areas means that the scope for end-user benefit can potentially be very wide and a strategy to maximize the impact will need to focus on areas where the benefits can be most effectively exploited.

Other more routine difficulties must also be addressed continually. These include improving the efficiency of the CMC review process, finding and supporting pilots for running key comparisons, minimizing delays in carrying these out and reporting their results.

### **Outlook in the short and long term**

The CCM will hold its 21st meeting (13-14 May 2027), preceded by meetings earlier that week of most of its Working Groups, including the Working Group on Strategy and MRA coordination. The major goals of the CCM meeting are:

- review the document prepared by the TGPfD-kg on the criteria for transition from Phase 2 to Phase 3 and on the way in which the dissemination of the kilogram will be made from the individual experiments
- review and approval of the protocol for the fourth key comparison of realizations of the kilogram
- appointment/re-appointment of all WG chairs and vice-chairs.

By the end of 2028 we expect to complete the fourth key comparison of realizations of the kilogram, and to determine the fourth Consensus Value for the dissemination of the mass unit as well as reviewing a possible transition to Phase 3 of the dissemination.

In the long term, from 2029 and beyond, we expect to have a better view of the status of realization experiments and a strengthened infrastructure to facilitate the achievement of the following goals:

- managing the dissemination phase from the Consensus Value to individual realizations of the kilogram
- ensuring that a sufficient number of primary realizations of the unit of mass are always available, in each RMO if possible
- development of less expensive and more easily operated apparatus (also those based on new ideas, alternative to Kibble balance and X-ray-crystal-density (XRCD) routes) to realize the kilogram in terms of the Planck constant for use by the NMIs
- development of commercial instruments for the realization of the kilogram and its submultiples for use at NMIs in the short term, and by a widening range of end users in the longer term
- continuing the development of technical and scientific activities in the CCM Working Groups according to the CCM Strategy and the Working Group action plans.

## CCM Data

CCM set up in 1980

President: G. Macdonald

Membership:

List of CCM members and observers:

Meetings since the 27th CGPM meeting:

Full reports of the CCM meetings:

Nine Working Groups

Two Task Groups

Executive Secretary: H. Fang

27 members and 5 observers

<https://www.bipm.org/en/committees/cc/ccm/members>

25-26 May 2023, 26-27 June 2025

<https://www.bipm.org/en/committees/cc/ccm/publications>

<https://www.bipm.org/en/committees/cc/ccm>

- Strategy and MRA coordination (WGS)
- Realization of the kilogram (WGR-kg)
- Dissemination of the kilogram (WGD-kg)
- Density and Viscosity (WGDV)
- Force and Torque (WGFT)
- Pressure and Vacuum (WGPV)
- Fluid Flow (WGFF)
- Hardness (WGH)
- Gravimetry (WGG)
- Phases for the Dissemination of the kilogram following redefinition (TGPfD-kg)
- Dynamic Measurement (TGDM)

| CCM Comparison activity                                | Completed                                                  | In progress | Planned |
|--------------------------------------------------------|------------------------------------------------------------|-------------|---------|
| CCM key comparisons<br>(and supplementary comparisons) | 109                                                        | 17          | 1       |
| BIPM comparisons                                       | 0                                                          | 0           | 0       |
| CC pilot studies                                       | 5                                                          | 3           | 1       |
| CMCs                                                   | 2 905 CMCs in 29 service categories registered in the KCDB |             |         |