

# CCPR President's Report

28th CGPM (2026)



Working together to  
promote and advance  
the global comparability  
of measurement

## Report by the President of the CCPR

Dr M.L. Rastello, President of the Consultative Committee for Photometry and Radiometry (Comité consultatif de photométrie et radiométrie, CCPR) presented the report on the activities of the CCPR since the 27th meeting of the CGPM (2022).

### CCPR Executive summary

Established as the Consultative Committee for Photometry in 1933, and further extended to include Radiometry in 1971, the CCPR now covers metrological aspects of optical radiation, which range from well-known measurements to very advanced research fields. Between 1997 and 2005, the CCPR established three Working Groups (WGs) to deal with specific topics as outlined in their names: Strategic Planning (SP), Key Comparisons (KC), and Calibration and Measurement Capabilities (CMCs). In each of the three WGs, there are several Task Groups (TGs) and Discussion Forums (DFs) that are not permanent but address specific metrological needs or pressing issues.

CCPR members have contributed to progress in all the five domains of application identified in its Strategy Document (2025-2035) since the 27th meeting of the CGPM (2022). Three examples are listed below:

- An increased collaboration with the International Commission on Illumination (CIE), via a joint workshop organized in 2024, to setup strategic objectives to implement a scientifically rigorous photometric system based on cone-fundamentals to provide a new link between photometric and radiometric quantities.
- The demonstration of good agreement between measurements performed using Silicon Single-Photon Avalanche Diodes, which are ultrasensitive quantum photodetectors counting individual photons, crucial for quantum computing, communication and storage (via a Pilot Study completed in 2025).
- Significant progress in replacing incandescent lamps as transfer standards with LED-based standard sources across spectral ranges, via work in multiple CCPR task groups and a Pilot Study launched in 2024, advancing and promoting a shift toward radiometer- and spectroradiometer-based realizations.

### Scope of the CCPR

The responsibilities of the CCPR are:

- To provide advice to the CIPM on all matters concerned with photometry and radiometry
- To establish global compatibility of related photometric and radiometric measurements through promoting traceability to the SI photometric unit, the candela, and associated derived units for photometric and radiometric quantities
- To contribute to the establishment of a globally recognized system of national measurement standards for photometry and radiometry and development of absolute radiometry methods and facilities
- To contribute to the implementation and maintenance of the CIPM MRA in the field of photometry and radiometry
- To review and advise the CIPM on the uncertainties of the photometry and radiometry calibration and measurement capabilities as published on the BIPM website
- To act as a forum for the exchange of information about the photometry and radiometry activities of the CCPR members and observers;
- To create opportunities for collaboration in the field of photometry and radiometry.

### Strategy

The strategy developed by CCPR members to cover the responsibilities listed above are detailed in the Strategy

document, which was recently updated to cover the period 2025 to 2035. A brief summary is provided below.

The CCPR strategic goals for the 2025-2035 period are:

- to contribute to the resolution of global challenges in photometry and radiometry
- to promote the uptake of metrologically-traceable photometric and radiometric measurements as well as other important areas such as spectrophotometry
- to progress the state of the art of photometry and radiometry measurement science
- to improve efficiency and efficacy of the global system of comparisons for photometry and radiometry
- to continue evolving the set of Calibration and Measurement Capabilities (CMCs) to meet stakeholders needs
- to maintain organizational vitality, regularly review and, if necessary, update the CCPR structure so it can perform its mission.

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

### Membership

In 2024, the National Scientific Centre “Institute of Metrology” (NSC-IM, Ukraine) became the 27th full member of the CCPR.

### Meetings and workshops

Since November 2022, the CCPR held one plenary session in June 2024 at the BIPM headquarters, preceded by a one-day workshop “100 years of  $v(\lambda)$  and the Future of Photometry” co-organized with the CIE.

The three CCPR working groups held two series of meetings hosted by NPL (UK) in September 2023 and BEV (Austria) in July 2025. A third series of Working groups meetings is planned in September 2026, to be hosted by KRISS (Republic of Korea).

Half-days workshops were organized on Dark Uncertainty (September 2023) and Digitalization in PR (July 2025).

### Advising the CIPM and promoting traceability to the candela

#### **The candela and related documents**

In June 2024, the Strategic Planning Working Group organized a workshop on the Future of the Candela for CCPR members. The goal of this workshop was to have comprehensive discussions on several proposals for the definition of the Candela. It was noted that discrepancies between the current  $V(\lambda)$  photometric function and newer 2024 data existed, which motivated discussions on the future of photometry. The workshop presented multiple perspectives on redefining the candela, ranging from maintaining the current definition to adopting cone fundamentals, photon-based approaches, or alternative physical bases, each with different implications for science and industry. The conclusion was that no immediate change was necessary, while recognizing both the potential benefits and challenges of any future redefinition.

#### **Cone-fundamentals systems**

The workshop on the Future of Photometry, organized in June 2024 with the CIE, was the first task of the Task Group on cone-fundamentals created after the 25th CCPR meeting - CCPR WG-SP-TG16. It received strong participation from CIE and CCPR members, with a total of 226 participants. The four workshop sessions covered the history of photometry and colorimetry, recent results on cone fundamentals, and discussions on their impact on the reference document “principles governing photometry” (a joint CCPR/CIE publication). Key discussion points included challenges such as

adapting to display and daylight applications, costs of updating instruments, how to best capture the diversity of the population in the standard observer behind the  $V(\lambda)$  function, and the continued importance of the current definition for essential tasks. It was concluded that further research is needed to evaluate the benefits and impacts of potential changes, with ongoing work continuing through CIE Research Forum 05 and CCPR WG-SP-TG16.

### **Digitalization**

CCPR members developed strong links with the CIPM Forum on Metrology and Digitalization (FORUM-MD), via the Task Group on “Discussion on the impact on digitalization on matters related to the CCPR” created in 2022 (CCPR-WG-SP-TG15). The Task Group held several online meetings and organized a workshop in July 2025. They identified specific aspects of digitalization in the field of Photometry and Radiometry: high dimensionality of measurements, different types of observers, many different quantities as well as the many quantities with dimension 0, which causes difficulties for machine readability. They already progressed on harmonized data formats and CMCs for easier readability of the BIPM KCDB.

#### Ensuring global compatibility of measurements

In accordance with its policy, international comparisons on key quantities currently undertaken at the CCPR level are repeats of the set of ten “cycle 1” comparisons. The ten “cycle 2” comparisons are at various stages of progress, with three comparisons completed and published. Part of the delays reported in May 2022 were solved, but restrictions in communication and cooperation between some countries continue to hinder progress. Investigations on future comparisons via Pilot Studies are continuing and are mentioned later in this document (Outlook in the short and long term).

In June 2025, CCPR members recognized the increasing level of activities of GULFMET and modified the rules on participation in comparisons organized by the CC to maintain the limit on number of participants to 12, while allowing participation of NMIs from GULFMET.

#### Improvements in the CIPM MRA

After the updates carried out on the guidelines to rationalize CMC claims and their evaluation during 2019-2022, CCPR members estimated that no more changes were required, as anticipated in the report to the 27th meeting of the CGPM. The guidelines have been helpful to understand requirements and to find guidance regarding the scope of Key Comparisons in terms of CMC support. New formats for CMCs for fibre optics and terrestrial irradiance were implemented after discussions within expert groups in the two areas, as the old structure did not match customer requests. Members of the Working Group on CMCs worked with the Task Group on Digitalization to better harmonize the format of CMCs and ensure that Findable, Accessible, Interoperable and Reusable (FAIR) principles are applied. Progress was made on understanding how “Dark Uncertainty” (increased variance) observed as a result of comparisons could impact participants’ CMCs, but more expert discussions are required before undertaking any update of the relevant guidelines.

#### Challenges and difficulties

Since February 2022, the main challenge faced by the CCPR has been a reduction in international cooperation, with restrictions imposed by some countries on communication with other parties, exchange of data and shipment of goods. This has delayed several Key Comparisons, and required significant efforts by CCPR officials (President, WG Chairs and Executive Secretary) to monitor each situation case-by-case and find alternative solutions, while complying with the rules agreed within the CCPR.

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

In the next ten years, CCPR members will continue to complete the second round of the existing portfolio of key comparisons which are still considered to be adequate to underpin the needs of the CCPR community. Additionally, the

recent success of the Pilot Study comparing detection efficiency of single-photon detectors (TG11 of WG-SP) will result in guidance documents for NMIs and will be followed by more comparisons. Investigations on the use of LED-based standard lamps for the existing KCs will continue to progress and will result in the lamps being used in comparisons at a later stage. The Pilot Study on spectral responsivity comparisons in the THz range (TG8 of WG-SP) will start in 2027. Comparison activity to support the calibration of gravitation wave detectors will continue, managed within TG18 of WG-SP. Although limited to only two NMIs (NIST and PTB), its scientific value is highly appreciated by CCPR experts in view of its significant impact on the fundamental Hubble constant.

In the near future, extensions of comparisons into different spectral regions will become necessary. For example, semiconductor industries require SI-traceable measurement of extreme UV radiation. Mid- and far-infrared radiometry has become more important to support and increase the accuracy of Earth and climate observations. To allow the extension of the measured ranges, various activities to validate the methods and the equivalence of each laboratory should follow.

The Strategy Working Group will continue implementing the actions expected by CCPR members as expressed in the 2022 survey conducted by its Task Group 10. Workshops, task groups and pilot studies were recently launched in LED-based standards, few-photon metrology, digitalization and cone-fundamentals, and similar actions are planned to support development of UV measurements, photovoltaic standards, optical properties of materials, and climate and environmental observations.

The CCPR has been active for many years in the field of climate science, including via its liaison activities with the World Meteorological Organization (WMO). Better coordinated and increased activity is expected in the coming ten years via the recently created Task Group on Metrology for Satellite Observations (CCPR-WG-SP-TG17). The group aims to provide a consistent and coordinated response from the NMI radiometry community to the needs of the satellite-observation communities, which are key to monitoring climate change. Their work will include a roadmap for the development and implementation of radiometric capabilities to provide calibration services for optical (UV, visible, SWIR, thermal IR) satellite sensors (pre- and post-launch). They will also be key players to ensure good contribution of the CCPR in the CIPM Sectorial Task Group on Climate Change and Environment (CIPM STG-CENV).

## CCPR Data

CCPR set up in 1933

President: M.L. Rastello

Executive secretary: J. Viallon

Membership:

26 members, 2 liaisons and 2 observers

List of CCPR members and  
observers:

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

Meetings since the 27th CGPM  
meeting:

6-7 June 2024

Full reports of the CCPR  
meetings:

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

Three Working Groups:

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

- Key Comparisons (CCPR-WG-KC)
- CMC (CCPR-WG-CMC)
- Strategic Planning (CCPR-WG-SP)

| CCPR Comparison activity                                   | Completed                                                 | In progress | Planned [period] |
|------------------------------------------------------------|-----------------------------------------------------------|-------------|------------------|
| CCPR key comparisons<br>(and supplementary<br>comparisons) | 17 KC, 3 SC                                               | 6           | 4 [2027-2030]    |
| BIPM comparisons                                           | 3                                                         | 0           | 0                |
| CC pilot studies                                           | 4                                                         | 1           | 2 [2027]         |
| CMCs                                                       | 1 519 CMCs in 7 service categories registered in the KCDB |             |                  |