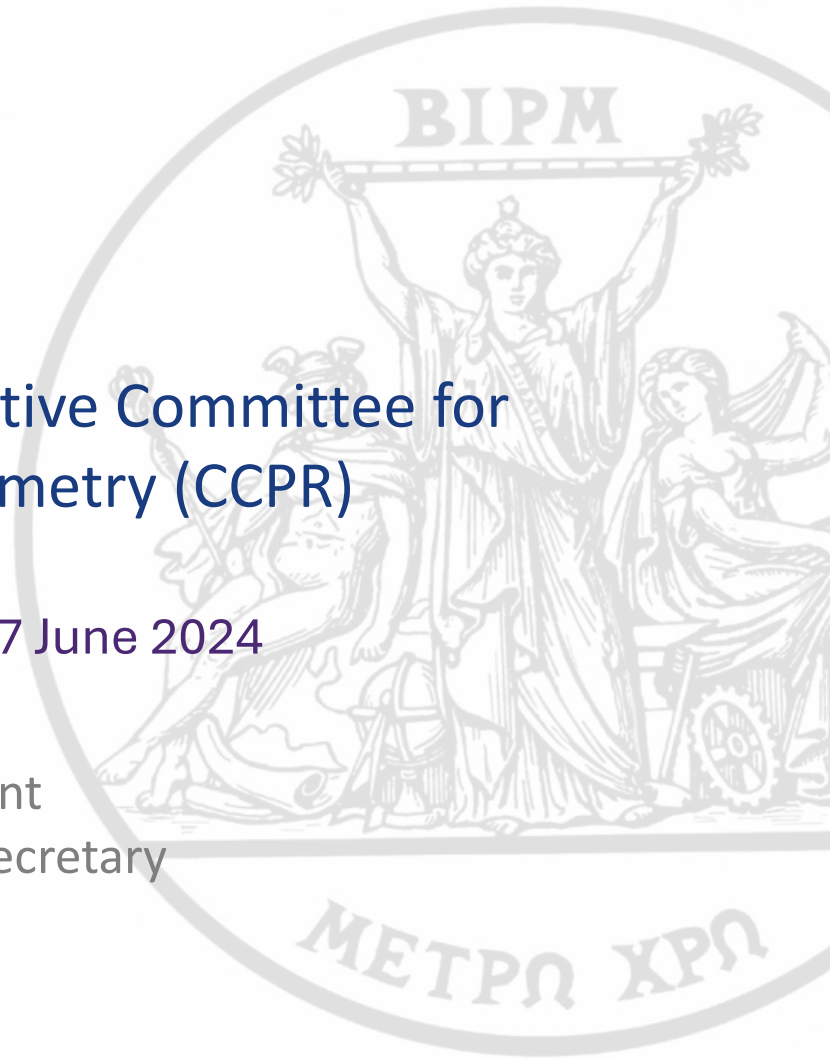


# 26<sup>th</sup> Meeting of the Consultative Committee for Photometry and Radiometry (CCPR)

BIPM Headquarters, 6-7 June 2024

M.L. Rastello – President

J. Viallon – Executive secretary





Versailles, 15-18 November 2022

## RESOLUTIONS

27<sup>e</sup> réunion de la  
Conférence générale  
des poids et mesures

### CGPM Resolution 1 (2022)

On the report prepared by the International Committee for Weights and Measures on the “Evolving Needs in Metrology”

### CGPM Resolution 3 (2022)

On the extension of the range of SI prefixes

### CGPM Resolution 5 (2022)

On the future redefinition of the second

### CGPM Resolution 7 (2022)

On the dotation of the International Bureau of Weights and Measures for the years 2024 to 2027

### CGPM Resolution 2 (2022)

On the global digital transformation and the International System of Units

### CGPM Resolution 4 (2022)

On the use and future development of UTC

### CGPM Resolution 6 (2022)

On universal adherence to the Metre Convention

# Member States and Associates (May 2024)

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

## NEW MEMBER STATES:

- Morocco (May 2019)
- Ecuador (August 2019)
- Belarus (January 2020)
- Estonia (January 2021)
- Costa Rica (September 2022)

## NEW ASSOCIATES:

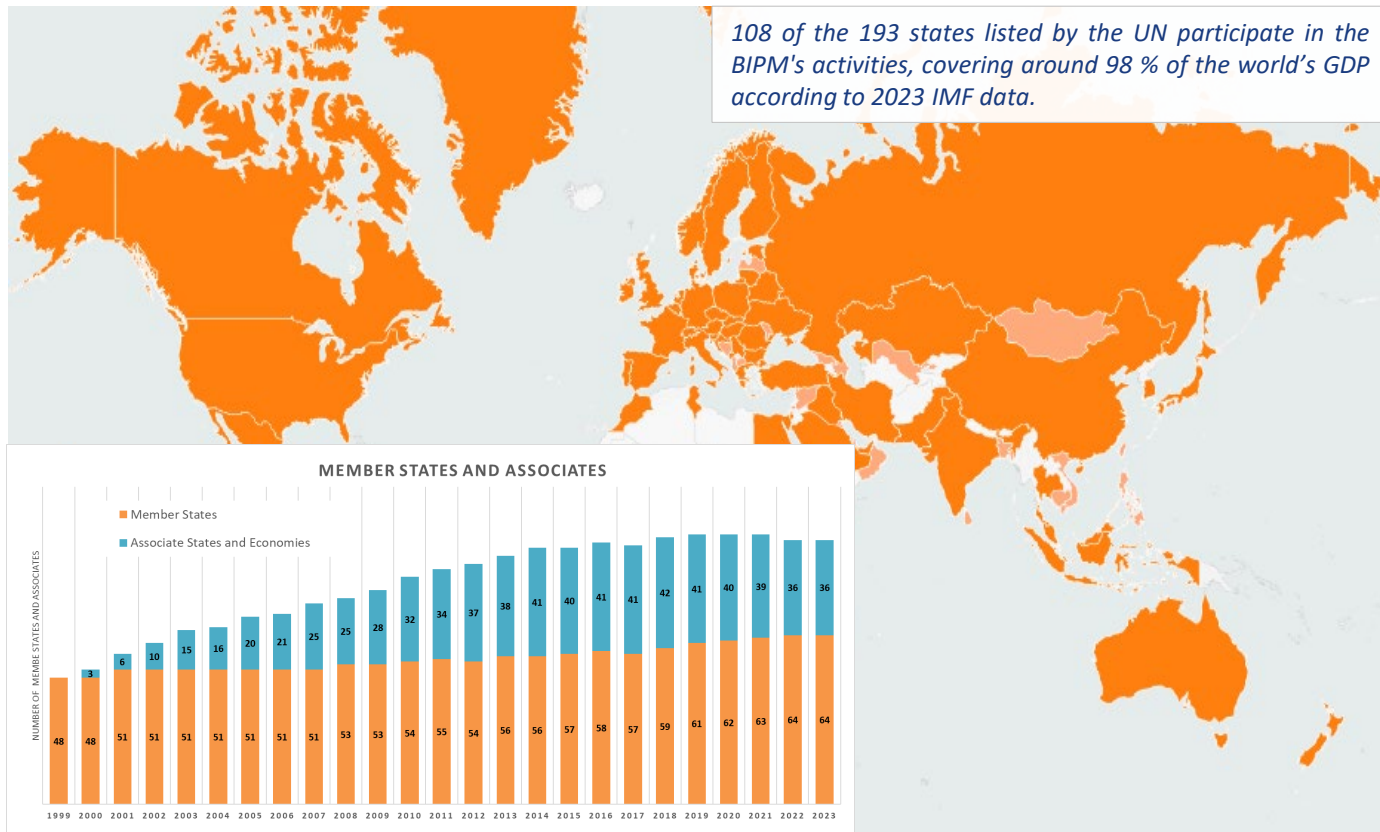
- Cambodia (January 2021)
- Zimbabwe (February 2022  
reinstatement; *excluded in Jan 2021*)

## EXCLUDED ASSOCIATES:

- Cuba (January 2022)
- Sudan (January 2022)

## WITHDRAWN ASSOCIATE:

- Seychelles (January 2022)



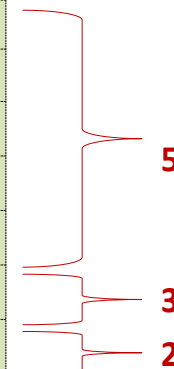
# The 'encouragement' criteria in practice (2024)

**RESOLUTION 4 of the 24<sup>th</sup> CGPM (2011):**  
 Associates who have been encouraged to become Member States

**Panama, Peru, Philippines, Viet Nam –**  
 general discussion on accession to the  
 Metre Convention but no obvious progress

#	Associate State	Date meeting criteria	Period of increasing subscription	
			Start	90% MS
1	Latvia	2011	2013	2017
2	<b>Panama</b>	2011	2013	2017
3	<b>Viet Nam</b>	2011	2013	2017
4	<b>Peru</b>	2014	2016	2020
5	<b>Philippines</b>	2014	2016	2020
6	Azerbaijan	2020	2022	2026
7	Luxembourg	2021	2023	2027
8	Sri Lanka	2023	2025	2029

Step on ladder:



# 85 UN Member States are not Member States or Associate States

**60 States participate in an RMO**



**25 States do not participate in an RMO**

## 11 States on UN Scale $\geq 0.02$

**AFRIMETS members (3)** *Algeria, Cote d'Ivoire, Nigeria*  
**SIM members (3)** *Dominican Republic\*, Guatemala, Venezuela\**  
**APMP members (2)** *Brunei, Jordan*  
**COOMET member (1)** *Cuba\**  
**EURAMET member (1)** *Cyprus*  
**GULFMET member (1)** *Bahrain*

## 3 States on UN Scale $\geq 0.02$

**European States (1)** *Iceland*  
**Asian State (2)** *Lebanon, Turkmenistan*

## 49 States on UN Scale $< 0.02$

**AFRIMETS members (34)** *Angola, Benin, Burkina Faso, Burundi, Cabo Verde, Cameroon\*, Central African Republic, Chad, Comoros, Congo Brazzaville, Dem. Rep. of Congo, Equatorial Guinea, Eswatini, Gabon, Gambia, Guinea, Guinea-Bissau, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Rwanda, Senegal, Seychelles\*, Sierra Leone, South Sudan, Sudan\*, Togo, Uganda*  
**APMP members (6)** *DPR Korea\*, Fiji, Kiribati, Myanmar, Nepal, Papua New Guinea*  
*(inc. 3 Pacific Islands Forum members: Fiji, Kiribati, Papua New Guinea)*  
**SIM members (5)** *Bahamas, El Salvador, Haiti, Honduras, Nicaragua*  
*(inc. 2 CARICOM members: Bahamas, Haiti)*  
**COOMET members (3)** *Armenia, Kyrgyzstan, Tajikistan*  
**GULFMET (1)** *Yemen\**

## 22 States on UN Scale $< 0.02$

**African States (4)** *Djibouti, Eritrea, São Tomé and Príncipe, Somalia*  
**Pacific Islands Forum members (9)** *Marshall Islands, Micronesia, Nauru, Palau, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu*  
**Asian States (5)** *Afghanistan, Bhutan, Laos, Maldives, Timor-Leste*  
**European microstates (4)** *Andorra, Liechtenstein, Monaco, San Marino*

# CGPM outcomes



## New prefixes for the SI adopted by the General Conference on Weights and Measures

On 18 November 2022 the 27th meeting of the General Conference on Weights and Measures (CGPM) approved the proposal to extend the range of prefixes for use with the International System of Units (SI). The prefixes for decimal multiples and submultiples of the SI units are, together with the definitions for the seven base units, an essential part of the SI. They allow an effective communication of technical and scientific information.

The prefixes for multiples of the units have been extended from  $10^{24}$ , yotta, by adding ronna (symbol R) for  $10^{27}$  and quetta (symbol Q) for  $10^{30}$ . These new prefixes are expected to find applications in the near future in the expression of quantities of digital information, which will require orders of magnitude well in excess of  $10^{24}$ .

Prefixes for small submultiples of the units have also been added. These retain the “symmetry” of the large and small prefixes by introducing the ronto (symbol r) for  $10^{-27}$  and the quecto (symbol q) for  $10^{-30}$ .

The authoritative document describing the International System of Units is the SI Brochure. It is available from the BIPM web site and has been updated accordingly.

→ [SI Brochure: The International System of Units \(SI\)](#)

FACTOR	NAME	SYMBOL	MULTIPLYING FACTOR
$10^{30}$	quetta	Q	1 000 000 000 000 000 000 000 000 000 000
$10^{27}$	ronna	R	1 000 000 000 000 000 000 000 000 000 000
$10^{24}$	yotta	Y	1 000 000 000 000 000 000 000 000 000
$10^{21}$	zetta	Z	1 000 000 000 000 000 000 000 000
$10^{18}$	exa	E	1 000 000 000 000 000 000 000
$10^{15}$	peta	P	1 000 000 000 000 000 000
$10^{12}$	tera	T	1 000 000 000 000
$10^9$	giga	G	1 000 000 000
$10^6$	mega	M	1 000 000
$10^3$	kilo	k	1 000
$10^2$	hecto	h	100
$10^1$	deca	da	10
$10^{-1}$	deci	d	0.1
$10^{-2}$	centi	c	0.01
$10^{-3}$	milli	m	0.001
$10^{-6}$	micro	μ	0.000 001
$10^{-9}$	nano	n	0.000 000 001
$10^{-12}$	pico	p	0.000 000 000 001
$10^{-15}$	femto	f	0.000 000 000 000 001
$10^{-18}$	atto	a	0.000 000 000 000 000 001
$10^{-21}$	zepto	z	0.000 000 000 000 000 000 001
$10^{-24}$	yocto	y	0.000 000 000 000 000 000 000 001
$10^{-27}$	ronto	r	0.000 000 000 000 000 000 000 000 001
$10^{-30}$	quecto	q	0.000 000 000 000 000 000 000 000 000 001



General Conference on Weights and Measures  
27th meeting - 15-18 November 2022

# CGPM outcomes



<https://www.bipm.org/en/committees/cg/cgpm>

## Resolution 2

### “On the global digital transformation and International System of Units”

#### Encourages

the CIPM to undertake the development and promotion of an SI Digital Framework, that will include the following features:

- a globally accepted digital representation of the SI, compatible with, and useable within, digital data exchange standards and protocols, whilst maintaining compatibility with existing non-digital solutions,
- facilitating use of digital certificates in the existing robust infrastructure for the world-wide recognition and acceptance of calibration and measurement capabilities,
- the adoption of the FAIR principles (Findable, Accessible, Interoperable, and Reusable) for digital metrological data and metadata, ensuring that other communities recognize the critical importance of metrological traceability for measurement data, the latter being an established requisite for building trust.

# News from the CIPM

## Decision CIPM/112-38 (2023)

The CIPM approved CENAM (Mexico), INTI (Argentina), METAS (Switzerland), MSL (New Zealand), NIM (China), NIST (United States), NMIA (Australia), NPL (United Kingdom), NRC (Canada), PTB (Germany), VNIIMS (Russia) as Members of the Forum on Metrology and Digitalization.

The CIPM noted the expression of interest from other institutions and invited them to participate as Observers to the Forum.

The CIPM requested the BIPM Director to invite organizations from the international scientific and quality infrastructure, in particular Signatories of the *Joint Statement of Intent on the digital transformation in the international scientific and quality infrastructure*, to participate as Liaisons to the Forum on Metrology and Digitalization.

The CIPM invited J. Ullrich to Chair the first meeting of the Forum on Metrology and Digitalization and appointed G. Macdonald as Vice-Chair.



More information in Agenda point 11, Friday 7 June, on-line presentation by P. Blattner

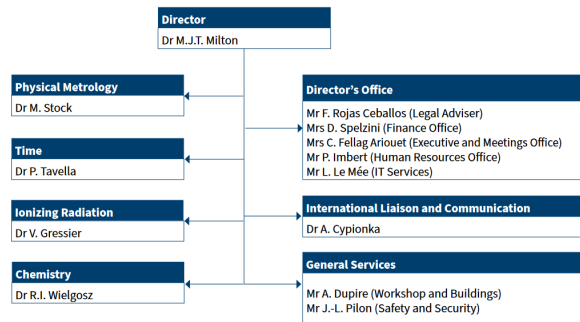


# News from the CIPM

## Decision CIPM/111-5 (2022)

The CIPM noted the decision taken by correspondence on 20 May 2022 that, considering the response to comments on the text for a draft resolution prepared by the *ad hoc* Working group of Member State representatives in February 2022, and in accordance with the First Article of the Metre Convention, the CIPM recalled its decision CIPM/107-06 and decided to recommend the use of the term “Headquarters” (in French “Siège”) whenever it is required (for example in formal or informal documents) to refer to the scientific and technical staff and facilities at the Pavillon de Breteuil.

Organigram of Headquarters' Departments and Services (since March 2023)



# News from the CIPM

## Decision CIPM/112-11 (2023)

Following Decision CIPM/110-10 (2021) to start the Sectorial Task Group on Climate Change and Environment (STG-CENV), the CIPM approved the structure, terms of reference, membership and work plan.

## CIPM Sectorial Task Group on Climate Change and Environment (CIPM-STG-CENV)

### Chair

#### Dr Dolores del Campo Maldonado

Director of Mechanical Quantities and Engineering Division  
Centro Español de Metrología  
Spain

### Executive Secretary

#### Dr Edgar Flores Jardines

Bureau international des poids et mesures  
France

More information in Agenda point 10, Friday 7 June,  
on-line presentation by E. Woolliams

# News from the CIPM – Current membership

## President

### Dr W. Louw

Formerly Director of Research, International and Infrastructure Development, NMISA  
South Africa

## Secretary

### Dr T. Usuda

Director General  
National Metrology Institute of Japan, AIST  
Japan

## Vice-President

### Dr J.K. Olthoff

Chief Metrologist  
National Institute of Standards and Technology  
United States of America

### Dr P. Richard

Director  
Federal Institute of Metrology METAS  
Switzerland

### Dr J.-T. Janssen

Chief Scientist  
National Physical Laboratory  
United Kingdom

CCRI

### Dr H. Laiz

Director of Metrology and Quality  
Instituto Nacional de Tecnología Industrial  
Argentina

CCAUV

### Dr S.-R. Park

Principal Research Scientist, Division of Chemical and Biological Metrology  
Korea Research Institute of Standards and Science  
Korea (Republic of)

CCQM

### Prof. Dr V.G. Achanta

CSIR National Physical Laboratory of India  
India

### Dr V. Coleman

Section Manager, Nanometrology  
National Measurement Institute, Australia  
Australia

CCL

### Dr D. del Campo Maldonado

Director of Mechanical Quantities and Engineering Division  
Centro Español de Metrología  
Spain

CCT

### Prof. Dr C. Denz

President  
Physikalisch-Technische Bundesanstalt  
Germany

### Dr J. Qu

Vice Director  
National Institute of Metrology  
China

### Dr M.L. Rastello

Formerly Scientific Director  
National Institute of Metrological Research/Istituto Nazionale di Ricerca Metrologica  
Italy

CCPR

### Dr N. Dimarcq

CNRS Senior Scientist at ARTEMIS  
CNRS, Université Côte d'Azur, Observatoire Côte d'Azur  
France

CCTF

### Mr H.A. Frøystein

Director, Head of Department  
Norwegian Metrology Service/Justervesene  
Norway

### Prof. Dr G. Rietveld

Senior Scientist  
VSL Dutch Metrology Institute  
Netherlands

CCEM

### Dr G.P. Ripper

Director for Scientific & Industrial Metrology and Technology, Substitute  
Instituto Nacional de Metrologia, Qualidade e Tecnologia  
Brazil

# 150th anniversary of the Metre Convention



19th May - BIPM

**VIP reception** for Heads of local organizations and authorities (the Mayor, the Prefect etc). Representatives from M/S Embassies, CIPM, NMI senior staff, BIPM senior staff.



20th May - UNESCO HQ, Paris\*

## **”150 years of the BIPM and celebration of World Metrology Day”**

A one-day event with VIP speakers, video tributes, a panel discussion of the future of “scientific multilateralism” and the launch of the anniversary book



21<sup>st</sup> & 22<sup>nd</sup> May – Palais des Congrès de Versailles

## **“From units to the universe – future revolutions in metrology”**

A conference highlighting themes from the CIPM Strategy (Climate, Quantum and Digital Transformation plus the “new second” and future metrology technologies). Poster competition for NMI staff.