Towards the replacement of the last artifact

CCM President:
Dr Philippe Richard

CCM Executive Secretary:
Dr Hao Fang
Mass and Related Quantities

Health

Energy

Fair trade

Safety
The last artifact

The kilogram is the unit of mass; it is equal to the mass of the international prototype of the kilogram (IPK)

- Unique
- Only 1 kg
- Stability cannot be checked
- Possible damage and contamination

Time for change has come
About the need for a change

... Alone among the three fundamental quantities of mechanics, [the unit of] mass will still rely on an artefact standard: the [IPK] made of an alloy of platinum and iridium, conserved at the Pavillon de Breteuil. Without even mentioning one of the cataclysmic disasters now haunting our world, and which would vaporize the IPK, it must be said that its invariability is something of a miracle.

In practice, it is only used rarely for fear of altering it. This is a weakness of the Metric System to which metrologists must sooner or later provide a remedy.

Report of CIPM President, Mr A. Danjon, to the meeting of the 11th CGPM, 1960, p. 25.
The main activities of the CCM

CCM: Consultative Committee for Mass and Related Quantities

CCM
- Roadmap
- Conditions
- Recommendations
- Mise en pratique
- Strategy
- CIPM MRA review

23 members, 6 observers and many experts

Mass, force, torque, pressure, vacuum, density, viscosity, hardness, fluid flow and gravimetry
Progressing towards the state-of-the-art

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www.bipm.org
The Planck constant

\[ h = 6.626\,070\,15 \times 10^{-34} \text{ J s} \]
Experimental determination of $h$

The Planck constant

$h = 6.626\,070\,15 \times 10^{-34} \text{ J s}$

Source: Physikalisch-Technische Bundesanstalt PTB

www.bipm.org
CCM quality check for the redefined kilogram

- Consistency
- Uncertainty
- Traceability
- Validation
CCM actions during the last years:

- Active consultation and communication about the changes to come (meetings, website, newsletter CCM e-News)
- Invited talks and keynote at conferences and in the regions
- Publication of a Metrologia focus issue on *Realization, Maintenance and Dissemination of the Kilogram*
- Information for users about the proposed revision of the SI (BIPM website)
Important work at the BIPM

- The CCM thanks the BIPM for the strong support of the CCM activities and especially those related to the redefinition of the kilogram.
- The CCM supports the BIPM Work Programme 2020-2023.
- The CCM congratulates the BIPM for the excellent results obtained recently with the BIPM Kibble (watt) balance.

The BIPM Kibble (watt) balance is the balance of the member states.
Global comparability of measurements

- The CIPM MRA improved the global comparability of measurements in the numerous fields of the CCM
- CCM established guidance documents for supporting the key comparisons and the CMC submission and review
- The CCM worked with all the regions in the context of the CIPM MRA
- A calibration campaign with the IPK was performed at the BIPM prior to the redefinition
- The first comparison of the future realization experiments is being organized
Outlook
26e CGPM
Versailles
13-16 novembre 2018

www.bipm.org

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