

Report of the CCM Working Group on Mass

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Bureau
+ **I**nternational des
+ **P**oids et
+ **M**esures



WG Meetings held since last CCM

- ◆ The last meeting of the WG Mass was held (on-line) on 23rd April 2021



WG Meetings planned

- ◆ The next meeting of the WG Mass will be held in conjunction with the CCM plenary meeting in 2023.
- ◆ A proposal has been made to schedule an interim (on-line) meeting in 2022. This is being considered by the WG members.

Main actions taken and main achievements

- ◆ The first Key Comparison of realization experiments (CCM.M-K8.2019) was completed, and the results published in the KCDB.
- ◆ A consensus value for the kilogram was agreed and was officially implemented 1st February 2021.
- ◆ CMCs of NMIs impacted by the increase in uncertainty due to the use of a consensus value were reviewed and updated (with the agreement of the NMIs) by an ad-hoc Task Group of the WGM.
- ◆ A number of RMO KCs and SCs reports have been reviewed and approved for publication in the KCDB.

Progressing the state of the art

- ◆ Encourage additional NMIs to explore the option of developing realisation experiments by providing technical support and coordination.
- ◆ Consider how realisation experiments could be developed by NMIs with the aim of providing “shop-floor” level SI traceability
 - Commercial balances for realizing the unit of mass are underway at various NMIs (NIST, NPL, PTB).
 - Experiments to realise the unit of mass at values other than 1 kilogram are underway.
 - The SIM RMO is developing an infrastructure for disseminating the unit of mass with relation to the NIST and NRC Kibble balances.
 - Means for the storage and transport of mass standard in inert gas have been implemented at NMI level.

Liaison & stakeholders

- ◆ RMOs
- ◆ NMIs who are Non-WG members
- ◆ Other metrology organisations (OIML, WELMEC, EA, ISO etc.)
- ◆ Manufacturers
 - Balances (Mettler-Toledo, Radwag, Sartorius)
 - Weight manufactures (Mettler-Toledo, Häfner, Troemner)
 - Equipment supporting realisation experiments

KCs completed and underway

- ◆ CCM.M-K8.2019 comparison of realisation experiments completed
- ◆ CCM.M-K8.20xx will take place every 2 years

KCs planed

- ◆ Comparisons of realisation experiments (CCM.M-K8.20xx) will take place every 2 years. Next comparison due to start Oct 2021.
- ◆ Follow on from CCM.M-K4 (1 kilogram) scheduled to start end 2022.
- ◆ Comparison of sub-multiples of the kilogram due to start 2024.

KCs planed

year 20XX KC identifier	17	18	19	20	21	22	23	24	25	26	27	28	29	30
CCM.M-K1 CCM.M-K4 (1 kg)						X								
CCM.M-K2 CCM.M-K5 CCM.M-K7 ((sub-)multiples)								X						
CCM.M-K3 CCM.M-K6 (50 kg)							X							
CCM.M-K8			X		X		X		X		X		X	

Program of work for the next 5 years

- ◆ Ensure review and rationalisation of Mass CMCs to reduce number of entries and improve usability (2021).
- ◆ Support BIPM for repeat of Comparison of realisation experiments (2021, 2023, 2025).
- ◆ Organise repeat of kilogram Key Comparison (2022).
- ◆ Organise repeat of (sub-)multiple and 50 kg KCs (2024).
- ◆ Coordinate with RMOs to ensure the effective use of KCs and minimisation of (non-linked) SCs.
- ◆ Support NMIs in continuation with or initiation of realisation experiments and to look for additional areas where the redefinition of the kilogram can have wider impact for end users (2024).

Proposed changes (membership, chairmanship, ToRs)

- ◆ Requests for membership have been received from GUM, Poland and NIS, Egypt. It is proposed that these are considered by the WGM at the next physical meeting.
- ◆ Delegate list updated to reflect merger of WGD-kg and WGR-kg

CCM-TGPfD-kg: proposed change in ToRs (I)

The ongoing dissemination of the kilogram following the completion of the first comparison of realization experiments, CCM.M-K8, ~~after 20 May 2019~~ will take place in ~~three~~ two consecutive phases:

- ~~▪ Present traceability (taking into account the additional uncertainty coming from the new definition),~~
- Dissemination of the consensus value,
- Dissemination of individual realizations.

Based on "*the mise en pratique of the definition of the kilogram*" and on "the CCM ~~short~~ detailed note on the dissemination process after the proposed redefinition of the kilogram" the task group will:

- Ensure the correct implementation of the ~~present traceability across the period of the redefinition of the kilogram~~, approved dissemination process across the transition period until dissemination of individual realizations
- ~~▪ Propose a detailed calculation of the consensus value and its uncertainty and oversee the transition for the "present traceability" to the use of the consensus value,~~ provide support for the periodic comparison of realization experiments, CCM.M-K8, and calculate the consensus value and its uncertainty after each comparison

CCM-TGPfD-kg: proposed changes in ToRs (II)

- ~~Propose methods to maintain the best possible stability of the consensus value over time (including comparison periodicity),~~ If necessary, revise the detailed note on the dissemination process
- ~~Propose clear criteria for moving from the consensus value dissemination phase to the individual realization dissemination phase,~~ Based on the criteria outlined in the detailed note on the dissemination process being met, propose the transition from the consensus value dissemination phase to individual realization dissemination phase
- ~~Maintain a detailed document describing the three dissemination phases for the CCM and the mass community. This document includes the calculation of the consensus value, its uncertainty and time scale as well as any other relevant information related to the dissemination of the kilogram,~~
- Provide advice to the ~~CCM-WGD-kg and CCM-WGR-kg~~ CCM-WGM in all questions regarding traceability of the kilogram during the first ~~two~~ phases above.

CCM-TGPfD-kg: proposed changes in membership

- ◆ Members: Dr Hao Fang (BIPM), Dr Dorothea Knopf (PTB), Ms Maria Nieves Medina (CEM), Dr Lars Nielsen (DFM), Dr Philippe Richard (METAS), Dr Alan Steele, Dr Michael Stock (BIPM)
- ◆ New members from NIST (Dr Dave Newell) and NMIJ (Dr Naoki Kuramoto), Philippe Richard steps down, Dr Richard Green replaces Alan Steele

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