

**RECOMMENDATION OF THE
CONSULTATIVE COMMITTEE FOR MASS AND RELATED QUANTITIES
SUBMITTED TO THE INTERNATIONAL COMMITTEE FOR WEIGHTS AND MEASURES**

RECOMMENDATION G 1 (2013)

On a new definition of the kilogram

The Consultative Committee for Mass and Related Quantities (CCM)

recalling its previous Recommendations to the CIPM on the “Conditions for a new definition of the kilogram”, CCM G 1 (2005), and “Considerations on a new definition of the kilogram”, CCM G 1 (2010),

welcoming Resolution 1 (2011) of the CGPM “On the possible future revision of the International System of Units, the SI” which, when accomplished, will link the unit of mass to the Planck constant,

recognizing the need to confirm and clarify Recommendation CCM G 1 (2010) in the light of that Resolution,

considering

- recent statements of stakeholders and user communities such as the OIML, the International Organization of Legal Metrology, and CECIP, the European weighing industry association, on the envisaged revision of the International System of Units, the SI, and specific activities of the CCM and its working groups in response to Resolution 1 (2011) of the CGPM,
- continued progress at several National Metrology Institutes and the BIPM with watt balance and X-ray Crystal Density (XRCD) experiments, two distinct and highly-accurate routes to determining the Planck constant, with new and significantly improved data available now, and additional results anticipated before the end of the year 2015,
- progress towards the *mise en pratique* for the realization of the new definition of the kilogram and its future dissemination,
- significant progress at the BIPM to establish an ensemble of reference mass standards,

foreseeing the necessity to develop or improve methods and operate facilities so that, after redefinition, 1 kg can be realized and disseminated with a standard uncertainty not larger than 20 μg ,

recommends that the following conditions be met before the CIPM asks CODATA to adjust the values of the fundamental physical constants from which a fixed numerical value of the Planck constant will be adopted,

1. at least three independent experiments, including work from watt balance and XRCD experiments, yield consistent values of the Planck constant with relative standard uncertainties¹ not larger than 5 parts in 10^8 ,
2. at least one of these results should have a relative standard uncertainty¹ not larger than 2 parts in 10^8 ,
3. the BIPM prototypes, the BIPM ensemble of reference mass standards, and the mass standards used in the watt balance and XRCD experiments have been compared as directly as possible with the international prototype of the kilogram,
4. the procedures for the future realization and dissemination of the kilogram, as described in the *mise en pratique*, have been validated in accordance with the principles of the CIPM-MRA².

¹ supportive arguments for these requirements, which aim at a sound experimental basis for the CODATA adjustment of h before the redefinition, are given in *Metrologia*, 2010, **47**, 419-428

² as stated in the document CIPM MRA-D-05 “Measurement comparisons in the CIPM MRA”