



MWG7 Meeting, Querétaro, México
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General report of CCM meeting April 2008

Claude JACQUES
NORAMET Regional Representative for
SIM MWG7
NRC-INMS, Canada
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Possible redefinition of the kilogram

Resolution 12 of the last CGPM (2007) encourages
NMIs to:

pursue experiments relevant to the kilogram
redefinition,
prepare a *mise en pratique*,
explain new definitions to end users,
initiate an awareness campaign to alert end users of
impact

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Possible redefinition of the kilogram



Resolution 12 would allow the use of the Prototype International and/or its official copies

The CCU favors fixing the Planck constant over the Avogadro number.

This means favoring the Watt balance projects over the Avogadro project, but...

... discrepancies between the two projects have still to be resolved.

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Possible redefinition of the kilogram



Avogadro project:

In 2007, 4.8 kg of enriched silicon 28 was grown and from this ingot two spheres have been produced (99.994% pure silicon-28)

Diameter measurements repeatable to 0,3 nm

Mass measurements uncertainty 3 μ g

Completion of the project by 2010

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Possible redefinition of the kilogram



Other projects:

Watt balances at NPL, NIST, METAS, LNE and BIPM

Ion accumulation at PTB (coming to a close)

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Possible redefinition of the kilogram



Working Group on changes to the SI kilogram – Terms of reference:

To advise the CCM about issues concerning the redefinition of the kilogram;

To consider the impact on mass metrology of a new definition of the kilogram (and its *mise en pratique*);

To monitor the results of relevant experiments by following the progresses of the different projects (individual, regional and international) with a view to how a *mise en pratique* at the level of 1 kg might best be achieved;

To solicit and collate comments from a wider scientific community on the wording of the future definition and on the *mise en pratique*;

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To coordinate and assist the work of the WGM Task Groups, within and between the regions.

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Possible redefinition of the kilogram

WGM TG1 Mass Metrology under vacuum – PROVISIONAL terms of reference:

Evaluation of the available experimental results from the Watt balance and Avogadro experiments with a special emphasis on the necessary vacuum mass metrology

Identification of requirements on mass metrology for a practical realisation of a new definition

Organization of international comparisons and evaluation of the results

In coordination with TG2, identification and evaluation of the uncertainty inherent in the *mise en pratique* for the kilogram when a new definition is proposed to the CGPM

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Possible redefinition of the kilogram

WGM TG2 Uncertainty components due to traceability to the international prototype of the kilogram –Terms of reference:

To report to the WGM and the CCM on the following:

The present uncertainty to which the unit of mass can be disseminated from the international to the national prototypes;

Methods for evaluating the correlation between the measured mass values of the prototypes of the kilogram;

Recommendations for additional measurements which would allow an improved uncertainty evaluation. These measurements may involve use of the international prototype or its official copies;

In coordination with TG1, identification and evaluation of the uncertainty components inherent in the *mise en pratique* for the kilogram when a new definition is proposed to the CGPM.

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The BIPM key comparison database

180 laboratories, from 45 member States and 25 Associates

614 KCs and 174 SCs

40 new KCs and 20 new SCs each year

20 000 CMCs, 600 new CMCs last year

~16 000 visits per month to Appendix C (and B)

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Recent activities of the Metre Convention

51 States are signatories of the Metre Convention

26 Associates to CGPM (5 new over last year)

New RMO: AFRIMETS; includes the current RMO SADC MET

Unification of BMC and CMC: it includes ILAC accredited values

Metrology day 2008-05-20: « Metrology in sports »

BIPM Summer School: 2008-06-29 / 2008-07-11; 93 students, 3 Nobel laureates

Luis Mussio, LATU, new executive secretary of JCRB (May 2008)

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RMO activities EURAMET

EUROMET becomes EURAMET

KCs and SCs were presented

Results of EURAMET.M.M-K4 and EURAMET.M.P-S3 and S4 were presented

Report of the EURAMET TC-M in Bucharest, Romania, on March 2008 was presented; 80 delegates from 31 countries

Transfer of six guidance documents from EA (European Accreditation) EURAMET

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RMO activities SADCMET

Contains few developed economies, only the southern area was covered

New RMO -> AFRIMETS

Comparisons were presented – mass, force and volume

SADCMET.M.M-S1 results presented

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RMO activities APMP

CMCs reviews: intra-regional and inter-regional (review committee, status of CMC reviewed, number of CMCs)

Results of APMP.M.P-K6 and K7 presented

Activities and workshops of the TC-M

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RMO activities SIM

34 countries, 5 sub-regions, 21 signatories of the MRA,
wide range of capabilities

Training activities and workshops were presented

Status of comparisons and CMCs were presented

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Materials metrology activities in the CCM



The tasks which the CCM must address include:

Identification of areas within Material Metrology (MM)
where there is a need for traceability

Cooperation with international activities and with other
interested bodies such as VAMAS, ISO, IEC ILAC,
OIML etc.

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Materials metrology activities in the CCM



Seven quantities have been recommended where
measurement traceability could be addressed by the CCM:

Hardness

Modulus

Strength

Toughness

Fatigue

Creep

Viscosity

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Work at the BIPM Mass Section



Calibrations for Member States of

1 kg masses

Density and magnetic susceptibility for Member States

Coordination of the International Avogadro Project

CIPM-2007 Air density formula

Cleaning of weights (project with NPL)

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Work at the BIPM Mass Section



Measurement of G

Watt balance project

Mise en pratique for the eventual new definition of the kilogram (WGM TG1 and TG2)

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Recommendations to CIPM

That BIPM published CMCs

Prof. Andrew Wallard said the issue will be addressed but did not envision the need for a formal recommendation.

It will be conveyed to the CIPM.

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