



PTB

CCM Workshop on the *mise en pratique* of the new definition of the kilogram

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Workshop on the *mise en pratique* of the kg

- **Date: 21-22 November 2012**
- **Venue: BIPM, Paris**
- **About 55 participants from 25 institutes**

Targets

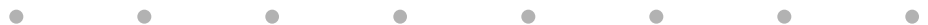
- **Discussion on the *mise en pratique* (condition of CGPM)**
- **Discussion on the new definition of the kg**

Contents of the workshop

- **Status of watt balance and Avogadro projects**
- **EMRP projects on the kg**
- **Current maintenance and dissemination of the kg**
- **Reports of WGM Task Groups**
- **Positions of watt balance and Avogadro projects**
- **Positions of NMI directors and of ‘other’ NMIs**
- **External opinions: OIML, CECIP**

: Avogadro and watt balances

Year	Avogadro	NIST	NRC	METAS	LNE	BIPM	NIM	MSL	KRISS
2013	3,0	3,0?	2,5	Set-up	2000	1000	2500	Set-up	Set-up
2014	New ²⁸ Si spheres	Discrepancy resolved?		10	10	100		1	
2015	1,5		2?	5	5	50	100?		
2016	1,0?								
2017					2?		20?		2
2018			1?	1?		<10			

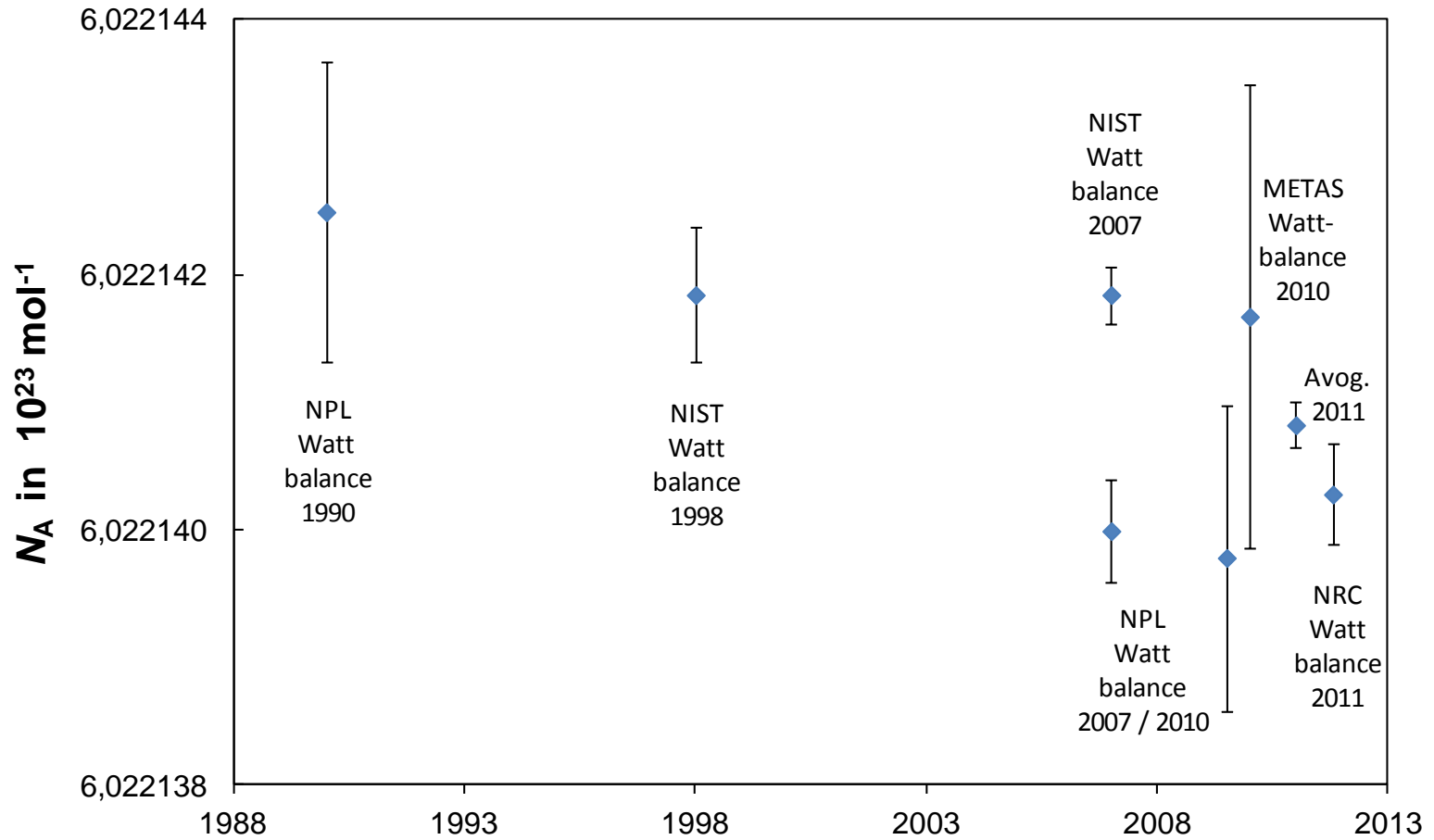


: How many N_A determinations?

Partners		Lattice parameter		Sphere volume	Sphere mass	Molar mass	Crystal perfection	Surface	Sphere fabrication
		Abs.	Rel.						
	BIPM				X			H ₂ O	
	INRIM	X					X		
	METAS							XPS	
	NIM			2013?	?	2014?		2013?	
	NIST					X			
	NMI-A			X				Ellips.	X
	NMIJ		X	X	X	2014?	X	X	
	NRC					X			
	PTB	2015		X	X	X	X	X	X

Most of the quantities are measured by 3 or more institutes!

: Avogadro constant values



Current maintenance and dissemination

- **BIPM and WGM TG 2**
- **Stability of mass standards at BIPM**
- **Inconsistencies up to 60 μg ?**
- **Uncertainty of national prototypes**

Projects on the new kg

- **EMRP JRP SIB-03 kNOW “Realisation of the awaited definition of the kilogram - resolving the discrepancies”, Sept. 2012 – Aug. 2015**
- **EMRP JRP SIB-05 NewKILO “Developing a practical means of disseminating the redefined kilogram”, June 2012 – May 2015, in particular air-vacuum transfer (cf. WGM TG1)**
- **Ensemble of reference mass standards at BIPM**

CCM conditions for the redefinition

- **Too difficult, not achievable?**
- **Acceptable**
- **Absolutely necessary (OIML, CECIP)**
- **No “jump” larger than 4×10^{-8} rel. (CECIP)**
- **Not robust enough?**

Time schedule for the redefinition

- **The time has come (some WBes)**
- **Not urgent (LNE)**
- **At least some more years (WGAC, some WBes)**
- **Not premature (CECIP)**
- **5 to 10 years (some NMI directors)**

Number of independent realisations

- **Three are enough (some WBes)**
- **At least 5 or 6 (some WBes, NMI directors, W. Bich)**

Comparison before the redefinition?

- **All participants agreed**

Discussion with wider public

- Questionnaire to all NMIs?
- Discussion with wider public (cf. CGPM)
- Improve formulation (OIML, CGPM)
- “Anonymous” fundamental constant (CECIP)
- Education of users?

Which key comparisons are necessary?

- **Key comparison before the redefinition**
- **On-going BIPM key comparison after redefinition**
- **CCM key comparisons after redefinition?**

Dissemination of the new kg

- From each single realisation
- From each single realisation with correction to a key comparison reference value (KCRV) ?
- From the BIPM ensemble of reference mass standards using a KCRV
- Defining and using an “ensemble-world”?
- Encouraging/discouraging institutes to realize the new kg?

Realisation at which mass value?

- At the 1 kg level
- Also at other mass values, e. g. 1 μg
- Atomic masses?

Mise en pratique difficult to understand?

Additional handbooks?

Participants were asked to submit comments and corrections to the version 6.3

- **Table of all comments and decisions**
- **New version 7.0**
- **Discussion at the WG SI-kg meeting**

Who decides on the conditions for the redefinition?

- **Watt balance and Avogadro projects?**
- **Stakeholder = mass community !**
- **Correlations?**

Thank you very much for your attention!

Questions?

Comments?