

"Overview of CIPM Mutual Recognition Arrangement"

The CIPM Mutual Recognition Arrangement
How to prepare, implement and use

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Trinidad and Tobago, 13 October 2005



Why do we need a CIPM MRA?

- Trade agreements
- Accreditation agreements
- Regulators
- Traders
- Laboratories
- ✓ Need a transparent, reliable system of traceability to internationally long term stable references, being the SI
- ✓ One multilateral agreement much cheaper than many bilateral agreements



The KPMG study for the BIPM

Key findings of the study are:

- CIPM MRA results in a notional saving of 75000 euros per annum in the costs of establishing and maintaining mutual recognition with one other NMI
- Total notional savings to the community of NMI's 85 million euros per annum
- The CIPM MRA confers significant benefits to signatory nations

The KPMG study for the BIPM

OECD International Trade by Commodities Statistics:

- A set of 28 CIPM MRA and OECD signatory nations, including all major trading and industrialized nations in the world, have a total export value in 2000 of 4.2×10^{12} euros
- It is not unlikely that 10% benefit can be obtained by taking away technical barriers to trade
- Even when only 0.1% net benefit is generated by the effects of the CIPM MRA, this means 4.2 billion



Establishing Comparability through Traceability

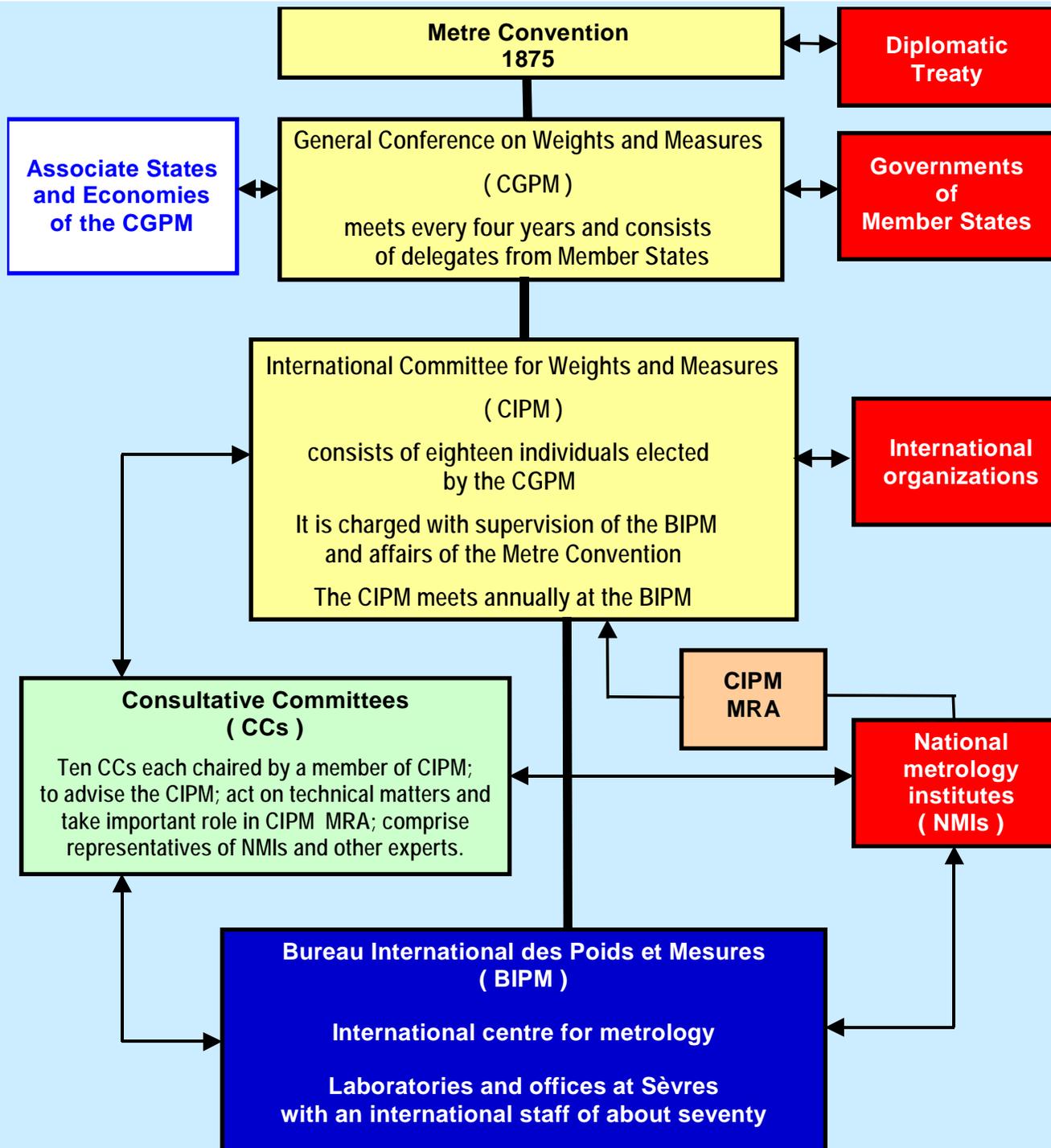
Metrological traceability

- ✓ Traceability to the SI or if not (yet) possible to another internationally agreed reference (e.g. hardness, pH, WHO International Units)
- ✓ Globally recognized, reliable and comparable measurement values with a stated measurement uncertainty, traceable to long term stable measurement standards (Trueness)
- ✓ Applicable to all fields of measurements, analysis and testing

Establishing worldwide comparability through traceability

- **Inter-Governmental Treaty** of the **“Metre Convention”**, established in 1875
- Member States and Associate countries and economies (nowadays 51 Member States, 30 Associate States and Economies)
- 10 Consultative Committees, among others CCQM
- International Bureau (BIPM) in Sèvres, France
- Coordinating and representing the National Metrology Institutes (NMI's) globally





CIPM Consultative Committees (CCs)

organising CC Key Comparisons and Pilot Studies

- Mass
- Dimensional
- Electrical and magnetism
- Temperature
- Time and frequency
- Photometry and radiometry
- Ionizing radiation
- Metrology in chemistry
- Acoustics and ultra vibration
- Units

The CIPM Mutual Recognition Arrangement

- Mutual recognition of national measurement standards and of calibration and measurement certificates issued by NMI's (and other designated institutes)
- Now signed on behalf of some 170 NMI's and other designated institutes, acting as NMI's for certain quantities and measurement ranges, of about 75 Member States and Associate Economies and 2 international organizations (IAEA and EC (IRMM and JRC-Ispra)) (See **Appendix A**)



The CIPM Mutual Recognition Arrangement

- NMI's and other designated institutes internationally recognised for claimed
 - Calibration and Measurement Capabilities (CMC's)
 - And listed CRM's as their means of disseminating traceability
 - See **Appendix C of the KCDB** www.bipm.org
- Listed are the normally delivered services to customers

The CIPM Mutual Recognition Arrangement

- Based on results of key-, supplementary- and bilateral comparisons (**Appendix B**)
- Quality system in place in conformity with ISO/IEC 17025 and ISO Guide 34 for CRMs
- Quality system assessment by RMO review, accreditation and/or on-site peer review
- Regional and inter-regional review of claimed calibration and measurement capabilities (CMCs)



The CIPM Mutual Recognition Arrangement

- Calibration and Measurement Capability (CMC):
the highest level of calibration or measurement normally offered to clients, expressed in terms of a confidence level of 95%, sometimes referred to as best measurement capability (bmc)
- CMCs are the peer reviewed measurement capabilities of an NMI (or other designated institute) to provide traceability to the SI (or if not yet possible to an other internationally agreed reference) within the framework of the CIPM MRA

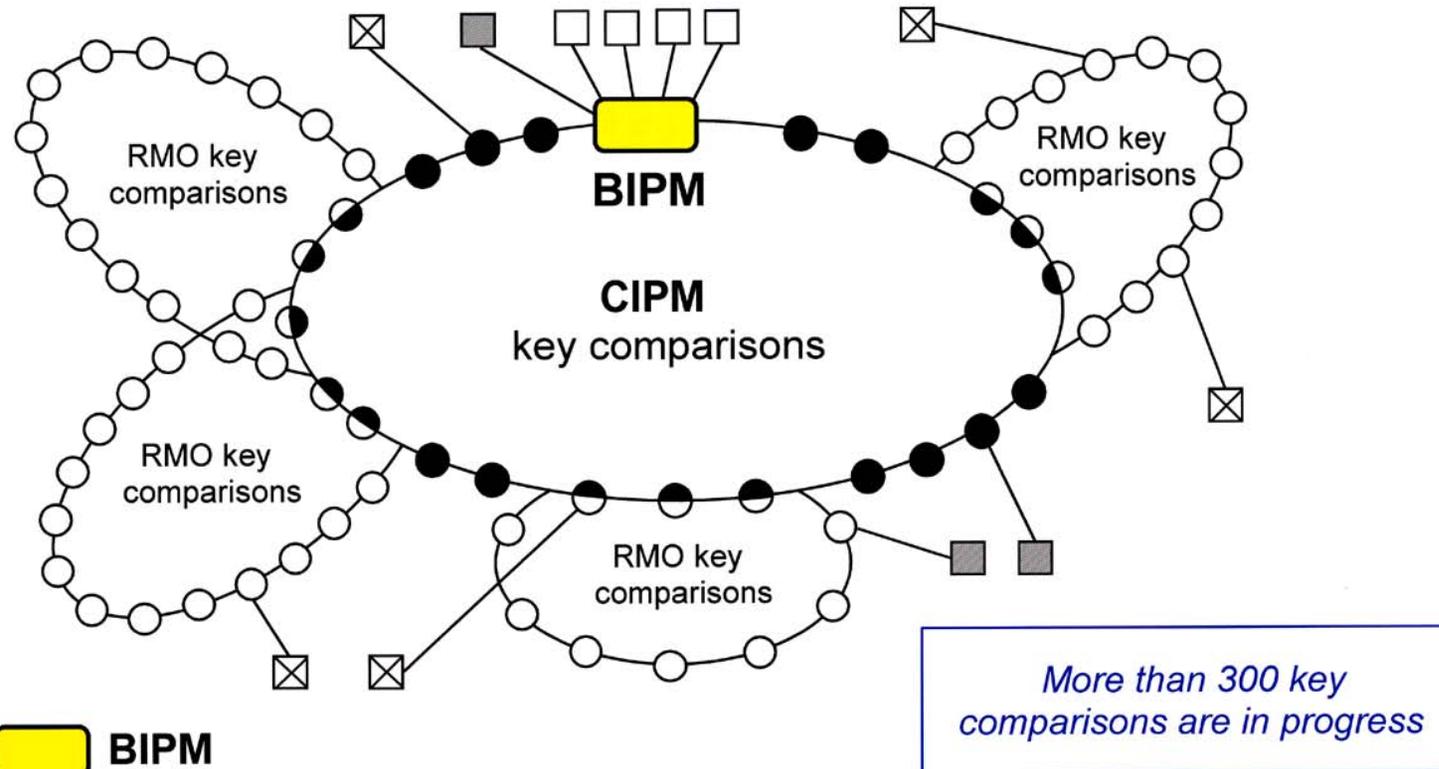
Appendix C chemistry CMC template April 2001

Priority	Designated Service Provider	NMI Service Identifier	Measurement Service Category No.	Measurement Service Sub-Category No.	Measurement Service Category	Matrix	Measurand			
							Analyte Group Identifier	Analyte or component	CAS Number	Quantity
γ A	NMI A	1	4	4.2	Environmental	nitrogen		carbon monoxide	630-08-0	Amount-of-substance fraction
γ A	NMI A	2	4	4.2	Environmental	nitrogen		nitrogen monoxide	10102-43-9	Amount-of-substance fraction
γ A	NMI A	3	4	4.2	Environmental	nitrogen		nitrogen monoxide	10102-43-9	Amount-of-substance fraction
γ A	NMI A	4	4	4.2	Environmental	nitrogen		ammonia	7664-41-7	Amount-of-substance fraction
γ A	NMI A	5	4	4.4	Forensic	synthetic air		ethanol	64-17-5	Amount-of-substance fraction

Dissemination Range of Measurement Capability			Range of Expanded Uncertainties for Measurement Capability						Range of Certified Values in Reference Materials			Range of Expanded Uncertainties for Certified Value					
From	To	Unit	From	To	Unit	Coverage factor	Level of confidence	Is the expanded uncertainty a relative one?	From	To	Unit	From	To	Unit	Coverage factor	Level of confidence	Is the expanded uncertainty a relative one?
10	100	µmol/mol	0.4	0.3	%	2	95%	Yes	10	100	µmol/mol	0.4	0.3	%	2	95%	Yes
100	1000	nmol/mol	3	2	%	2	95%	Yes	100	1000	nmol/mol	3	2	%	2	95%	Yes
1	10	µmol/mol	2	1	%	2	95%	Yes	1	10	µmol/mol	2	1	%	2	95%	Yes
10	100	µmol/mol	10	5	%	2	95%	Yes	10	100	µmol/mol	10	5	%	2	95%	Yes
100	1600	µmol/mol	0.5	0.5	%	2	95%	Yes	100	500	µmol/mol	0.5	0.5	%	2	95%	Yes

Mechanism(s) for Meas Service Delivery	Source of Traceability	Measurement Technique(s) Used	Link(s) to Appendix B (Key Comp. Name)	Comment(s) of Service Provider	RMO Services Administration (for RMO use only)		Comments
					Review Code / Status	Review Comments	
PRGM, SGS & calibration	NMI A	NDIR	COQM-K1 a Euromet 313	Static gravimetric preparation. Analysis against primary binary standards			Unclassified
SGS & calibration	NMI A	Chemiluminescence	Euromet 430	Static gravimetric preparation. Analysis against primary binary standards			Unclassified
PRGM, SGS & calibration	NMI A	Chemiluminescence	Euromet 430	Static gravimetric preparation. Analysis against primary binary standards			Unclassified
SGS & calibration	NMI A	Chemiluminescence & FTIR		Static gravimetric preparation. Analysis against primary binary standards			Unclassified
PRGM, SGS & calibration	NMI A	Flame Ionisation	COQM-K4	Static gravimetric preparation. Analysis against primary binary standards			Unclassified

Scheme for key comparisons



BIPM

- NMI participating in CIPM key comparisons.
- ◐ NMI participating in CIPM key comparisons and in RMO key comparisons.
- NMI participating in RMO key comparisons.
- NMI participating in ongoing BIPM key comparisons.
- ⊠ NMI participating in a bilateral key comparison.
- International organization signatory to MRA.

Key Comparisons (KCs)

- Selected comparisons to demonstrate that claimed CMCs can be met
- Delivering the basis for the Degrees of Equivalence with other NMI's
- Demonstration of complete understanding of what is being measured
- Demonstration of the right use of available techniques and proper application of the measurement method/procedure
- Demonstration of capability and competence in a wider field of measurement of the same kind (demonstrating **how far the light shines**)

Key Comparisons (KCs) and Supplementary and other Comparisons

- Consultative Committee KCs and RMO KCs
- Supplementary Comparisons carried out by the Regional Metrology Organisations (RMOs)
- Bilateral Comparisons
- All qualify as demonstrations of capability and competence
- Are reported in the Appendix B

Pilot studies

Comparisons

- To test methods
- To test capabilities and competence
- Good training exercises

Results will not be published in the Appendix B and are not used as demonstration of claimed CMCs

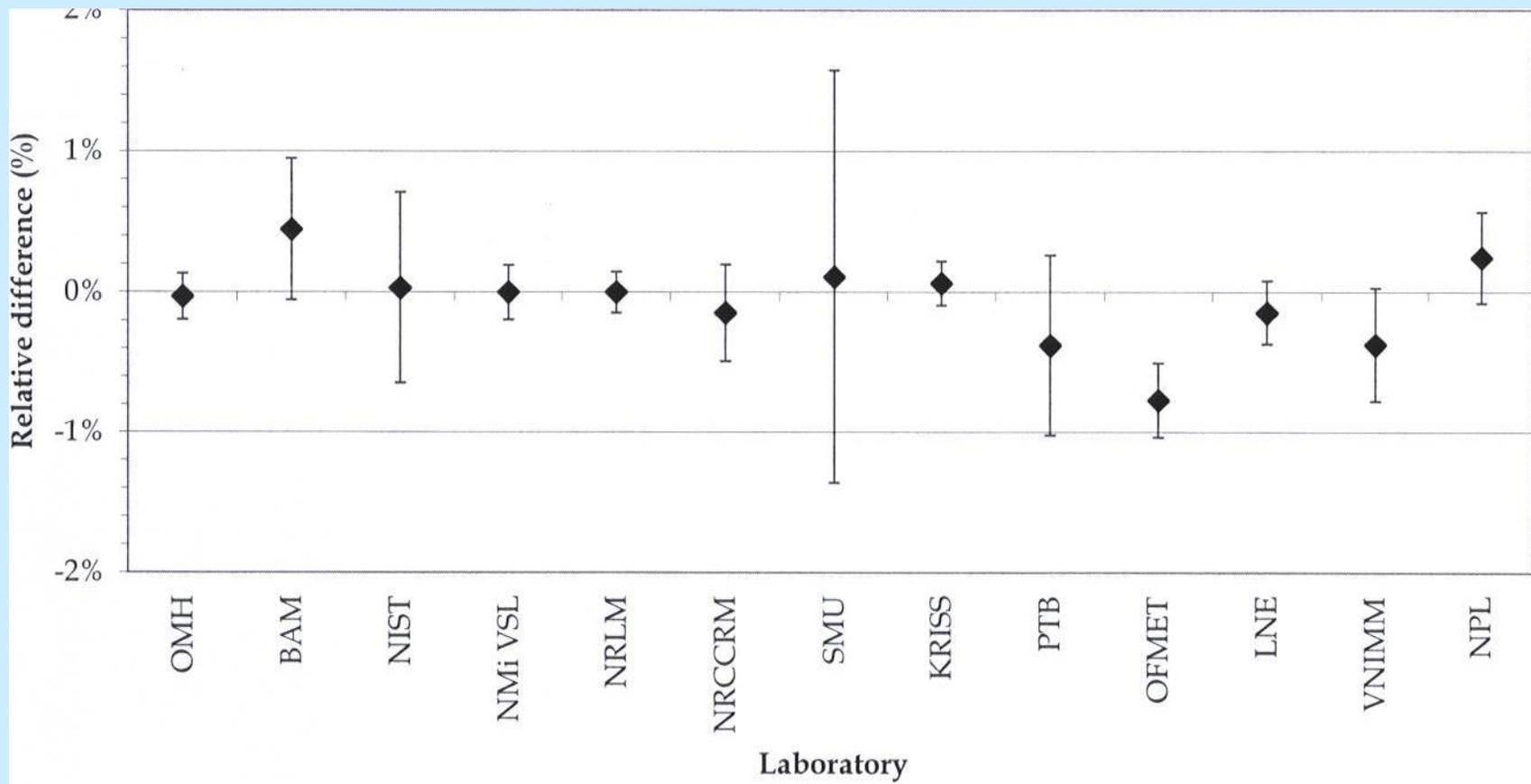


Figure 4: Results for C₃H₈

Arsenic Concentration (mmol/kg)

CCQM-P11

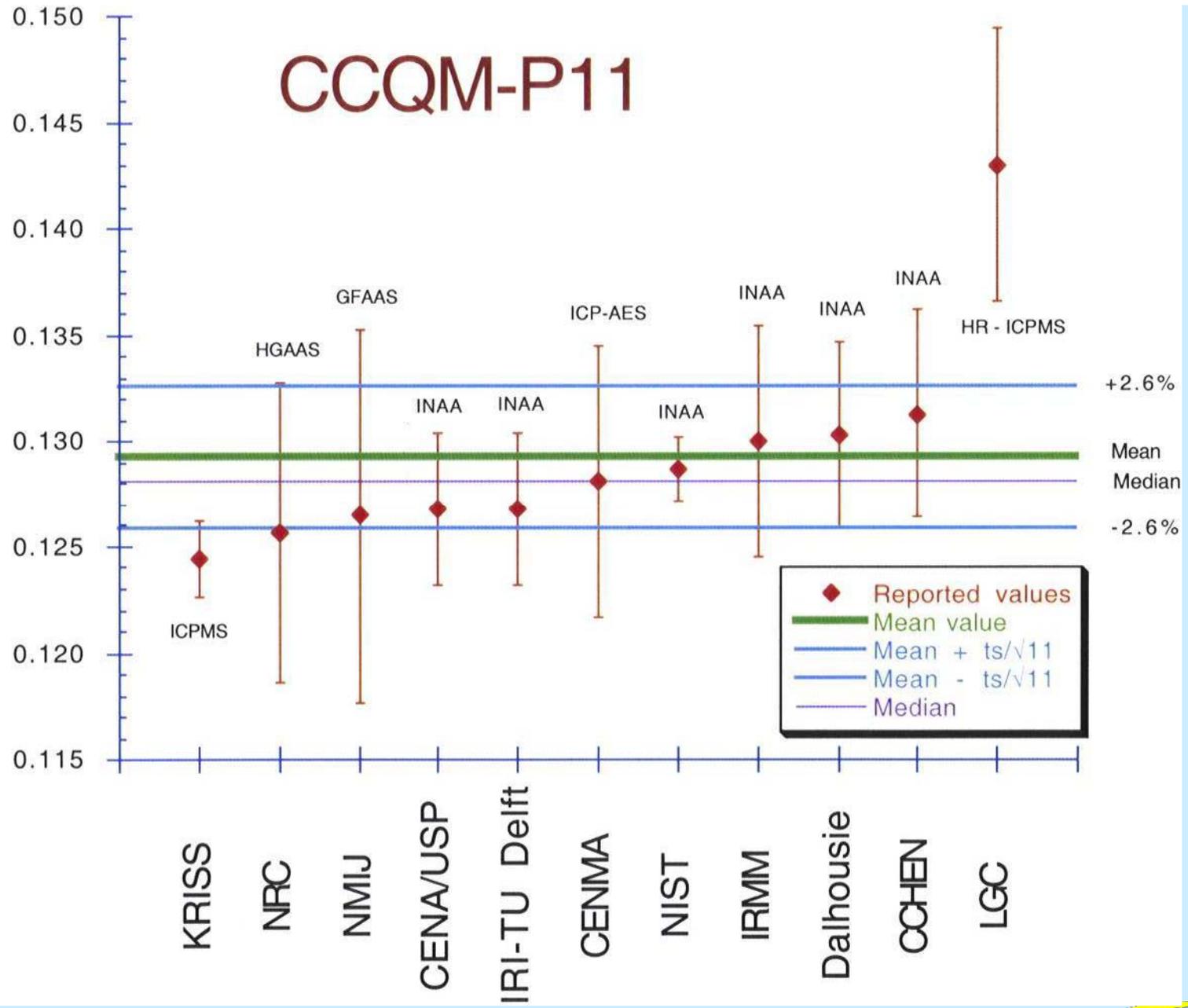
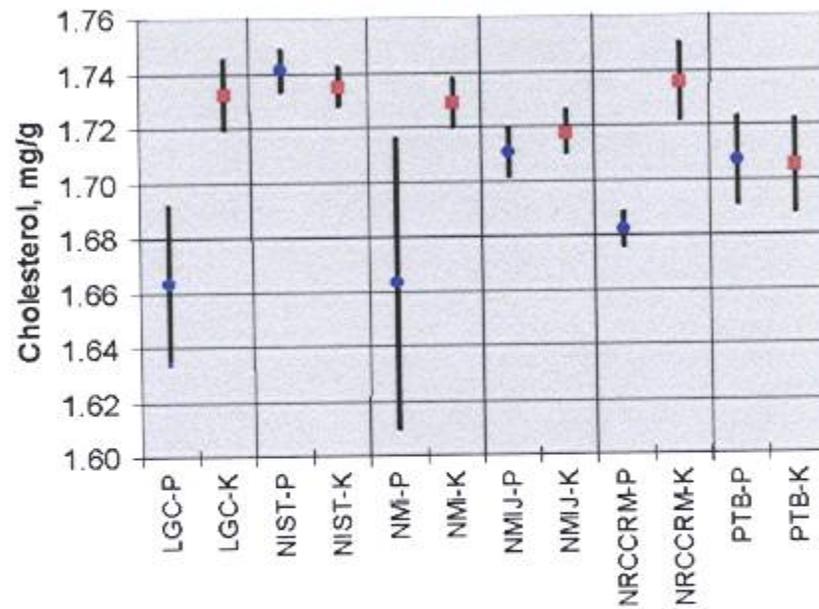


Figure 2. Comparison of Results from the Key Comparison and the Pilot Study on the Same Material

**CCQM – Comparison of Results for Cholesterol in Serum
in 1999 Pilot Study • and in 2000 Key Comparison ■ (CCQM-K6)**

mean ± U: 1.700 ± 0.029 mg/g (Pilot: CCQM-P6 Matl A_p)
1.726 ± 0.013 mg/g (Key: CCQM-K6 Matl B)



Recognition of Calibration and Measurement Capabilities - CMCs

- Demonstration of competence and capabilities by results of key, supplementary and bilateral comparisons
- It is impossible to underpin all claimed CMCs by the results of comparisons
- How far does the light shine?
- Additional information is needed, for example from results in pilot studies, publications and on-site peer assessments

Recognition of Calibration and Measurement Capabilities - CMCs

- 1st review by own RMO (intra RMO review)
- 2nd review by other RMO's (inter RMO review)
- Periodical review
- Final harmonization of claimed CMCs and discussion on remaining questions by the relevant CC Working Group on Key Comparisons and CMC Quality
- Eventual further scientific discussions in relevant CC and its Working Groups

Who will join?

- Key comparisons only for NMIs and other designated institutes of member states and associates
- Pilot studies open for other expert laboratories and potential designated institutes (added value, awareness, training)
- NMIs and other Designated Institutes claiming CMCs must participate in KCs to demonstrate their capabilities and competence

The role of the JCRB and the BIPM

Joint Committee of the RMOs and the BIPM

JCRB charged with

- Coordination of activities among the RMOs with respect to the implementation of the CIPM MRA
- Making the CIPM MRA working by developing operational procedures
- Facilitating appropriate inter-regional supplementary comparisons
- Making policy suggestions to the RMOs and the CIPM

The role of the JCRB and the BIPM

The BIPM is charged with

- Executive secretariat of the CIPM MRA
- Maintenance and improvement of the Key Comparison Data Base KCDB

The policy decisions and final overall responsibility is with the CIPM

The CIPM Mutual Recognition Arrangement and the ILAC Arrangement for accredited calibration and testing laboratories

- Arrangements are fully complementary
- No principal difference between ILAC “BMCs” (best measurement capabilities) and CIPM MRA “CMCs” (calibration and measurement capabilities)
- ILAC BMCs traceable to CIPM MRA CMCs (thus ILAC BMCs in general larger measurement uncertainty than CIPM CMCs)