

Assuring data quality in the CIPM MRA

Bureau
International des
Poids et
Mesures

21st January 2021
Andy HENSON
BIPM

CIPM MRA

Reconnaissance mutuelle
des étalons nationaux de mesure
et des certificats d'étalonnage et de mesurage
émis par les laboratoires nationaux de métrologie
Paris, le 14 octobre 1999

[Supplément technique révisé en octobre 2003 \(pages 17-20\)](#)



Mutual recognition
of national measurement standards
and of calibration and measurement certificates
issued by national metrology institutes

Paris, 14 October 1999

[Technical Supplement revised in October 2003 \(pages 38-41\)](#)

Comité international des poids et mesures

Bureau
international
des poids
et mesures

Organisation
intergouvernementale
de la Convention
du Mètre

The CIPM Mutual Recognition Arrangement (CIPM MRA) is the framework through which **NMIs demonstrate**

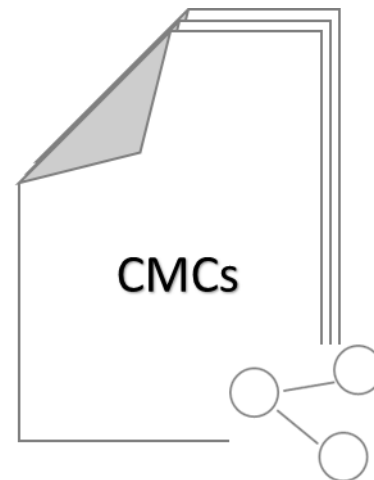
- the international equivalence of their measurement standards and
- the calibration and measurement certificates they issue.

“thereby to provide governments and other parties with a secure technical foundation for wider agreements related to international trade, commerce and regulatory affairs”

CMCs

The outcomes of the CIPM MRA are the internationally recognized (peer-reviewed and approved) **Calibration and Measurement Capabilities (CMCs)** of the NMIs declared on the publicly available BIPM key comparison database (KCDB).

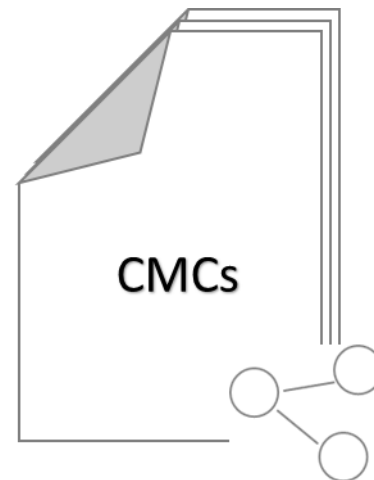
These CMCs declared by NMIs form the top of the metrological traceability chain that supports, amongst others, the 70 000+ accredited calibration and testing laboratories worldwide.



Services covered by CMCs

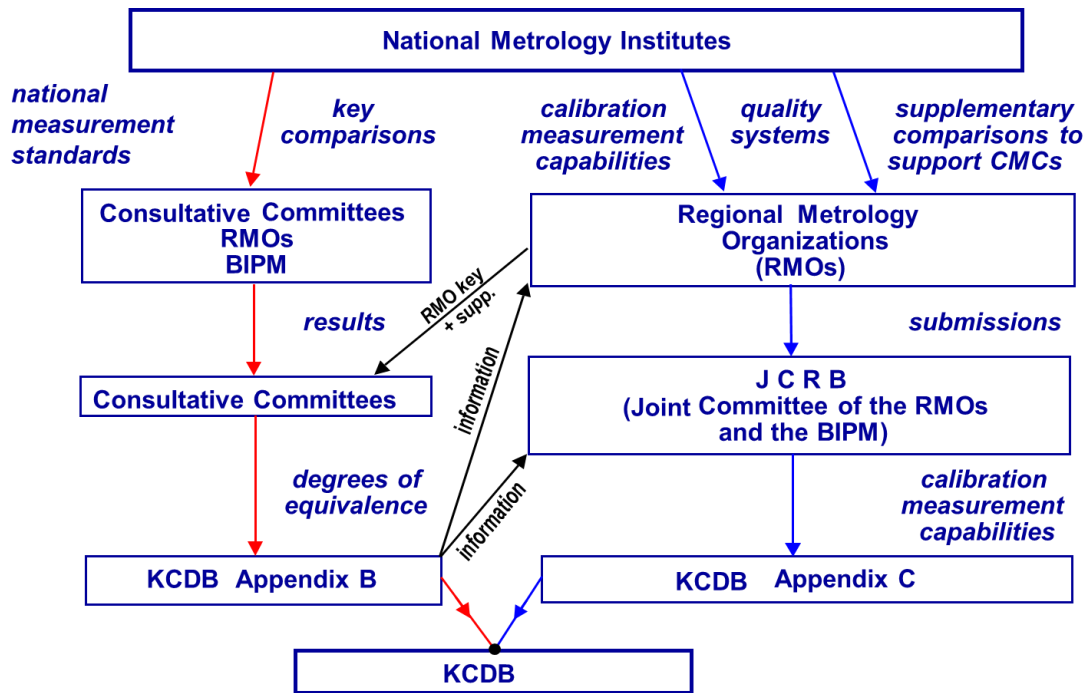
In context of the CIPM MRA calibration and measurement capabilities underpin:

- calibrations and measurements delivered by NMIs in accordance with the requirements of the ISO/IEC 17025:2017
- certified reference materials (CRMs) that are produced by NMIs according to ISO 17034:2016.

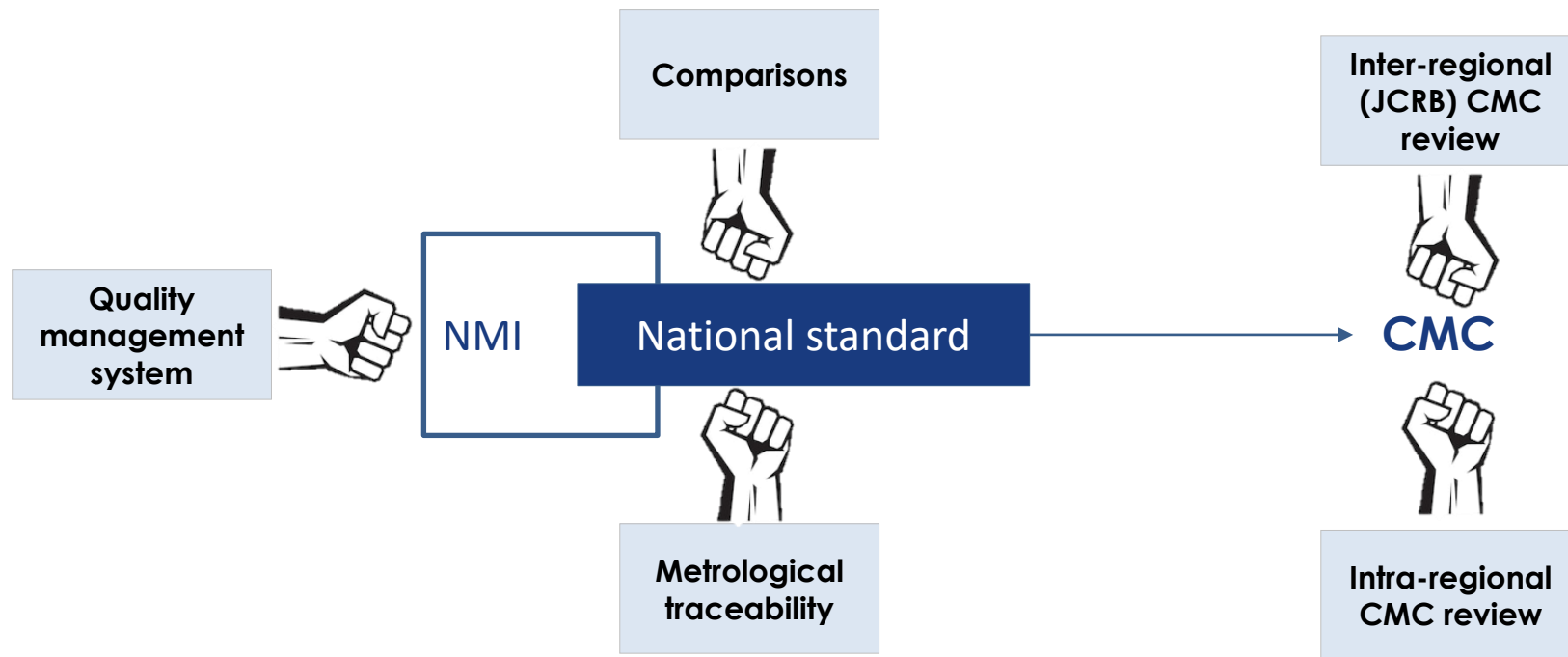


CMCs' declaration process

*CIPM Consultative Committee
WGs play a vital role ensuring
consistent and technically
valid application*

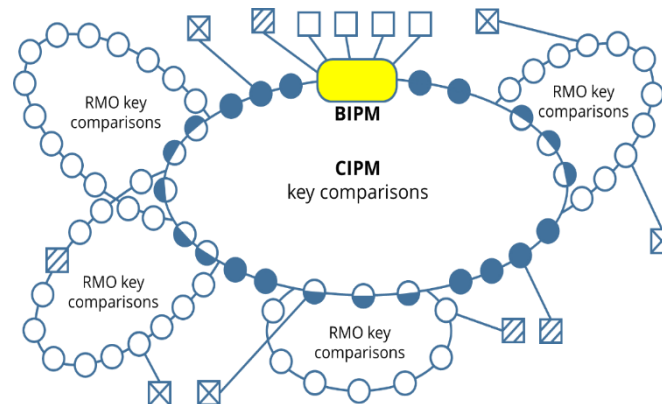


In simplest term...



Comparisons

- A fundamental mechanism of the CIPM MRA.
- Establish the degrees of equivalence of national measurement standards.
- Demonstrate NMI measurement capabilities.
- Peer-evaluated by RMOs and CCs.
- Published in the KCDB.



There are 3 basic categories

- CIPM key
- RMO key
- Supplementary

Quality management system

Requirements for NMIs on QMS

QMS shall cover all declared CMCs and meet the requirements:

- ISO/IEC 17025 for CMCs, and (if applicable)
- ISO 17034 for CRM production

Requirements for RMO on establishing confidence

RMO shall peer review each quality management system either:

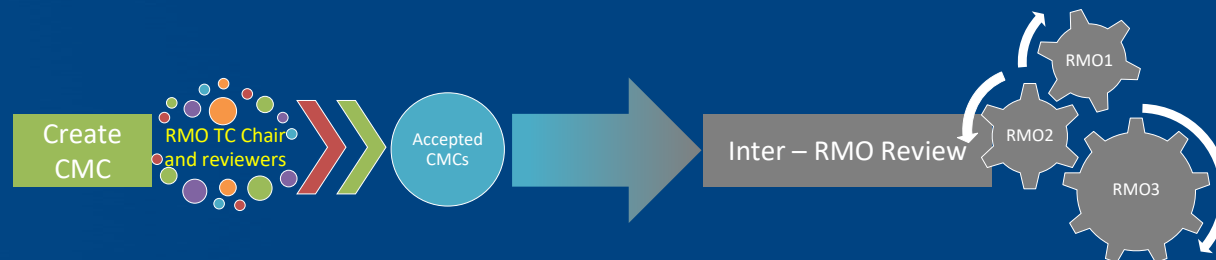
- with the support of an accreditation body; or
- directly, without third-party involvement

Metrological traceability

NMI shall establish its metrological traceability route to the SI via one of the following routes:

- A primary realization or representation of the unit of measurement concerned.
- Another NMI having relevant CMCs in the KCDB or through calibration and measurement services offered by the BIPM.

Peer review of CMCs



INTRA-REGIONAL CMC REVIEW

According to RMO internal procedures

INTER-REGIONAL CMC REVIEW

According to the CIPM MRA documents

Calibration and Measurement Capabilities – CMCs

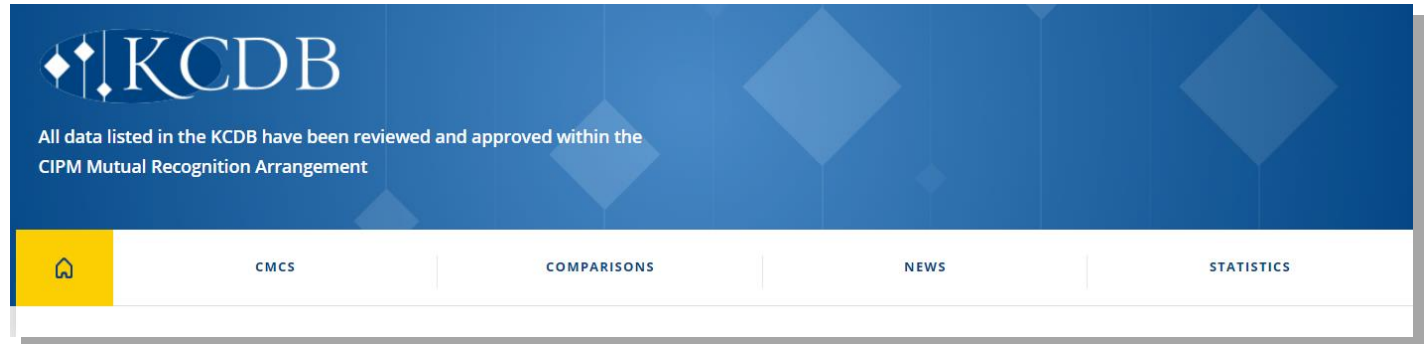
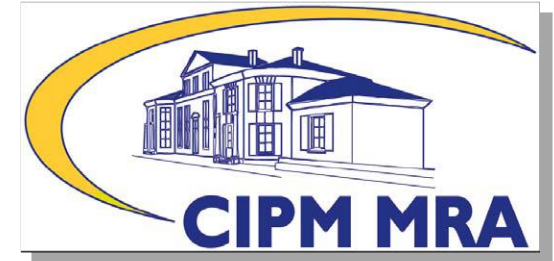
Type a keyword

SEARCH

→ [Advanced search](#)

Validity

By placing the logo on a calibration certificate and the statement, NMI is indicating that the calibration falls within NMI's calibration and measurement capabilities published in the KCDB under the CIPM MRA.



However, the authority is the KCDB.

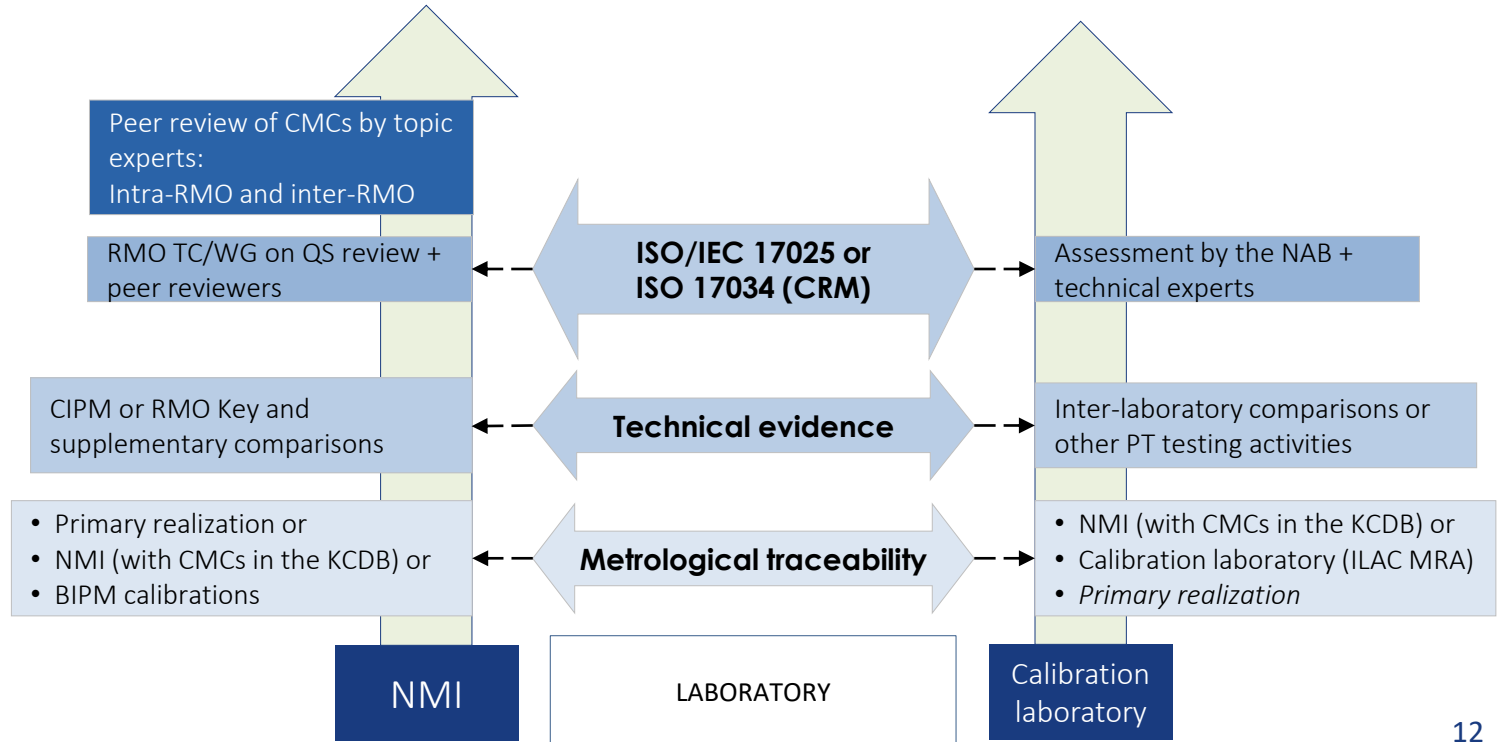
CMCs' process

A CMC is a calibration and measurement capability available to customers under normal conditions:

- *as published in the BIPM key comparison database (KCDB) of the CIPM MRA*

or

- *as described in the laboratory's scope of accreditation granted by a signatory to the ILAC MRA*



Assuring data quality for ILAC

ILAC-P10:07/2020

2. ILAC POLICY ON METROLOGICAL TRACEABILITY OF MEASUREMENT RESULTS

When metrological traceability is required, the ILAC policy is that the measuring equipment⁽¹⁾ shall be calibrated by:

Reliable route for metrological traceability

- 1) A National Metrology Institute (NMI) whose service is suitable for the intended use and is covered by the International Committee for Weight and Measures Mutual Recognition Arrangement (CIPM MRA). Services covered by the CIPM MRA can be viewed in the Bureau International des Poids et Mesures Key Comparison Database (BIPM KCDB) which includes CMCs for each listed service.



Page 6 of 11

KCDB figures *(January 2021)*

258 Institutes

- 102 National Metrology Institutes
 - 62 Member States
 - 40 Associates
- 4 International organizations
(ESA, IAEA, JRC, WMO)
- plus 152 Designated Institutes

6 RMOs

Playing an important role to support mutual confidence in the validity of calibration and measurement certificates issued by participating institutes



1,682 comparisons

1062 key, 620 supplementary
comparisons

25 724 CMCs

regionally and internationally peer-
reviewed CMC declarations

Conclusion

- CIPM MRA is a secure technical foundation for wider agreements related to international trade, commerce and regulatory affairs.
- Harmonizes worldwide recognition of the realisations of the SI units and measurement standards.
- Ensures the mutual confidence through peer reviewed systems (quality and CMCs), underpinned by measurement comparisons.
- Reliable route for metrological traceability.

Thank you

Bureau
International des
Poids et
Mesures

Andy.henson@bipm.org