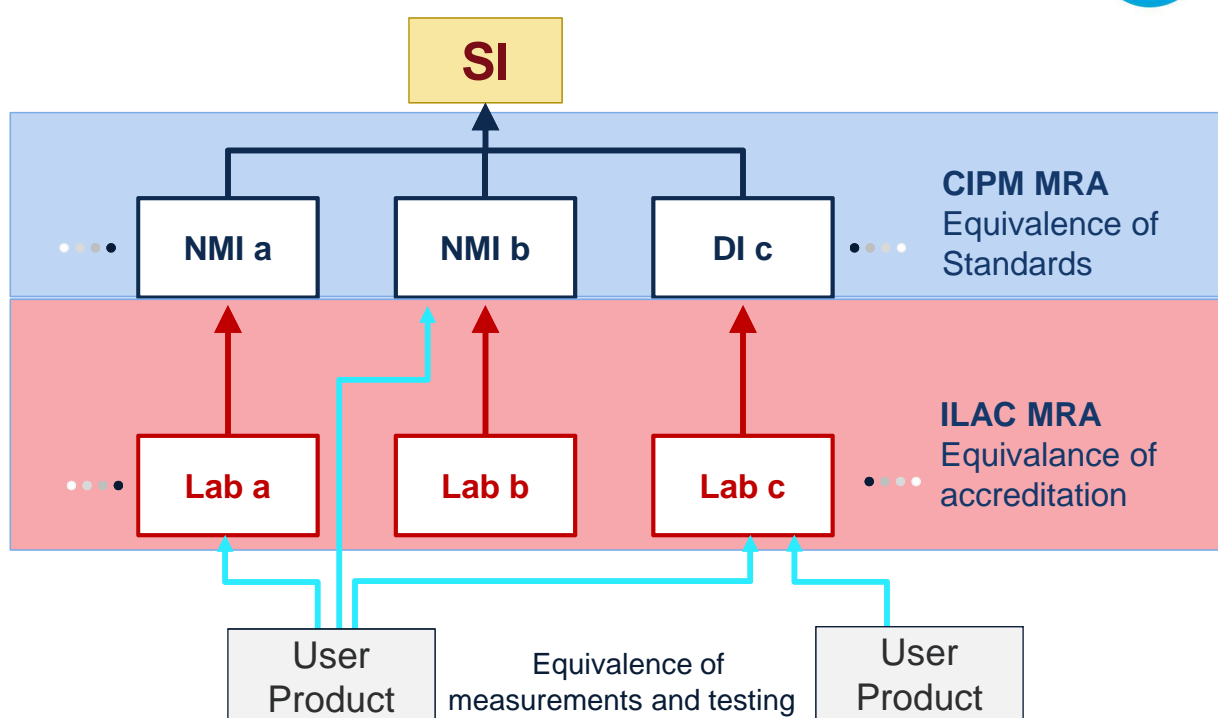


## CIPM-MRA: General Introduction and Implementation

Beat Jeckelmann  
EURAMET Chairperson

### Equivalence of measurements



# Mutual Recognition Arrangement (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



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

Paris, 14 October 1999

Comité international des poids et mesures

Bureau  
international  
des poids  
et mesures

Organisation  
intergouvernementale  
de la Convention  
du Mètre



- Establishes the degree of **equivalence of national measurement standards**
- Provides for mutual **recognition of calibration and measurement certificates** issued by NMIs

## Importance of the CIPM-MRA



### The CIPM MRA

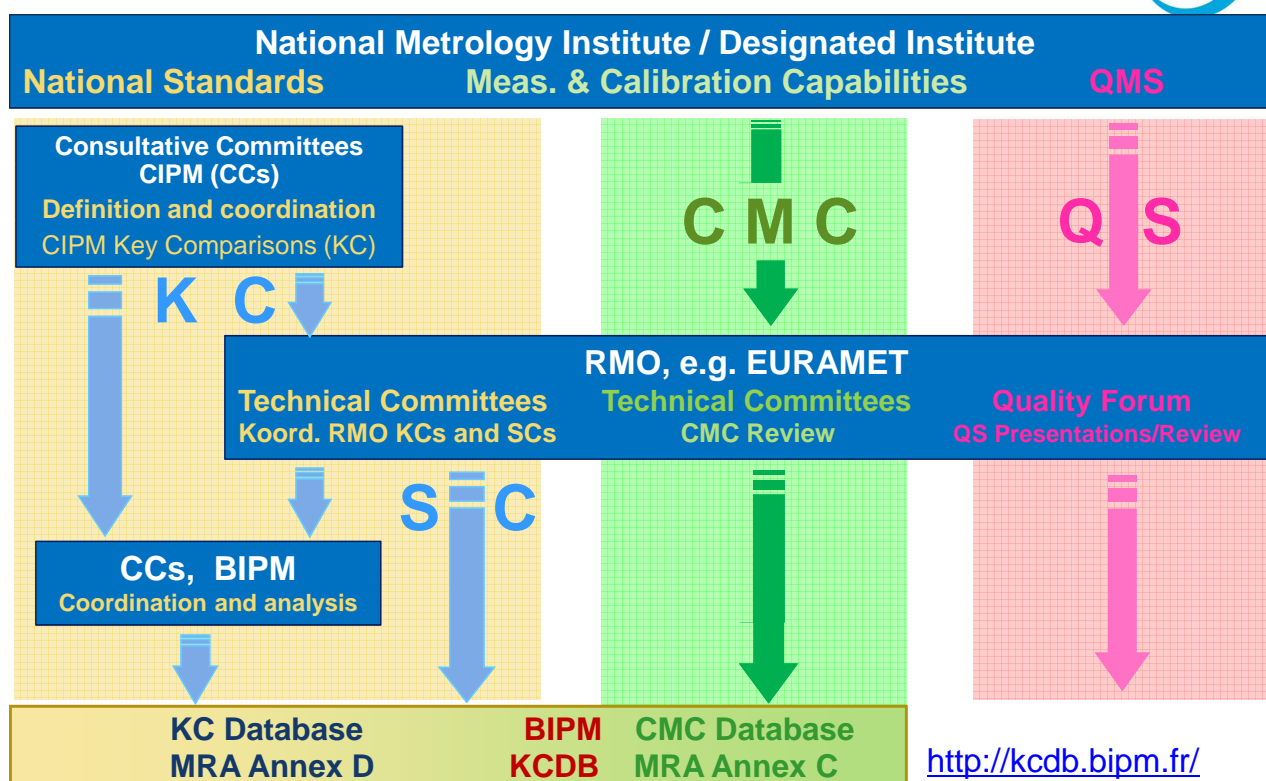
- responds to the need for an open, transparent and comprehensive scheme
- Provides confidence in, and knowledge of the measurement capabilities of participating laboratories for all users, including the regulatory and accreditation communities
- Provides the technical basis for wider agreements negotiated for international trade, commerce and regulatory affairs
- Reduces Technical Barriers to Trade arising from lack of traceability and equivalence.

The CIPM MRA has been signed by the representatives of 100 institutes – from 56 Member States, 40 Associates of the CGPM, and 4 international organizations – and covers a further 153 institutes designated by the signatory bodies.

The RMOs play an important role in the CIPM MRA:

- They are responsible for carrying out comparisons and other actions within their regions to support mutual confidence in the validity of the calibration and measurement certificates of their member NMIs.
- Through the **Joint Committee of the RMOs and the BIPM** (JCRB), they carry out an inter-regional review of declared capabilities before approved CMCs are published in the KCDB.
- They make policy suggestions to the CIPM on the operation of the CIPM MRA.

## MRA Processes

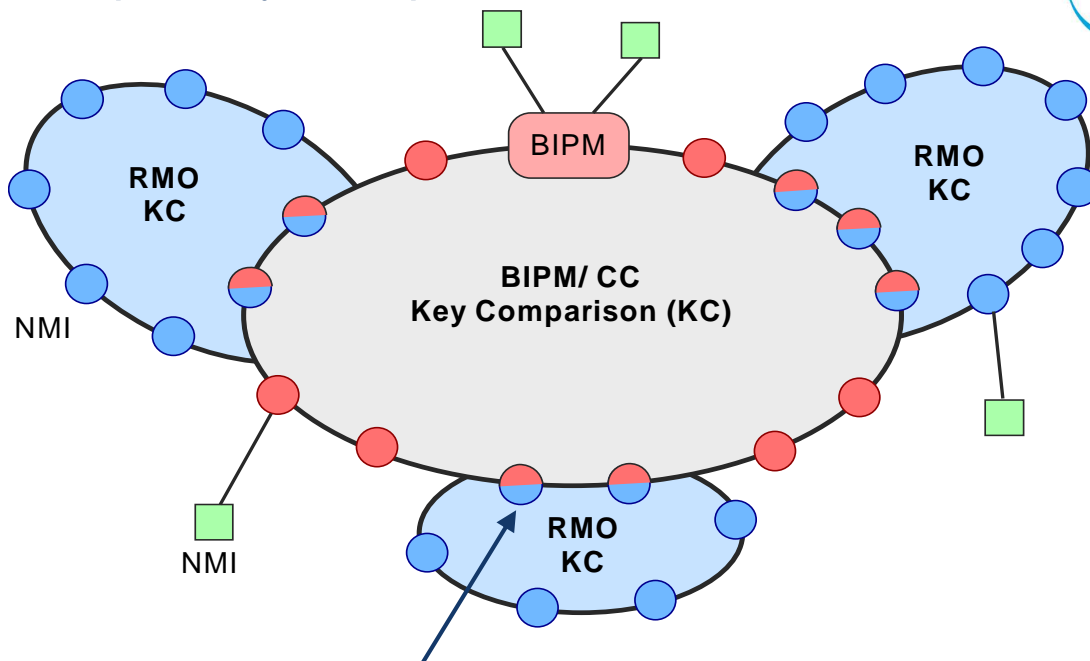


Key comparisons are the technical basis of the CIPM MRA

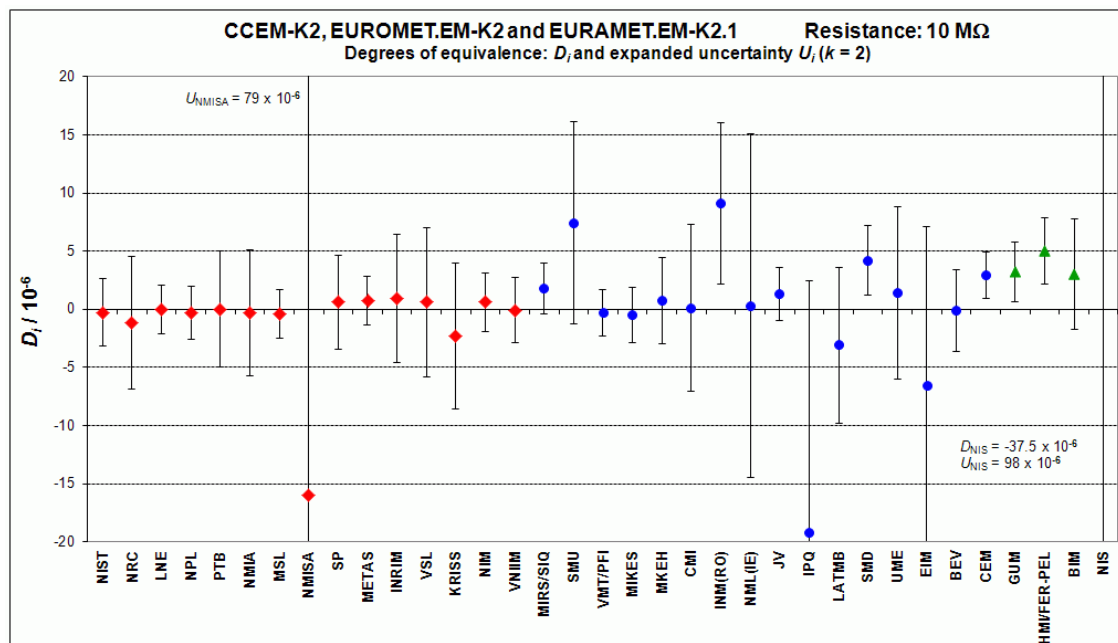
- **CIPM key comparisons**, of international scope, are carried out by those participants having the highest level of skills in the measurement involved, and are restricted to laboratories of Member States. The CIPM key comparisons deliver "the reference value" for the chosen key quantity;
- **RMO key comparisons**, of regional scope, are organized at the scale of a region and are open to laboratories of Associates as well as Member States. These key comparisons deliver complementary information without changing the reference value.

In addition to the key comparisons, the RMOs may carry out **supplementary comparisons** to meet specific needs not covered by key comparisons, including comparisons to support confidence in calibration and measurement certificates.

## Principle Key Comparisons



Laboratories participating in international as well as regional loops, ensure the linkage of the comparisons



Red diamonds: participants in CCEM-K2  
Blue circles: participants in EUROMET.EM-K2  
Green triangles: participants in EURAMET.EM-K2.1 only

## CMC Review

Claimed calibration and measurement capabilities (CMCs) are developed by the participating institutes and submitted

- for first-stage review by their regional metrology organization.  
( $\Rightarrow$  intra-RMO Review)
- Once this review process has been completed, the regional metrology organization submits the CMCs to a second-stage inter-regional peer-review process.  
( $\Rightarrow$  inter-RMO Review)

After successful intra- and inter-RMO peer review, CMCs are published in the KCDB

## Example



Gases, Environmental  
**Germany, BAM (Bundesanstalt für Materialforschung und -prüfung)**  
Complete CMCs in Chemistry for Gases for Germany (.pdf file)

| Matrix or material | Analyte or component | Dissemination range of measurement capability       |                                    | Range of certified values in reference materials    |                                    |
|--------------------|----------------------|-----------------------------------------------------|------------------------------------|-----------------------------------------------------|------------------------------------|
|                    |                      | Amount of substance fraction in $\mu\text{mol/mol}$ | Relative expanded uncertainty in % | Amount of substance fraction in $\mu\text{mol/mol}$ | Relative expanded uncertainty in % |
| nitrogen           | carbon monoxide      | 10 to 100                                           | 1.0 to 0.5                         | 10 to 100                                           | 1.0 to 0.5                         |

Mechanism(s) for measurement service delivery: CRMs, calibration services  
 Uncertainty convention 2.  
 Approved on 19 July 2010  
 Internal NMI service identifier: BAM/G040-1

# Quality Management System

The participating institutes are required to operate an appropriate quality management system which is subject to an **approval process run by the relevant RMO**

- The accepted standards are ISO/IEC 17025 and ISO Guide 34 (for those institutes producing or assigning values to reference materials).
- The quality system may either be assessed by an accreditation body fulfilling the requirements of ISO 17011 or self-declared.

The main achievements of the CIPM MRA are:

- The potential removal of technical barriers to trade
- The mutual acceptance of calibration certificates issued by NMIs and DIs
- The **mutual confidence** through a peer reviewed system, underpinned by measurement comparisons
- Worldwide harmonized realisations of the SI units and measurement standards
- Provision of traceability routes
- Improved measurement capabilities of many NMIs and DIs (incl. the establishment of the tools to monitor and to quantify these capabilities).