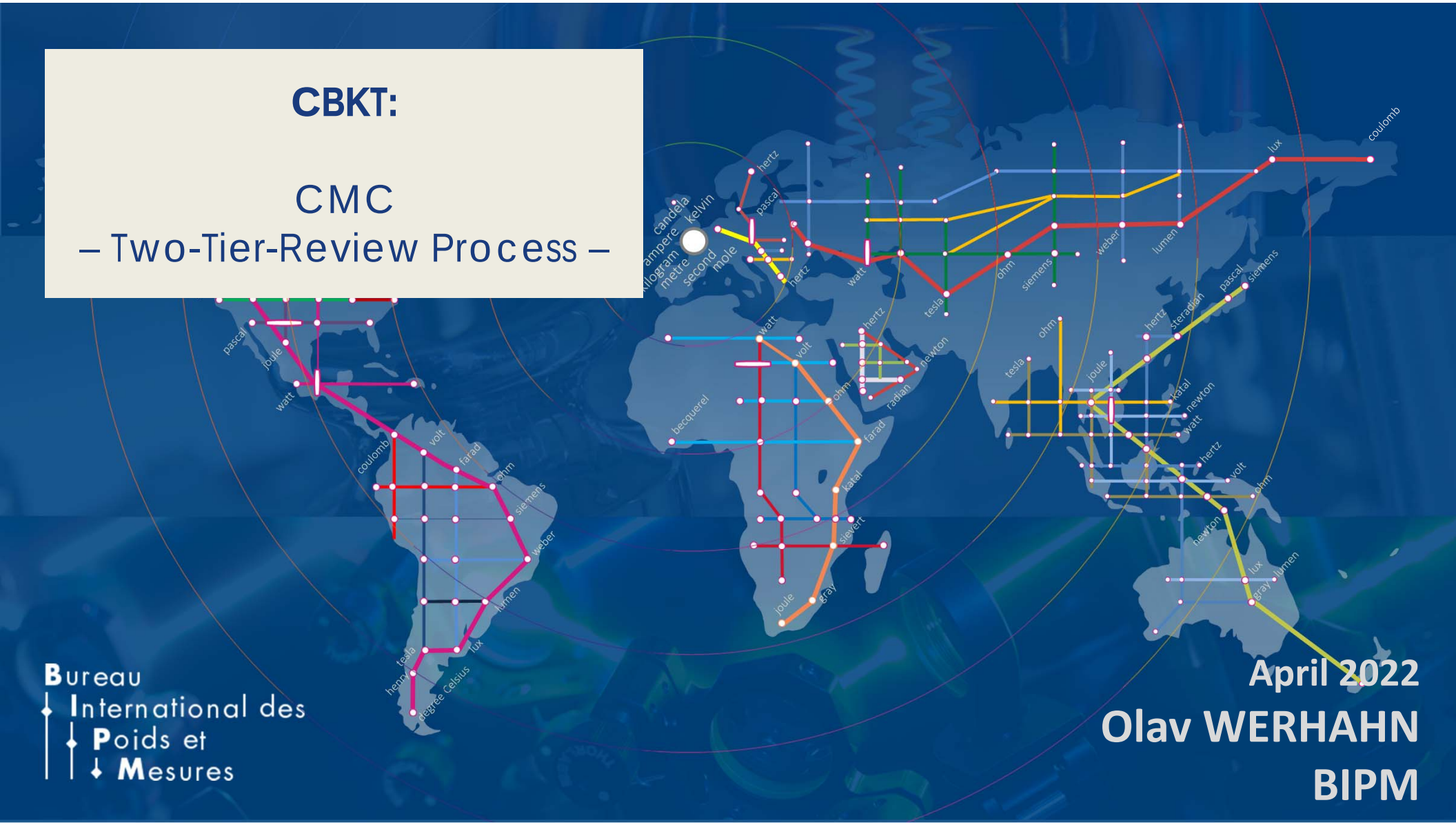
CBKT:

CMC
– Two-Tier-Review Process –



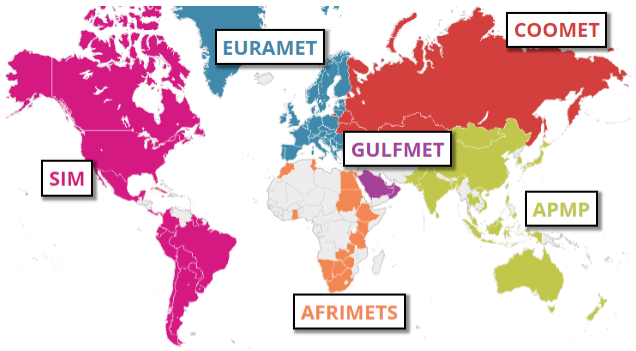
Bureau International des Poids et Mesures

April 2022

Olav WERHAHN
BIPM

Calibration and Measurement Capability

- Internationally recognized outcome of the CIPM MRA
- Measured quantity and associated measurement uncertainty
- Traceable to the SI
- Subject to open two-tier peer review process
- Backed up by technical evidence
- Supported by Quality assurance
- Published in the KCDB



Currently in the KCDB there are

252
CIPM MRA participants

1120
key comparisons

25714
CMCs

652
supplementary comparisons

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In the context of the CIPM MRA and ILAC Arrangement the common definition is:
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 Arrangement.

Calibration and Measurement Capability

HELD BY GULFMET PARTICIPANTS

Number of CIPM MRA participants:	6
Number of CMCs published in the KCDB:	39

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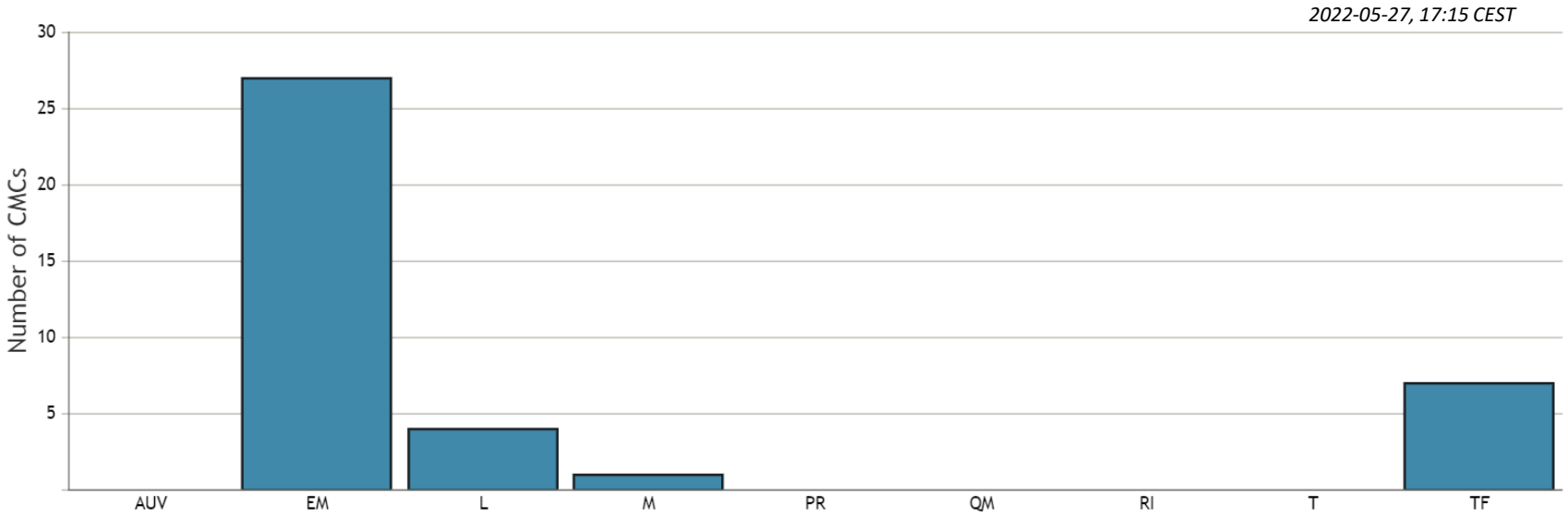
Calibration and Measurement Capability



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CMCs

- Are calibration and measurement capabilities available to customers under normal conditions
    - as published in the BIPM KCDB of the CIPM MRA; or
    - as described in the laboratory's scope of accreditation granted by a signatory of the ILAC Arrangement
- Shall reflect the services available to customers and shall not be artificially subdivided
- Institutes are encouraged to use the percentage of coverage of servic as a metric of success rather than the number of CMCs
- CMC declarations shall be self-consistent, and a CMC specification shall not depend on references to other services

CIPM MRA-P-11, Section 8
CIPM MRA-G-13, Section 1

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CMC specification

- Measurand
  - one per CMC with corresponding unit (e.g., mass rate and flow rate separately)
- Range
  - explicitly expressed
- Measurement uncertainty
  - as single value valid throughout the measurement range
  - as a range with the assumption of linear interpolation
  - as an explicit function of the measurand or a parameter, i.e., a quantity-based equation
  - in a table where entries depend on the measurand and other parameters

CIPM MRA-P-11, Section 8
CIPM MRA-G-13, Section 2

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Metrological traceability

Two options given:

- via a primary realization or representation of the unit of measurement → traceability declared to the institute's own demonstrable realization of the SI unit
- via another institute having relevant CMCs published in the KCDB or through services offered by the BIPM → traceability declared through the laboratory providing the service

references to accreditation laboratories, cf. NOTE 3!

CIPM MRA-P-11, Section 5
CIPM MRA-G-13, Section 3

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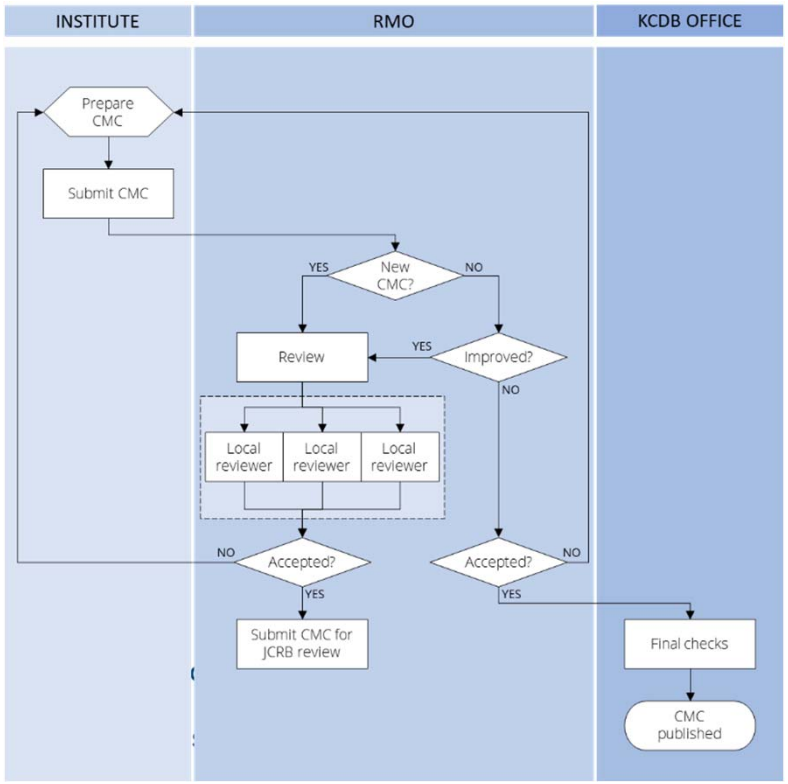
Open two-tier peer review

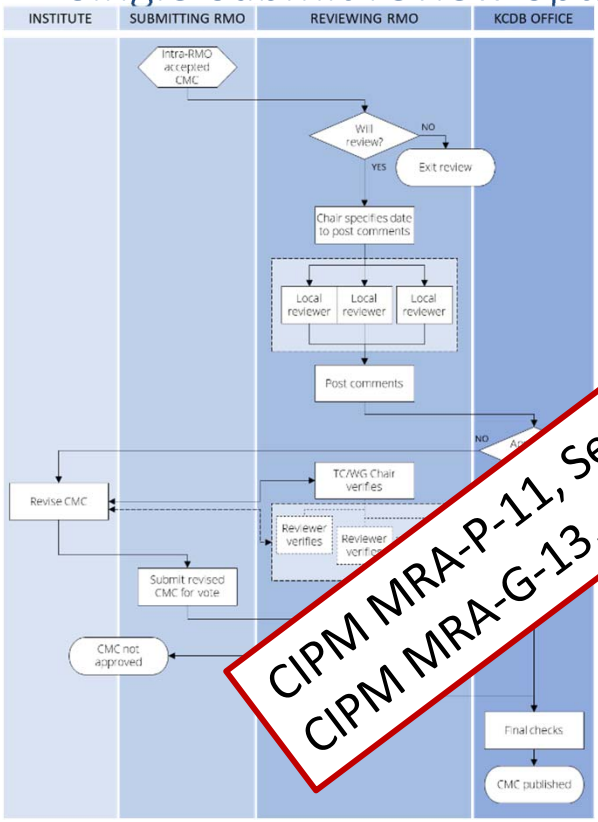
Intra-regional RMO review

- Locally organized
- Supported by KCDB



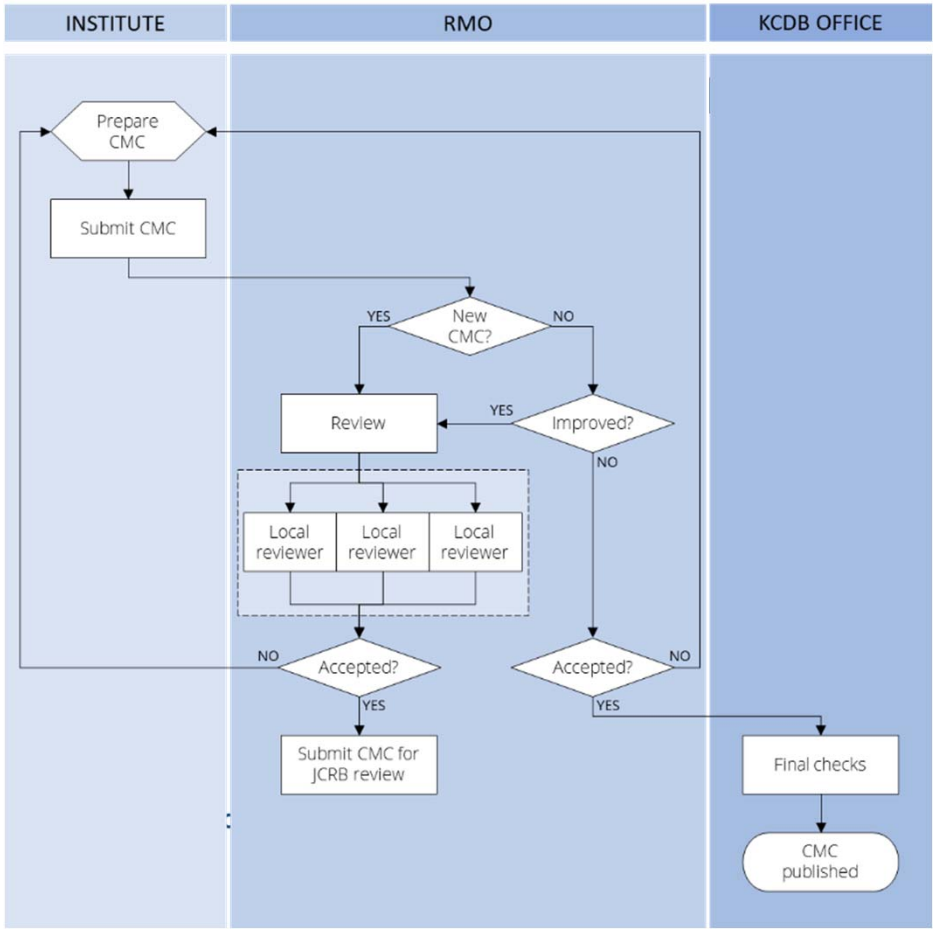
JCRB review

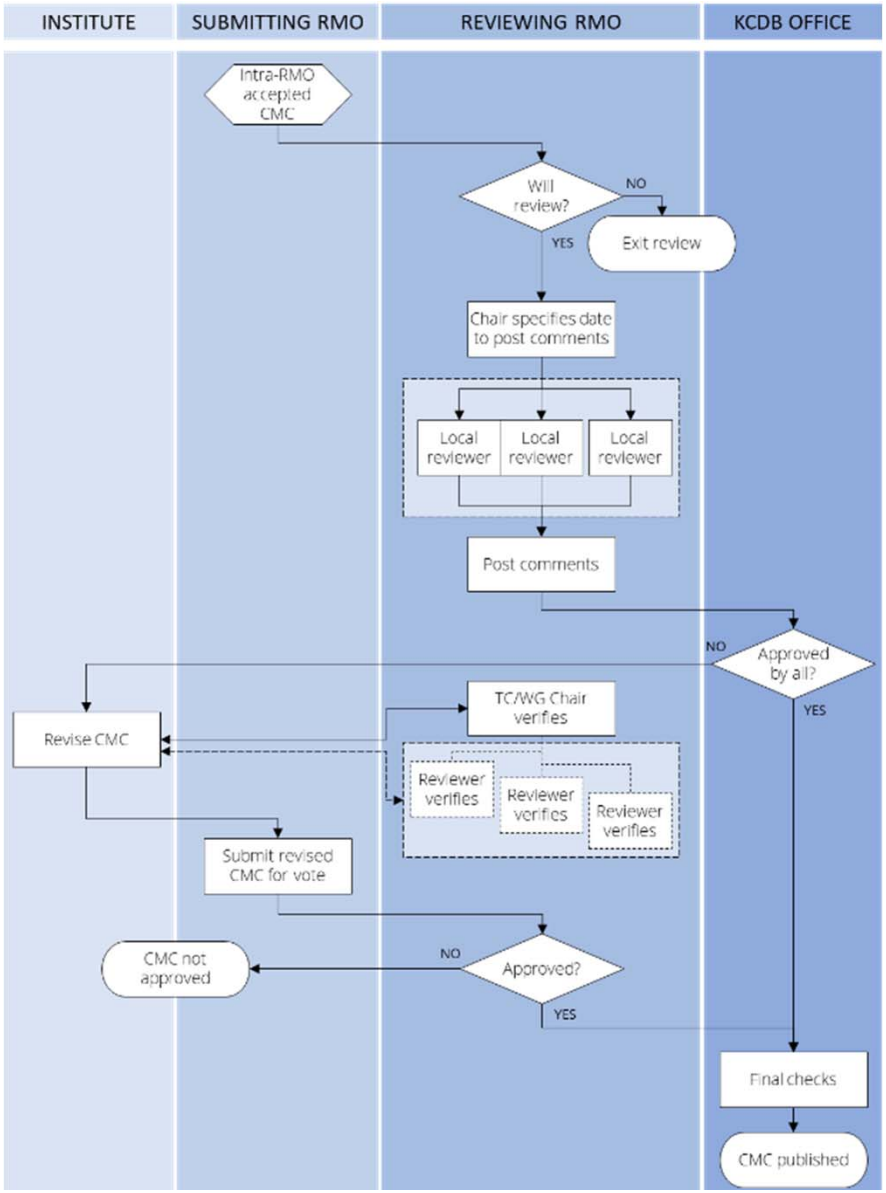
- Programmed deadlines
- Single-submit review option only



CIPM MRA-P-11, Section 8
CIPM MRA-G-13, Section 5

Two-tier review





Technical evidence

- Results of key and supplementary comparisons
- Publicly available information on technical activities including publications
- On-site peer-assessment reports, including those from accreditation assessment with appropriate technical peers
- Active participation in RMO projects
- Other evidence of knowledge and experience, as agreed by the appropriate Consultative Committee

~~CIPM MRA-P-11, Section 9~~
CIPM MRA-G-13, Section 3

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Quality assurance

Requirements for the quality management system

- ISO/IEC 17025:2017 for calibration and measurement services
- ISO 17034 for certified reference materials production

Requirements for establishing confidence

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

Evidence of approval by RMO to be submitted with the CMC
following the practice adopted by the RMO

CIPM MRA-P-11, Section 7
CIPM MRA-G-12

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Tier one: intra-RMO review

Each RMO is responsible

- for establishing the intra-RMO review
- assuring that CMCs from the RMO have sufficient technical support, and
- assuring that the CMCs are covered by a QMS in both ranges and uncertainties;

The intra-RMO review

- is technically supported by and performed on the KCDB 2.0 platform;
- does not have any CIPM MRA-required deadlines.

CIPM MRA-G-13
Section 5.1

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Tier one: intra-RMO review

The intra-regional review is completed when the RMO TC/WG has accepted the CMC and the RMO TC/WG QS Chair has confirmed that the ranges and the measurement uncertainties of the CMCs are fully covered by the quality management system of the institute submitting the claims.

CIPM MRA-G-13
Section 5.1

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Tier two: JCRB review

Each RMO TC/WG Chair after indicated interest to review is responsible

- for organizing the review in their region and
- should involve local reviewers (if considered necessary);
- are setting a deadline for the completion of the review in her/his region.

Each RMO should indicate whether they are interested or not to participate in the review.

The JCRB review

- is technically supported by and performed on the KCDB 2.0 platform;
- can only been pursued by an RMO if the expression of interest is made with
  week period.

CIPM MRA-G-13
Section 5.2

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Tier two: JCRB review

The JCRB review

- is technically supported by and performed on the KCDB 2.0 platform;
- can only been pursued by an RMO if the expression of interest is made within a 3-week period
- needs to be completed by an RMO within the period ending with deadline set by the RMO – after which the RMO's right to continue the review is relinquished.

CIPM MRA-G-13
Section 5.2

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Tier two: JCRB review

The JCRB review is completed

- when all reviewing RMOs have accepted a CMC.

The JCRB review is continued

- when at least one of the reviewing RMOs require revision, and
- the CMC has been made available to the Writer again for appropriate action.

A CMC revised by the Writer is possible to be re-submitted only once.

CIPM MRA-G-13
Section 5.2

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Tier two: JCRB review

A CMC revised by the Writer is possible to be re-submitted only once.

A revised CMC is submitted by the originating RMO TC/WG Chair for approval by the reviewing RMO TC/WG Chairs by

- voting *(as an additional step of action)*;
- within a voting period of 3 weeks.

A negative vote from one or more RMO(s) prevents approval of the CMC

CIPM MRA-G-13
Section 5.2

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JCRB review conducted through CC working groups

CIPM Consultative Committees have working groups to facilitate the JCRB review, with objectives to

- detail CMC content, as possible service categories, rules for entries of CMCs;
- agree on detailed technical review criteria;
- coordinate and/or conduct JCRB reviews;
- Provide guidance on ranges of CMCs supported by KCs/SCs;
- Coordinate the review of existing CMCs in the context of new results from KCs /

CIPM MRA-G-13
Section 7

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JCRB review conducted through CC working groups

CIPM Consultative Committees have working groups to facilitate the JCRB review that

- may establish own rules for coordinating the JCRB review on CMCs, but
- all should be processed on the KCDB 2.0 web platform.

For GULFMET's largest area of commitment, i.e. EM, CCEM holds these CC-specific guidelines: *Link*

CIPM MRA-G-13 Section 7

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CMC checklist

Metrological traceability of the national standard	Metrological traceability of supporting measuring instruments that contribute to the measurement uncertainty	Technical evidence	Quality assurance
• *via a primary realization or* • *via another NMI or DI having relevant CMCs with appropriate uncertainty published in the KCDB,* • *or through calibration and measurement services offered by the BIPM*	• *via NMI or DI having relevant CMCs with appropriate uncertainty published in the KCDB* • *or via laboratory accredited by accreditation body participating in the ILAC MRA* *Example A: calibration of instrumentation related to the conditions under which the calibrations were made.* *Example B: dimensions of the piston/cylinder for deadweight tester*	*CMC declarations must be backed by evidence. Acceptable evidence as per CIPM MRA-G-13* *Key and supplementary comparisons are the ideal supporting evidence*	*According to ISO/ IEC 17025 (ISO 17034 for CRM producers)* *Peer-Review and recognition according to the local RMO system*

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Modification of published CMCs

Primary responsibility for CMC validity lies with the institute making the claim. Four categories of modifications are identified:

- material or editorial errors to the explanatory text. *Intra-regional and JCRB reviews not required but changes need to be confirmed by local RMO TC/WG Chair.*
- voluntary updating by reducing range and/or increasing measurement uncertainty. *Intra-regional and JCRB reviews not required but changes need to be confirmed*.
- deviation from a comparison result, resulting in reduced range or increased measurement uncertainty. *RMO TC/WG Chair to verify sufficiency to assure equivalence of measurements.*

but

- change of method, reduction of measurement uncertainty or increase in scop
  Modifications shall follow the full procedure of intra regional and JCRB re
  CMCs.

CIPM MRA-P-11, Section 8
CIPM MRA-G-13, Section 8

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Thank you

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