

CBKT:

CMC - Writers/Reviewers

Bureau
International des
Poids et
Mesures

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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



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.

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 services by CMCs 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

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

Metrological traceability

Two options given:

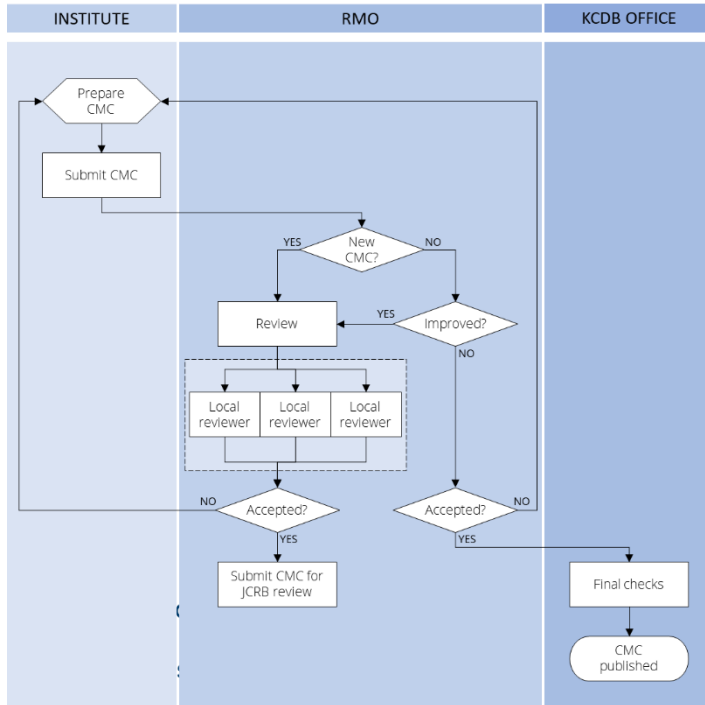
- via a primary realization or representation of the unit of measurement → traceability declared to the institute's own demonstrable realization of the SI unit
- via another institute having relevant CMCs published in the KCDB or through services offered by the BIPM → traceability declared through the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

references to accreditation laboratories, cf. NOTE 3!

Open two-tier peer review

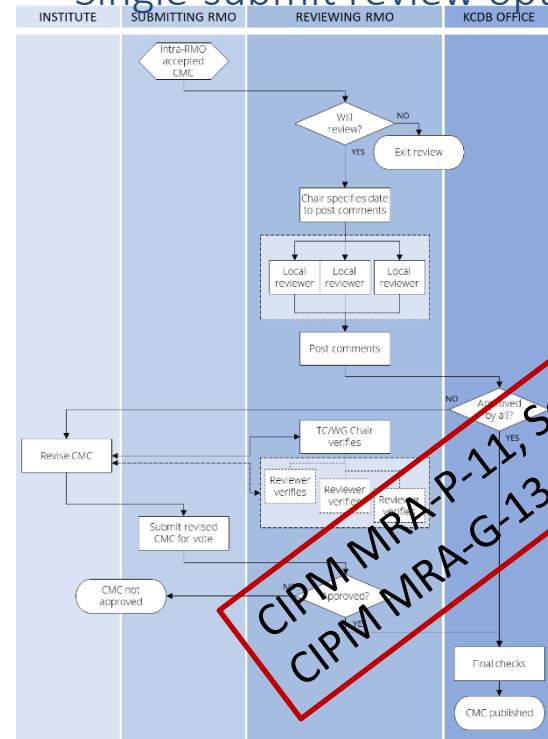
Intra-regional RMO review

- Locally organized
- Supported by KCDB



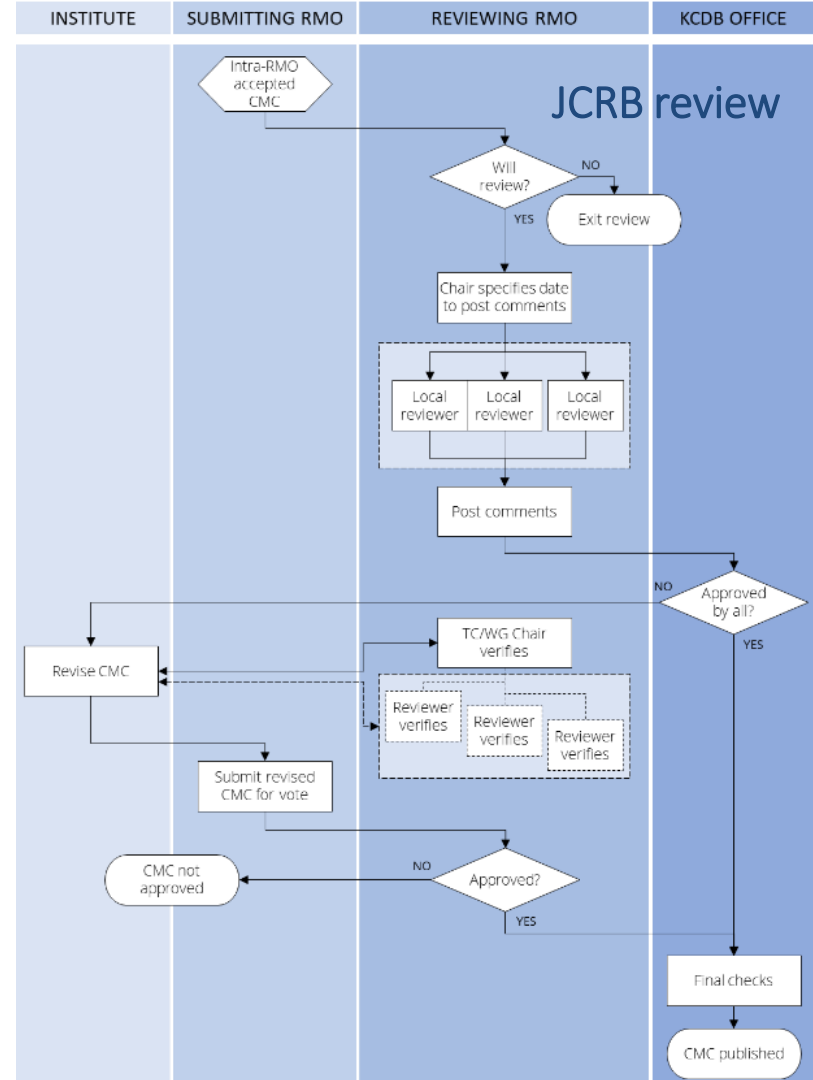
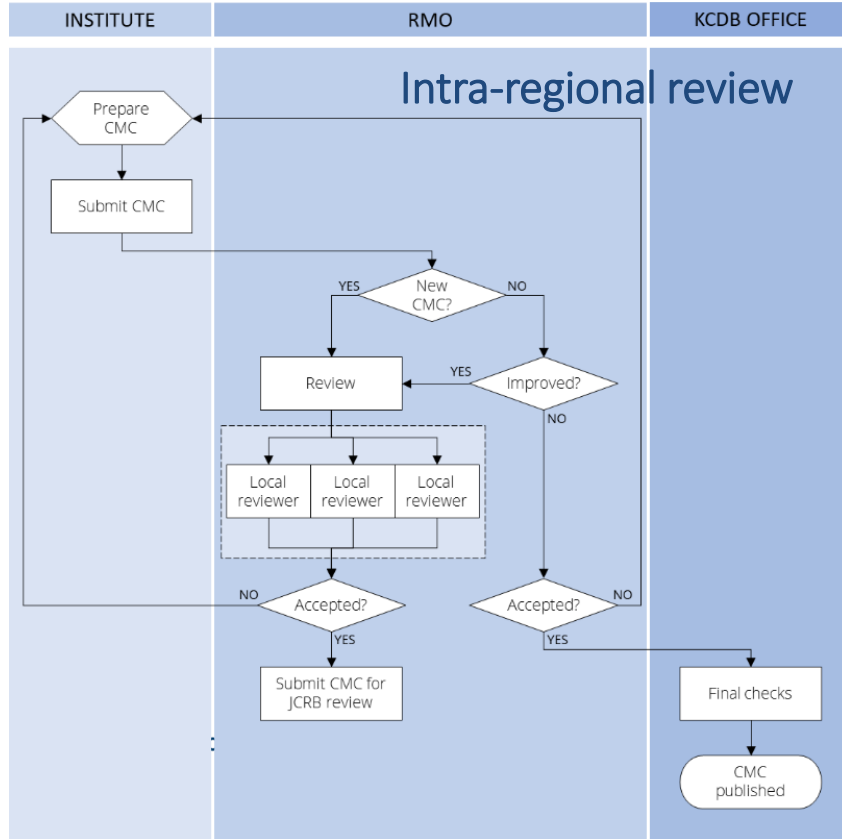
JCRB review

- 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
- ➡ The validity of results shall be monitored according ISO/IEC 17025
- ➡ Peer review and recognition according to the local RMO system in line with CIPM MRA-G-12
- Other evidence of knowledge and experience, as agreed by the appropriate Consultative Committee

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

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.*
 - **In view of i. new comparison results, or ii. temporal changes at the institute:**
 - voluntary updating by reducing range and/or increasing measurement uncertainty. *Intra-regional and JCRB reviews not required but changes need to be confirmed.*
 - **modifications** might be required
 - 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.*
 - **deletion of CMCs** could be appropriate
- but*
- change of method, reduction of measurement uncertainty or increase in score.
Modifications shall follow the full procedure of intra regional and JCRB reviews of CMCs.

CMC checklist

Metrological traceability of the national standard	Metrological traceability of supporting measuring instruments that contribute to the measurement uncertainty	Technical evidence	Quality assurance
<ul style="list-style-type: none"> • <i>via a primary realization or</i> • <i>via another NMI or DI having relevant CMCs with appropriate uncertainty published in the KCDB,</i> • <i>or through calibration and measurement services offered by the BIPM</i> 	<ul style="list-style-type: none"> • <i>via NMI or DI having relevant CMCs with appropriate uncertainty published in the KCDB</i> • <i>or via laboratory accredited by accreditation body participating in the ILAC MRA</i> <p><i>Example A: calibration of instrumentation related to the conditions under which the calibrations were made.</i></p> <p><i>Example B: dimensions of the piston/cylinder for deadweight tester</i></p>	<p><i>CMC declarations must be backed by evidence. Acceptable evidence as per CIPM MRA-G-13</i></p> <p><i>Key and supplementary comparisons are the ideal supporting evidence</i></p>	<p><i>According to ISO/ IEC 17025 (ISO 17034 for CRM producers)</i></p> <p><i>Peer-Review and recognition according to the local RMO system</i></p>

Thank you

Calibration and measurement capabilities in the context of the CIPM MRA

Guidelines for their review,
acceptance and maintenance

CIPM MRA-G-13

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