BIPM

Calibration and Measurement Capabilities (CMCs)

The tangible outcomes of the CIPM MRA

When a country's metrology institutes participate in the CIPM MRA, they can demonstrate their measurement capabilities to the international measurement community by publishing their own CMCs in the BIPM key comparison database (KCDB). CMCs enable countries around the world to recognize each other's measurement standards and calibration certificates, utilizing a common platform for measurement services that allow them to find the optimal solution for their needs.

What is a CMC?

A CMC is a calibration and measurement capability made available to customers of an institute, provided under normal conditions (i.e., not a special, once-only calibration at better than documented uncertainties). A CMC has the same meaning in the context of the CIPM MRA as it does in the context of the ILAC Arrangement[1]. More than 250 institutes participating in the CIPM MRA have published over 25 000 individual peer-reviewed CMCs. The countries to which the CMC holders belong cover approximately 98 % of the world's GDP. By publishing CMCs, an institute joins an extensive system of capabilities, and adheres to a common understanding of the way those capabilities are expressed.

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Components of a CMC are the *measurand* (for example, measured quantity such as mass), and associated *measurement uncertainty*, for a given *range*, *method* or *measurement* used, and values of the *influencing parameters*. Backed up by their corresponding CMCs, the National Metrology Institutes (NMIs) demonstrate their measurement capabilities; for example, measurements of time intervals of 24 h can have an uncertainty of just a few nanoseconds, or mass measurements of 1 kg can have an uncertainty of a few tens of micrograms. Data, proper nomenclature and terminology of expression can be found in the KCDB for the published CMCs of each measurand, as well as in guidance documents on the BIPM website.

The CIPM MRA has provision for certified reference materials (CRMs) to be listed in the KCDB. One or more CRMs may be included in association with chemistry/biology and radionuclide metrology CMCs that are directly related to the ability of the institute to characterize and assign traceable values to CRMs.

What are the benefits of holding a CMC in a certain measurement area, and why should you publish CMCs?

Holding CMCs will benefit many parties within a country: the government; business, industry, and manufacturers; regulators; and even citizens as they can infer from the published CMCs what level of measurement quality can be achieved in the country. With published CMCs, the NMI helps to address measurement challenges in your country. The international standard ISO/IEC 17025, used by tens of thousands of laboratories world-wide, identifies CMCs that are published in the KCDB, as one of the internationally accepted paths for demonstrating metrological traceability.

CMCs demonstrate and strengthen the technical competence of NMI staff based on the rigorous approval process, placing them on a common footing with other institutes around the world that publish CMCs. The NMI will be required to engage with its Regional Metrology Organization (RMO) technical and quality committees during the CMC review process, which will provide opportunities to establish relationships with technical experts around the world as well as providing opportunities for knowledge transfer.

NMIs can develop stronger stakeholder relationships with their nation's government, business and scientific community through the measurement services they provide with their CMCs. Understanding the needs of stakeholders enables the NMIs to optimize their national measurement service programmes, including the selection of the national measurement standards on which these programmes rely.

[1] *The ILAC Mutual Recognition Arrangement (ILAC MRA)*

For more information:

BIPM website: https://www.bipm.org/en/

CIPM MRA documents: https://www.bipm.org/en/cipm-mra/cipm-mra-documents

CIPM MRA-G-13 'CMCs in the context of the CIPM MRA: Guidelines for their review, acceptance and maintenance'

KCDB: https://www.bipm.org/kcdb/