



Consultative Committee for Length

Ismael Castelazo, CCL President

November 2022

A large, colorful graphic on the right side of the slide, consisting of multiple concentric, overlapping circular bands in a rainbow spectrum (red, orange, yellow, green, blue, purple, red). The bands are slightly offset from each other, creating a sense of depth and movement.

Working together to
promote and advance
the global comparability
of measurements



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A decorative graphic on the right side of the slide, consisting of multiple overlapping, concentric arcs in a rainbow color palette (red, orange, yellow, green, blue, purple, magenta). The arcs are arranged in a circular pattern, creating a sense of depth and movement.

27^e réunion de la
Conférence générale
des poids et mesures

Overview

CCL membership and meetings

Global forum for progressing the state-of-the-art

- *Metrologia* Focus Issue on Length

Facilitating dialogue between NMIs and stakeholders

- CCL Digitalization

Global comparability of measurements

- CCL Guidance on CMCs and comparisons

- CCL KC Portfolio

Standards organizations, accreditors and regulators

- CCL liaison with ISO/TC 213



CCL membership and meetings

CCL: 25 Members, 6 Observers

Since the last CGPM, the CCL community welcomed the following participants:

- NIS (Egypt) Member
- GUM (Poland) Observer
- INTI (Argentina) Observer
- NIMT (Thailand) Observer
- NSC IM (Ukraine) Observer

25-27 October 2021: 18th meeting of the CCL (Virtual meeting).

CCL WGs met regularly over the last few years.

The next CCL meeting will be in 2024.



Global forum for progressing the state-of-the-art

- Focus Issue of *Metrologia* on Length
 - 16 papers published
 - (13,900) downloads and (26) citations so far
- Improved *mise en pratique*, including silicon lattice and laser routes.
- Nano-scale metrology.
- Spectral and double-ended interferometry.
- State-of-the-art angle metrology.
- Metrology of X-ray computed tomography.
- A digital framework for realising the SI metre.

Focus Issue on Length Metrology

Guest editors

Andrew Yacoot, *National Physical Laboratory***

Andrew Lewis, *National Physical Laboratory*

Scope

As part of the 2019 redefinition of the SI, the definition of the metre was updated alongside those of the six other base units. At the same time, a substantial change was made to the recommended ways of realising the SI metre in practice (the so-called '*Mise en Pratique*') with more explicit guidance given on using the time of flight (frequency, speed) and interferometric (wavelength) methods together with the addition of new traceability routes for dimensional nanometrology, via the silicon lattice parameter.

In collaboration with the President of the Consultative Committee for Length, the journal *Metrologia* is organising a *Focus Issue on Length Metrology* to highlight recent developments in fundamental length metrology and its applications. Papers can be submitted for publication at any time up until the cut-off date; reviewed papers will be published online (with DOI) immediately after completion of the refereeing process and added to the Focus Issue which will be finalised later.

For this Focus Issue, contributions are requested which deal with latest research in traceable dimensional and angle metrology, across all length scales, in particular papers which fulfil one or more of the following criteria:

- report on novel research into providing traceability to the SI metre
- describe work which benefits from the revised metre definition and updated *Mise en Pratique*
- show research being used to address issues and applications in industrial measurement scenarios relating to fundamental traceability
- make contributions to the accuracy of the length-related component of derived units like pressure, acceleration or other units with a length-related component
- report on novel contributions to length-related constants that are of fundamental importance to physics.

The focus issue will be edited by Andrew Yacoot and Andrew Lewis from the National Physical Laboratory. Standard *Metrologia* submission and review processes will apply.

Please inform one of [Andrew Lewis](#), [Andrew Yacoot](#) or [Sten Bergstrand](#) in first instance if planning to submit a paper to this special issue.



Facilitating dialogue between NMIs and stakeholders

CCL Digitalization:

- Pilot survey on the digitalization of the SI metre
- Collaboration with the BIPM to develop an API for the standard frequencies of Annex 2 of the SI Brochure for a possible digital calibration certificate.

Instrument manufacturers and end users

- Major industrial stakeholders include aerospace, automotive and semiconductor manufacturers but dimensional metrology touches every aspect of manufacturing
- “MacroScale” and “NanoScale” conference series
- Presentations from equipment manufacturers, some end-users and other stakeholders



CCL Survey - Digitalized SI metre

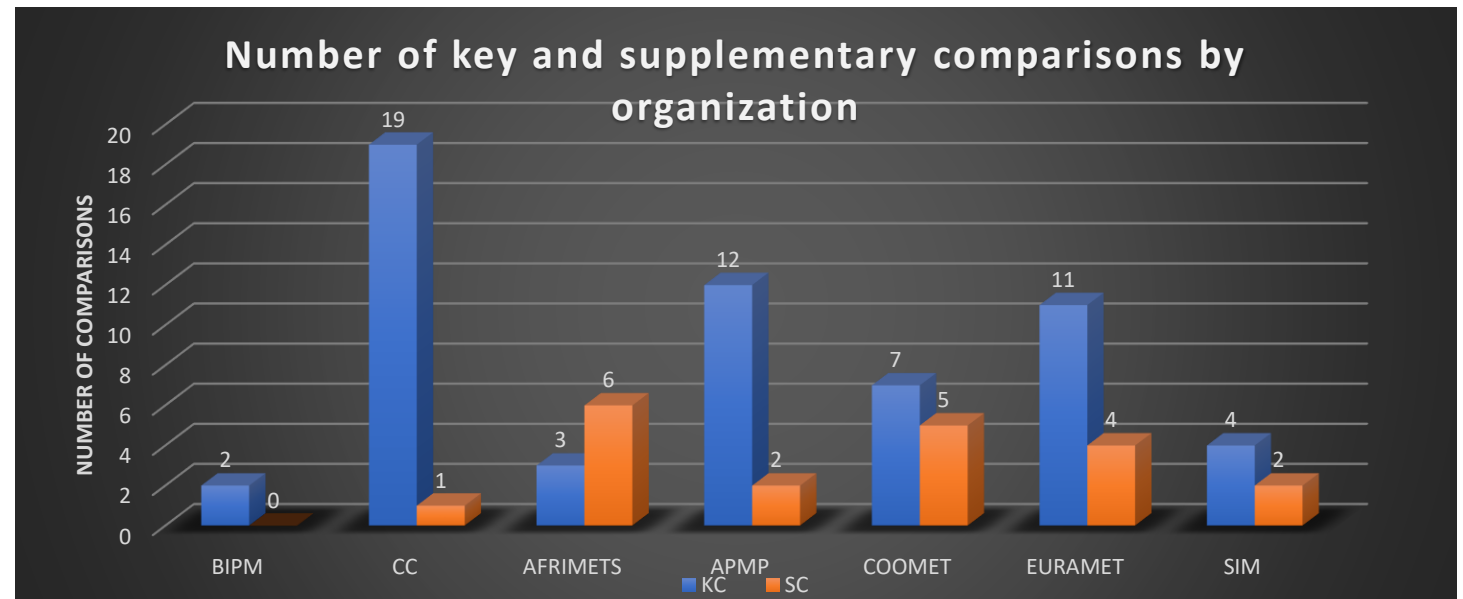
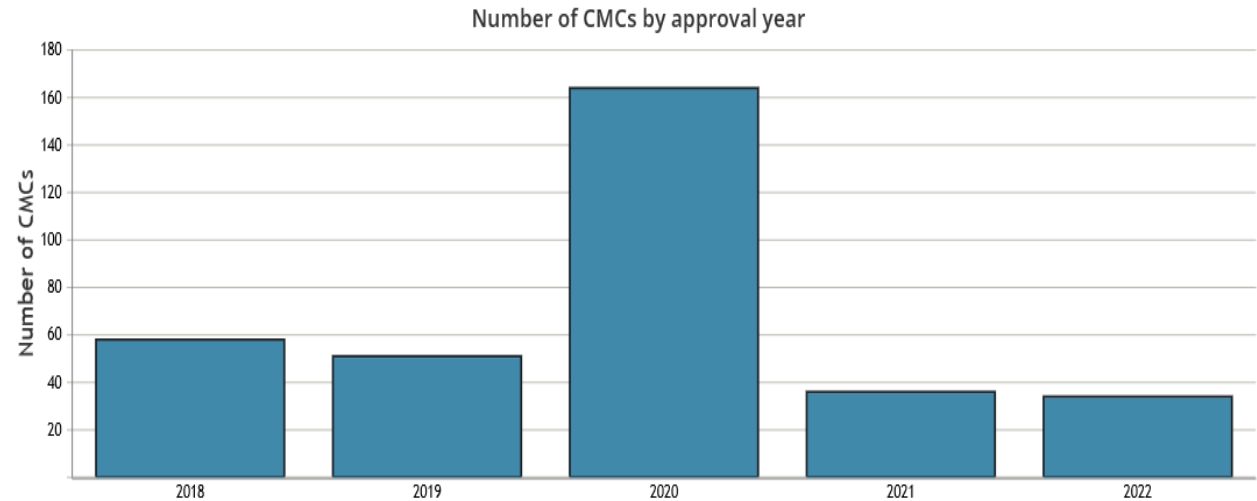
This survey is addressed to CCL members to investigate on aspects of a 'digital SI metre' to introduce the discussion on the meaning of 'Digitalization of the SI metre', on the use of it and on how it might benefit all stakeholders in the SI.



Global comparability of measurements

A comparison portfolio based on dimensional metrology techniques

Nine key comparisons test the principal techniques required by a competent dimensional metrology laboratory



Guidance on CMCs and comparisons

Approved guidelines:

- CCL-GD-08 entitled ‘CMCs on frequency stabilized lasers’
- CCL-GD-07 on List of Good Practice Guides and similar sources of information in length metrology

<https://www.bipm.org/en/committees/cc/ccl/publications>

Approved new CCL-K11 protocol document

Revision of the coding scheme used for numbering comparisons undertaken in the CIPM MRA



Guidance documents on the CIPM MRA

[CCL] CCL-GD-1
Running of MRA comparisons in length metrology and monitoring their impact on CMCs (V8)

[CCL] L - Classification of services in Length - DimVIM

[CCL] CCL-GD-2
Comparison scheme applied in dimensional metrology

[CCL] CCL-GD-3
Guide to preparation of Key Comparison Reports in Dimensional Metrology

[CCL] CCL-GD-3.1
KC Technical Protocol Template

[CCL] CCL-GD-3.2
KC Report Template

[CCL] CCL-GD-3.2b
Bilateral Report Template

[CCL] CCL-GD-3.3
Executive Report Template

[CCL] CCL-GD-4
KC Planning V1.51

[CCL] CCL-GD-5
Guide to formatting CMC entries (DimVIM Guide) and to their inter-RMO review

[CCL] CCL-GD-6
CMCs of category Standards of 1D point-to-point dimensions

[CCL] CCL-GD-8
CMCs on frequency stabilized lasers - Guidelines

[CCL] Example Excel file for comparison analysis

[CCL] Example Excel file for comparison analysis of linked-loop comparisons

[CCL] WGMRA Comparison progress report template

Guidance documents - Other

[CCL] CCL-GD-7
List of good-practice guides and similar sources of information in Length Metrology

Standards organizations, accreditors and regulators

- **Standards organizations**

ISO/TC 213 is responsible for the ISO-GPS (Geometrical Product Specification) system of standards

A **liaison between CCL and ISO/TC 2013** has been formalized

CCL members play a major role in national, international and industry-based standards organizations

- **Accreditors and regulators**

CCL technical decisions are used by members, observers and liaison organizations to support accreditors and regulators

Outlook

A new Task Group has been created to discuss the format of laser frequency data for submission to the CCL-CCTF-WGFS, taking into account the needs of the digitalized SI metre initiative.

Migration of CMCs in quantity equations is in progress.

The CCL works to optimize the NMI's work for the CIPM MRA in a permanent way.