TC Chair Annual Report 2022 - 2023

TC for Length (L)
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1. General Aspects

EURAMET TC-L currently has contact persons from **34 EURAMET members** and **6** named observers: 1 from a DI, 3 from liaison NMIs (EG, KZ, ZA) and 2 from liaison organizations (BIPM, COOMET). In the last online/physical hybrid meeting held at NPL in Oct. 2022, TC-L had 46 participants, out of which 14 contact persons present and 17 online; 1 observer present (SA) and 2 online (DK, UA); 4 guests present and 8 online (AT, DK, KZ, LT, RO, SA, SI, TR, 2 UK, 2 EURAMET Officers).

2. Projects

In the period under review 17 projects were active with status “in progress”, 9 of them being MRA comparisons, the last one of these (#1581) proposed and agreed at the last 2022 TC-L meeting.

Proj. No.	Starting	Title	Coordinator	Status	Type	KCDB
1239	2013-08-01	Measurement of surface roughness by AFM	PTB	in progress* circulation complete, aiming to close soon	Research	
1242	2013-09-01	Measurement of areal roughness parameters	PTB	in progress* new draft A2 circulated	Research	
1433	2018-01-01	Measurement of Steel Tapes of 10 m and 50 m	PTB	in progress* draft A2 circulated	Comparison	EURAMET.L-S27
1488	2020-06-01	Measurement of a 1 mm Stage Micrometer	BEV	in progress draft A	Comparison	EURAMET.L-S29
1490	2020-04-01	High precision flatness over 300 mm	PTB	in progress* running	Comparison	EURAMET.L-S28
1495	2020-02-01	Dissemination and verification of dimensional nanometrology technologies	NPL	in progress MST publication 2023	Research	
1502	2020-03-01	Calibration of surface roughness standards	PTB	in progress running	Comparison	EURAMET.L-K8.2020
1513	2020-11-01	Supplementary comparison on calibration of a transducer 60 mm	MIRS/UM-FS/LTM	in progress Measurements completed	Comparison	EURAMET.L–S31
1527	2021-06-01	Key comparison on calibration of angle standards	INRIM	in progress partly delayed, split reports	Comparison	~~EURAMET.L-K301~~ EURAMET.L-K3.n01;

						EURAMET.L-K3.n01.1
1528	2021-09-01	Pilot study on calibration of angle encoders	INRIM	in progress planning/running	Comparison	
1545	2022-07-01	Key comparison on gauge block measurement by interferometry	NPL	in progress to commence in July	Comparison	EURAMET.L-K1.n01
1547	2022-07-01	Key comparison on calibration of 1-D CMM artefacts: Step Gauges	GUM	in progress running	Comparison	EURAMET.L-K5.n01
1572	2022-10-13	EURAMET Technical Guide on GNSS distance metrology	PTB	in progress under review	Research	
1573	2022-11-18	Revision of EURAMET Calibration Guide No. 6 Cylindrical Diameter Standards	CEM	in progress submitted	Consultation	
1575	2022-10-14	Revision of EURAMET Calibration Guide No.2 on Calibration of Gauge Block Comparators	NPL	in progress submitted	Consultation	
1581	2023-03-08	Supplementary comparison on gauge block calibration by mechanical comparison	Metrosert	in progress to commence in July	Comparison	EURAMET.L-S2.2.n01
1584	2022-11-11	Revision of EURAMET Calibration Guide No.10 Pitch Diameter of Parallel Thread Gauges by Mechanical Probing	METAS	in progress	Consultation	

(*) Projects originally involving Russian institutes. Aligned with EURAMET's position in response to the war in Ukraine, cooperation with Russia in these projects has either been terminated or indefinitely suspended by the EURAMET participants as they have best seen fit.

Two long-term projects related to conference series are organized by TC-L at different locations, with colleagues from PTB serving as main contact. These triannual conferences collect length metrology researchers globally from NMIs, academia and industry.

- **EURAMET #1342 NANOSCALE** conference series

The latest Nanoscale took place at PTB Braunschweig in October 2019 with more than 100 participants from 25 countries and 5 continents. Next Nanoscale will be organized by MIKES in Helsinki in October 2023, one year later than usual.

- **EURAMET #1343 MACROSCALE** conference series

Macroscale 2020 was originally scheduled for Nov. 2020 in South Africa, organized by NMISA. However, this was first postponed to 2022 due to Covid-19 and later re-scheduled to 2025 to allow for preparations and getting back in rhythm with CCL meetings and Nanoscale conferences.

3. Comparisons

In 2021, CCL adopted a new coding scheme for length metrology Key and Supplementary Comparisons, utilizing provisions offered in section 5.1 of the CIPM-MRA-G-11. The 2021+ comparison coding scheme was designed to better communicate the sequence of Key Comparisons as well as the topic of Supplementary Comparisons (by using a number related to the DimVIM instead of a sequential count). The coding is detailed in Appendix A to the CCL-GD-1 guidance document.

3.1 Key Comparisons

The current status of EURAMET length key comparisons in line with the CCL-KC. Changes since the last GA meeting are marked in red in the status column.

Designation	Description	Status
EUROMET.L-K1	Gauge blocks	KCDB
EUROMET.L-K1.1	Gauge blocks	KCDB
EURAMET.L-K1.2	Gauge blocks	Published, KCDB
EURAMET.L-K1.2011	Gauge blocks	Published, KCDB
EURAMET.L-K1.2019	Gauge blocks	Published, KCDB
EURAMET.L-K1.n01	Gauge blocks	Measurements start July
EUROMET.L-K2	Long gauge blocks (now in L-K1)	Published, KCDB
EUROMET.L-K3.1	Optical polygons	Published, KCDB
EURAMET.L-K3.2009	Angle comparison using autocollimator	Published, KCDB
EURAMET.L-K3.2009.1	Angle blocks	Published, KCDB
EURAMET.L-K3.2009.2	Angle comparison using autocollimator	Published, KCDB
~~EURAMET.L-K3.01~~ EURAMET.L-K3.n01	Angle standards, separated into main and subsequent comparison	Measurements completed
EURAMET.L-K3.n01.1	Angle standards	Running
EUROMET.L-K4.2005	Outer diameter standards	Published, KCDB
EURAMET.L-K4.2005.1	Outer diameter standards	Published, KCDB
EURAMET.L-K4.2015	Diameter standards	Published, KCDB
EUROMET.L-K5.2004	Step gauge	Published, KCDB
EURAMET.L-K5.2016	Step gauge	Published, KCDB
EURAMET.L-K5.n01	Step gauge	Running
EUROMET.L-K6	2D CMM artefacts (discontinued)	Published, KCDB
EUROMET.L-K7.2006	Linescales	Published, KCDB
EURAMET.L-K7.2014	Linescales	Published, KCDB
EURAMET.L-K8	Surface texture - roughness	Published, KCDB
EURAMET.L-K8.2013	Surface texture - roughness	Published, KCDB
EURAMET.L-K8.2020	Surface texture - roughness	Running

3.2 Supplementary Comparisons

Recently active supplementary comparisons:

Designation	Description	Status
EURAMET.L-S26.1	Depth of V-shaped grooves	Published, KCDB
EURAMET.L-S27	Length of stainless steel tapes	Report in progress, draft A
EURAMET.L-S28	Flatness of surface plates	Measurements in progress
EURAMET.L-S29	1 mm stage micrometer	Report in progress, draft A
EURAMET.L-S30	Roundness in the equator of two alumina spheres	Published, KCDB
EURAMET.L-S31	Transducer displacement error	Measurements completed
EURAMET.L-S2.2.n01	Gauge block by mechanical comparison	Measurements start July

3.3 Corrective actions due to insufficient performance in KC/SC

CCL guidance is that so-called executive reports are made after each KC/SC by pilot and accepted by participants and RMO/CCL. In these reports those laboratories with problems to demonstrate their CMC capability are listed and the nature of the problem is explained. If corrective actions have been performed they are also listed. In the annual TC-L meetings any pending issues are discussed. A table is maintained and updated by TC-L where all corrective actions are listed. The DECISION CCL 2 (2015) – '*Procedure for discrepant result corrective actions*' describes the responsibilities: 'the NMI proposes corrective actions which are agreed by the RMO (e.g. TC-L) within 90 days, informs the pilot of these (for inclusion in the Executive Report) and then implements them'.
Since 2006 until now 13 corrective actions took place. The last two were closed in October 2018. Since then no new action have been opened.

4. CMCs

Year	Comment	Status
2020	715 CMCs / 30 countries (reformatted)	Published
2021	12 CMCs / 4 countries	Published
2022	27 CMCs / 8 countries	Published
2023	12 CMCs / 4 countries	In process

5. Activities of the Subcommittees

There are no sub-committees in TC-L.

6. Participation in EMPIR/Metrology Partnership

Length related accepted JRPs of EMPIR 2014, 2015 and 2016 have been completed. The ones of 2017, 2018, 2019 and 2020 where progress was made in the reporting period are listed below. TC-L regrets to not yet have any representation in the Metrology Partnership programme, and an online workshop was organized on 12 January to stand stronger in preparations, primarily for the Industry call in 2023.
Changes to statuses since last year's report year are indicated in red.

Call	Project name	Status
EMPIR 2017 *Industry*	Large Volume Metrology Applications	Final report published
EMPIR 2018 *Health*	Standardization of concentration measurements of extracellular vesicles for medical diagnosis https://www.metves.eu/	Final report published
EMPIR 2018 *SI Broader Scope*	Large scale dimensional measurement for geodesy https://www.ptb.de/empir2019/geometre/home/	Final report published
EMPIR 2018 *Normative*	Measurements of the focal spot size on x-ray tubes with spot sizes down to 100 nm https://www.ptb.de/empir2019/nanoxspot/home/	In progress
EMPIR 2018 *Research potential*	Traceability for contact probes and stylus instrument measurements http://www.probetrace.org/	In progress
EMPIR 2019 *Supp. for Networks*	Support for a European Metrology Network on advanced manufacturing	In progress
EMPIR 2019 *Energy*	High throughput metrology for nanowire energy harvesting devices https://www.ptb.de/empir2020/nanowires/home/	In progress
	Metrology for enhanced reliability and efficiency of wind energy systems https://www.ptb.de/empir2020/met4wind/home/	In progress
EMPIR 2020 *Industry*	DynaMITE: Dynamic applications of large volume metrology in industry of tomorrow environments (follow-on to the LaVA project which has already attracted many stakeholders)	In progress
	TracOPTIC: Traceable industrial 3D roughness and dimensional measurement using optical 3D microscopy and optical distance sensors	In progress
	MetExSPM: Traceability of localised functional properties of nanostructures with high speed scanning probe microscopy	In progress
	ATMOC: Traceable metrology of soft X-ray to IR optical constants and nanofilms for advanced manufacturing	In progress
EMPIR 2020 *Fundamental*	POLight: Pushing boundaries of nano-dimensional metrology by light	In progress
Metrology Partnership 2021 *Green Deal/ Normative*	No projects related to Length	

7. Capacity Building: Activities of the last year and future needs

Tanfer Yandayan from TUBITAK UME, TR, is the TC-L contact person in charge of capacity building issues since summer 2016. Tanfer regularly informs TC-L contacts about the RPOT and RMG calls and other capacity building instruments.
At the TC-L meeting in October 2022, some (non-MRA related) capacity building issues were raised and transferred for further communication between individual institutes.

8. Meetings

The following lists the TC-L meetings and related activities over the last 3 years:

- 2020 TC-L plenary, 12–13 October 2020, DFM, Copenhagen, Denmark. Online.
- 2021 TC-L plenary, 19–20 October 2021, MBM, Podgorica, Montenegro. Online.
- 2022 TC-L plenary, 12–13 October 2022, NPL, Teddington, United Kingdom. Hybrid. The annual meeting was preceded by the EMN Advanced Manufacturing annual meeting and open Strategic Research Agenda Workshop 10–11 October.

9. Issues

While the new KCDB is a helpful and transparent tool for the administration and review of CMCs, TC-L notices that the planning, review, and follow-up of comparisons is still largely done in the traditional way. As an example, the length community plans comparisons and mandates participation in them through CCL-GD-4 **KC Planning** (current version 1.61 [sic!] openly available at https://www.bipm.org/en/cipm-mra/cipm-mra-documents/cc-specific) while drafts and reviews are still sent manually by email. Moreover, since participation in the seven active length key comparisons are often shared between RMOs and a re-confirmation is expected every ten years, an automated monitoring of institutes' participation in appropriate comparisons would be helpful for planning comparisons and to ensure the validity and vitality of CMCs in accordance with the CIPM MRA.
Provided we haven't missed an evolution, TC-L therefore proposes that EURAMET seeks to enhance the KCDB support for comparisons.

10. Strategic Planning

The EMN on Advanced Manufacturing is progressing. The EMN covers metrology in several key industry sectors (KIS) and relates technical activities of the TC-L with many other fields through its horizontal coverage. In cooperation with a wide range of stakeholders, a strategic research agenda is under development (updated details available on https://www.euramet.org/european-metrology-networks/advanced-manufacturing/strategic-research-agenda).
The *Metrologia* Focus issue on Length Metrology reported on in last year's report was finalized in January 2023 with 10 contributions involving representatives from EURAMET length labs. Particularly interesting for strategic development is "A digital framework for realising the SI—a proposal for the metre" by Lewis et al., which presents a generic digital framework for measurements implemented at the point of realisation and metrologically traceable to the SI definition of the base unit. The work to extend this proposal to a functional service continues, and a preliminary version was presented at the BIPM online briefing on the establishment of a Forum for Metrology and Digitalization on 22 May.

11. Outlook for 2023/2024

Several initiatives for this year's Metrology Partnership call were identified at the workshop in January, and preparations for the call are currently underway.
Two new comparisons are about to start measurements in July and at the time of finalizing this report, Ukraine has reached out to participate in the EURAMET.L-K1.n01.
Hosted by VTT-MIKES in the week starting 9 October, the annual TC-L meeting will be coordinated with the Nanoscale conference and CCL WG meetings.