



TC Length: Highlights and Challenges

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Metrological Challenges for TC-L

Both, the definition and the realization of the unit, are in a highly-developed state today. It is hard to envisage that the uncertainty of the unit (some 10^{-14}) can ever be a limiting factor for real dimensional measurements (at least on this earth)

Small problem on how to compare CMCs for the primary standards to this uncertainty after closing of BIPM.L-K11 → solution CCL-K11 (and accompanying measures)

Real demands are coming from the user-side. In its 4 iMERA roadmaps the length community identified the most needful targets.





Metrological Challenges for TC-L

Dimensional metrology for advanced manufacturing technologies

Robust and traceable dimensional metrology. Short range (0.01 mm to 10 mm) uncertainties ~ 5 nm, larger range (up to 10 m) $U < 10^{-6}$ in the production environment. Automatic uncertainty evaluation, fast in-process metrology

Dimensional metrology for long-term fundamental research

kg (both routes), k_B (DCGT and acc.), cd (aperture), space metrology and positioning capabilities, nanoangle metrology





Metrological Challenges for TC-L

Dimensional metrology for micro- and nano- technologies

traceable counting, size, shape of nanoparticles 1 nm, traceable 2D(3D) metrology at sub-nm uncertainty over several 100 mm

Long range dimensional metrology

10 m up to few km, large scale production, global monitoring, waste management, traceable verification of global mapping systems at 10^{-6} and 10^{-8} 1D over long range in air.





Participation in iMERA+ / EMRP

In the period reported, TC-L had a lot work with the preparation regarding TP3 of the EMRP. The aforementioned challenges have been recognized by the referees:

8 JRP proposed → 4 of them are to be funded

JRP	JRP Short name	JRP Title
J1.1	Nanoparticles	Traceable characterization of nanoparticles
J1.4	NANOTRACE	New Traceability Routes for Nanometrology
J3.1	Long distance	Absolute long distance measurement in air
J2.2	NIMTech	Metrology for New Industrial Measurement Technologies

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The kick-off meetings of all projects have been held already





Executive Challenges for TC-L

Issues on CCL-RMO key comparisons

It is important for EURAMET TC-L to manage the increasing workload associated with the MRA. Certain points have to be considered: linking of CCL to RMO should be part of the TP, stability of artefacts, portfolio of KC. In summary a self-standing document from the CCL on how future comparisons would be organized is necessary (responsibility: WGDM)
→ impact on KC portfolio (should cover most fields, relevance also for industry, primary standards, availability of suitable artefacts, repetition cycle, ...)





CCL / EURAMET Key comparisons

At its last meeting (Sep. 2007) has reconsidered the key comparison portfolio. (EURAMET KC will be in line)

- K1 Gauge blocks up to 500 mm (incl. former K2)
- K3 Angle standard
- K4 Cylindrical diameter standard
- K5 Step gauge
- K7 Line scales
- K8 Surfaces texture standards
- K11 National standard of length (former BIPM.L-K11)





Executive Challenges for TC-L

Issues related to CCL-K11 (nat. standards of length)

The duties of BIPM.L-K11 have been handed over to CCL. The workload is now shared between 5 “node laboratories”. Since 3 out of this 5 node laboratories are members of EURAMET, TC-L plays an important role in providing a sound basis for running this KC. Sharing of responsibilities between CCL / CCTF (also change/simplification of the *mise en pratique*). Technical protocol of has been revised to meet requirements of the MRA and is ready for dissemination within CCL.



Executive Challenges for TC-L

Long time storage of comparison data

at the moment only pilots have original, raw, data available. If pilots are no longer contactable there are severe problems to get the data. EA might make requirements on those who conduct comparisons. At the last TC-L meeting requirements on what to store and procedures how to collect were discussed.

The actual collection project has now started. After the first call to the former pilots it became clear that much information is already gone.





TC-L Meetings

TC-L CP 2007 San Anton, Malta 29-30 Oct. 2007

TC-L CP 2008 to be held at MIKES, Finland, 6-8 Oct. 2008





Thank you for your attention!

