



EUROMET TC-Length Chairman's Annual Report (2006/2007)

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Outline

Paper report

- » Project statistics (numbers, participation, coordination)
- » Meetings
- » Status of length CMC submissions

This presentation

- » Status of TC-Length preparation for EMRP/ERA-NET
- » CCL-CIPM issues



Preparations for iMERA/EMRP/ERA-NET

Anticipation of call, TP3:

“TP3: Expressions of Interest related to collaborative Joint Research Projects contributing to a Targeted Programme for research in **dimensional/length metrology** as defined in III.2.2 “Length”

Note: In addition topics defined in III.1. “**New Technologies**” that are directly and **primarily related to dimensional metrology** will be considered to be in scope



Preparations for iMERA-EMRP-ERA-NET

- **III : 2.2 : Length :**
 - **Nano** and **micro**-metrology
 - Dimensional metrology for **advanced manufacturing** technologies
 - **Long-range** measurement capabilities
 - Dimensional metrology enabling progress in **basic science**

Proposals for Micro-Nano



Area	Topic	NMIs interested
1	Nanoparticles: Characterisation methods and applications in metrology	PTB, METAS, MIKES, CEM (NPL)
1	Particle analysis by means of light scattering	INRIM (NPL)
1	Traceability for non-spherical particles	PTB, CMI (NPL)
1	Tip-sample interactions in SFM and their effect on dimensional metrology in the nanometre range	NPL, PTB, INRIM, CMI, METAS, MIKES
1	Metrological SPMs	CEM, (METAS), NPL
1	Nano roughness standards for 2D and 3D parameters	PTB, CMI, CEM, NPL
1	Crystalline surfaces as standards for calibration or as base for new sensors	PTB, NPL
1	X-ray interferometry for dimensional measurements in the mm range	PTB, INRIM, NPL
1	High precision straightness metrology on planar substrates with graduations	PTB, MIKES
1	High-resolution sub-wavelength interferometry	INRIM, CMI
1	Investigations of influences on the uncertainty of optical structure position metrology	PTB, INRIM, MIKES, (NPL)
1	Micro coordinate metrology – probing systems	METAS, NPL (PTB)
1 (4)	Sub nano radian angle measurements	INRIM
1	Near field optical microscopy and spectroscopy applications in metrology	CMI

Proposals for Advanced Manufacturing



2	X-ray computer tomography	METAS, NPL, PTB
2	Metrological measuring machines	PTB, CEM, NPL
2	Large gears , large objects	PTB, NPL
2	CMM error mapping	MIKES, NPL, (PTB)
2	Numerical geometrical standards	PTB, INRIM, MIKES
2	Computed Tomography for small 3D objects (possibly including x-ray tomography)	PTB, NPL
2	High accurate 3D cylinder form calibration	PTB, NPL
2	Double-ended gauge block interferometry for measurement of absolute length	PTB, CMI, CEM
2	Double-ended gauge block interferometry for measurement of absolute thermal expansivity	PTB, CMI
2 (1)	Development of ring laser for angle measurement	CMI
2	Freeform metrology (medium scale)	NPL
2	In process metrology	NPL
2 (4)	Thermal expansion of non-prismatic objects	NPL (PTB)
2 (3)	Surface characterisation for large (flat) mirrors	CMI

Proposals for Long Range



3 (2)	Development & evaluation of 532/633 nm combined interferometer	CMI
3	Multi-wavelength interferometry for measuring of distances up to 1 km	PTB, MIKES
3	Refractive index measurement over long distance by using two-wavelength interferometry and spectroscopic humidity measurement	PTB, MIKES
3	Tracable absolute interferometry by using absorption lines	PTB, CMI
3	Long distance measurement using material standards	INRIM, MIKES, NPL
3	Long distance interferometry test facility for long range metrology systems	INRIM, CMI, CEM
3	Length measurements using the Frequency Comb	PTB, NMI, MIKES, CEM

CCL-CIPM issues

CIPM CONCERNS AND RECOMMENDATIONS

- ✦ CIPM is not completely satisfied with the WGDM responses.
- ✦ Why gauge block comparisons warrant a different approach from other artifact-based comparisons, (been triggered by concern about the large number of comparisons being organized). Perhaps they are not really KEY comparison topics.....
- ✦ In future comparisons the linking should be included as part of the protocol. (There were many schools of thought in calculating reference values, and encouraged participants to be open-minded.) WGDM not convinced numerical linking is meaningful for many DM comparisons
- ✦ The question of stability could easily be resolved by adopting a star formation for the comparisons. Increases the cost and damage rate
- ✦ Recommend that the WGDM meets at the BIPM occasionally. It does, at least biennially
- ✦ Develop a self-standing document from the CCL on how future comparisons would be organized. Another version being prepared but how to communicate it to CIPM effectively
- ✦ Develop a paper on the limitations of gauge-block comparisons and the consequences for linkages. CCL-K1 paper, CCL-K2, EUROMET.L-K2 reports in Metrologia



CCL-CIPM issues

From the MRA:

- 2.1 Participating national metrology institutes, listed in Appendix A, recognize the **degree of equivalence of national measurement standards, derived from the results of key comparisons, for the quantities and values specified in Appendix B**. This constitutes part one of the arrangement.
- 2.2 Participating institutes recognize the validity of **calibration and measurement certificates** issued by other participating institutes for the **quantities and ranges specified in Appendix C**. This constitutes part two of the arrangement.



Possible solutions

- **Statistical Consistency checks**
 - ‘Linking by competency’
- **Re-arrange the Key Comparison portfolio**



Final thanks

- **To the four meeting hosts:**
 - **NML, Ireland** **Howard McQuoid**
 - **INRIM, Italy** **Gian Bartolo Picotto**
 - **INM, Romania** **Gabriela Mocanu/Alexandru Duta**
 - **FSB, Croatia** **Vedran Mudronja**
- **To the other TC Chairs**
- **To the members of TC-Length**



End

