

ANNUAL REPORT
Of Chairperson of COOMET TC 1.4 “Length and Angle”
(2012)

1. General characteristics of cooperation in the field of length and angle

Technical Committee 1.4 realizes the COOMET work in the field of metrological assurance of length and angle measurements, including long length and nanoscale.

Within TC 1.5 there were created three Subcommittees, represented in table 1.

Table 1

№ of Subcommittee	Title	Chairperson	Location
SC 1.5.1	measurement of long distances outdoors	Kostrikov A.L., research scientist	NSC “Institute of Metrology”, Ukraine
SC 1.5.2	length measurements in the nanometer range	Todua P.A., Director	NICPV, Russia

One of the main tasks, solved by TC, is the task of cooperation organization of National Metrological Institutes (NMI) of COOMET Member Countries in the field of length and angle with the aim of conducting works in this kind of measurements, directed on realization of Agreement on mutual recognition of national standard units, calibration certificates and measurements, issued by NMI.

2 TC work on COOMET Projects

Proposed Projects:

№	Project	Project Name
1	591/UA/12	Comparison of accurate navigation systems GPS/GLONASS
2	590/UA/12	Comparison of precision ranging systems
3	570/UA/12	Comparison of measurement standards of flatness
4	569/UA/12	Comparison of measurement standards of length in the range from 0,001 to 1 mm
5	568/UA/12	Comparison of initial means of measurement of surface
6	564/RU/12	Comparison of standards of the unit of length in the measurement of deviations from sphericity
7	563/RU/12	Comparison of standards of the unit of length in the measurement of deviations from circularity
8	529/RU/11	Comparison of interferometric measuring systems for tapes up to 20m.
9	527/RU/11	Additional comparison of the surface coverage density
10	370/RU/06	Comparison of measurement standards of length in the nanometer range

Agreed Projects:

№	Project	Project Name
1	278/UA-a/03	Conducting of comparisons of line gage comparators.

2	524/UA-RU/11	Comparison of national measurement standards of the unit of face angle
3	501/UA/10	Comparison of measurement standards of flatness
4	450/UA/09	Comparison of measurement standards of unit of length for roughness parameters
5	440/RU/08	Comparison of stabilized He-Ne/I2 lasers at 633 nm wave-length
6	524/UA-RU/11	Comparison of measurement standards of face angle

There were no reports about completed works on Projects and their transformation in the status of completed in 2012.

Agreed Projects:

Project 524/UA-RU/11. At the moment, the report documents on comparisons are being prepared.

Project 501/UA/10. Measurements are conducted by two comparison members, Project is decided to close. The report documents on comparisons are being prepared.

The reason of closing is overlong break after the ending of measurements.

Project 450/UA/09 Measurements are conducted by two comparison members, Project is decided to close. The report documents on comparisons are being prepared.

The reason of closing is overlong break after the ending of measurements.

Project 440/RU/08. Comparison is over.

Project 278/UA-a/03 Conducting of comparisons of line gage comparators. Project is decided to close. The report documents on comparisons are being prepared.

The reason of closing is overlong break after the ending of measurements.

3 Works of TC on CMC review

In the work process, the Committee was faced with a problem of not confirmed CMC lines of two organizations:

- VNIIM on comparisons of CIPM.L-K4.a and CIPM.L-K4.b (comparisons of internal and external diameters of plug gages and hoops);

- NSC «Institute of Metrology» within the comparisons of EUROMET.L-K7 (comparison of line gage to 200 mm).

VNIIM made the proposals on increasing of the measurement uncertainties for correction of the relevant CMC-lines. Proposal on corrected CMC-lines was adopted and approved by the leadership of BIPM.

For now, VNIIM buys new equipment for measuring of internal and external dimensions of special measuring instruments and is interested in the new comparisons, as well as ready to act as a pilot-laboratory in the planned comparisons COOMET.L-K4.a and COOMET.L-K4.b. (CMC-lines 2.4.1,2.4.2) It is proposed to ask PTB to act as linking laboratory in these comparisons.

According to the comparison results of EUROMET.L-K7, which were held in November, 2007, it was identified the discrepancy of obtained results and declared CMC-lines.

Analysis of the issue allows to claim that emerged discrepancy had organizational and communication character, not technical one.

It can be proved by following:

- additional comparisons of COOMET.L-S1, which have published their results in Metrologia, 2011, 48, Tech. Suppl., 04003;

- successful results of peer review of Quality Management System in accordance with ISO/MEC 17025, including review in the field of “Length and angle”, which was held in May, 2011.

- comparisons He-Ne/J2 of lasers under the framework of COOMET 440/RU/08 according to metrological institutes of Russia and Kazakhstan, preliminary results of which had been published in the magazine “Measuring Technique” № 6, 2012.

NSC “Institute of Metrology” made changes in CMC-line (classifier code of CMC L.2.3.1 – precise line scale: tick spacing), which is completely eliminates the incompatibility. This action was agreed with the Chair of SWG-CMC under CCL BIPM (The subgroup on analysis of calibration and measurement capabilities and classification scheme of CMC, under the Consultative Committee of length of the BIPM) Doctor J.C.Valente de Oliveira, INMETRO, and confirmed by coordinator BIPM KCDB Doctor Cluadine Thomas.

In such a manner, presently the declared by NSC “Institute of Metrology” CMC L.2.3.1 from Ukraine was fully confirmed.

To expand the CMC lines TC 1.5 has prepared a list of new comparisons:

Project 529/RU/11 “Comparisons of interferometric setups for tapes up measurement to 20 m”. Works on preparing the comparison are holding. Comparisons are designed to empower CMC-lines of NMI.

L.2.3.7.	(Surveyor, engineer, pi) tape, (geodetic) wire: line spacing
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Project 570/UA/12 “Comparisons of measurement standards of flatness”. Comparisons of interferometric setups for measuring of products flatness to 300mm is planned. Comparisons are designed to empower CMC-lines of NMI.

L.4.1.1.	Optical flat: flatness
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Project 568/UA/12 “Comparisons of the initial measurement of the surface.” It is prompted to make comparisons of control parameters of the surface setting standards in accordance with the international standards ISO. At current stage the Project has proposed status and participants are expected. Comparisons are designed to empower CMC-lines of NMI.

L.5.1.1.	(Groove) depth (step height) standard (e.g. ISO 5436-1 Type A): step height, (groove) depth
L.5.1.2.	Tip-condition standard (e.g. ISO 5436-1 Type B): radii, angle
L.5.1.3.	Spacing standard (e.g. ISO 5436-1 Type C): amplitude or wavelength parameters
L.5.1.4.	Roughness standard (e.g. ISO 5436-1 Type D): ISO roughness parameters
L.5.1.5.	Profile coordinate standard (e.g. ISO 5436-1 Type E): profile coordinates
L.5.1.6.	Soft gauge standard (reference software data set): error in calculated dimensions, error in calculated parameters

Project 563/RU/12 “Comparisons of measurement standards of unit in the field of deviations measurement from roughness”. At current stage the Project has proposed status and participants are expected. Comparisons are designed to empower CMC-lines of NMI.

L.4.2.1.	External cylinder: roundness
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Project 564/RU/12 “Comparisons of measurement standards of unit of length in the field of deviations measurement Comparisons of measurement standards of unit in the field of deviations measurement from sphericity”. At current stage the Project has proposed status and participants are expected. Comparisons are designed to empower CMC-lines of NMI.

L.4.2.3.	Sphere (hemisphere): roundness
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Project 590/UA/12 “Comparisons of high-precision ranging setups”. At current stage the Project has proposed status and participants are expected. Comparisons are designed to empower CMC-lines of NMI.

L.6.4.1.	Geodetic baseline: interval distances
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Project 591/UA/12 “Comparisons of accurate navigation systems GPS/GLONASS”. At current stage the Project has proposed status and participants are expected. Comparisons are designed to empower CMC-lines of NMI.

L.6.4.1.	Geodetic baseline: interval distances
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Project 569/UA/12 “Comparisons of the measurement standards of length in the range from 0,001 to 1 mm”. Comparison of bar glass measures in a small range is expected. At current stage the Project has proposed status and participants are expected. Comparisons are designed to empower CMC-lines of NMI.

L.2.3.1.	Precision line scale: line spacing
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4 Interaction with international and regional organizations

From 27 till 30 of June in 2012. in Helsinki (Espoo) based on Finnish Centre for Metrology and MIKES Accreditation the European meeting “EMRP Partnering Meetings” was held, whereon were presented about 200 representatives of metrological institutes and organizations of EURAMET Member Countries.

One of the major issues of the meeting was acquaintance of participants with the general procedure of organization and implementation of prospective European metrological projects and programs.

Although Ukraine doesn't exist in EURAMET as a full-member, this meeting was attended by Head of the Laboratory of geometrical measurements NSC “Institute of Metrology” V.Kupko, specially invited as co-author of the planned project EMRP “Metrology for Long Distance Surveying”, where the coordinator of the project is PTB, Germany (in the person of Dr. F.Pollinger) and its co-workers which are representatives of the European metrology institutes of Germany, Sweden, Finland, Portugal, Italy and France.

The basic researches within this project will address issues of traceability of measurements of long lengths at practice, taking into account the influence of environmental conditions, including the use of global navigation satellite systems (GNSS), development of high-precision distance measurement means with compensation of the refractive index and the calibration of the measuring instruments.

In fact, this project is aimed to achieve a significant increase in the accuracy of

measurements of large lengths, which is an urgent task for the European Union. Execution of tasks of the project will give a positive impact not only in the field of metrology, the sphere of influence on the environment and the social sphere, but also give the opportunity to receive significant direct economic impact. For example, the increase by 10 times the accuracy of geodetic measurements for agricultural purposes can give the EU an annual effect of \$ 500 mln euro.

To complete this project it is planned the substantial funding, but under European rules, Ukraine will take part in such a European project only as non-financed party.

In addition to full participation in the work of the direction of "Metrology of long length for geodetic measurement", while the meeting a general introduction to the issues discussed in the group for directions was also held "Traceability in dimensional metrology engineering nanodevices," discussed the problem of quite relevant for the development of nanotechnologies uniformity of measurements in the nanometer range.

Vladimir Kupko,
Chairperson of TC 1.5