

THE MINUTES

of the 13th meeting of COOMET Technical Committee TC 1.10 “Thermometry and Thermal Physics”

The Center for Standardization and Metrology under the Ministry of Economy of the Kyrgyz Republic 7-8 September 2016, Bishkek, Kyrgyzstan

1. Opening the meeting, welcoming, introduction of the participants, adoption of the agenda

The meeting was opened by the Head of Metrology Department of the Center for Standardization and Metrology under the Ministry of Economy of the Kyrgyz Republic, Botoyev Nurgazy Atambekovich, who welcomed the participants of the meeting and wished them a successful work.

Further word was handed on to the Chairperson of COOMET Technical Committee “Thermometry and Thermal Physics” (TC 1.10), Pokhodun Anatoliy Ivanovich.

A. I. Pokhodun welcomed TC members present at the meeting, the representatives of 11 countries: Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russian Federation, Slovakia, Uzbekistan, Ukraine, and France were present at the meeting.

AZERBAIJAN

Mr. Hasanov R.G., the State Metrology Service under the State Committee for Standardization, Metrology and Patent

BELARUS

Mr. Krivonos P.V., BelGIM

Mr. Givoyno V.S., POINT Ltd.

GEORGIA

Mr. Chelidze Yu.V., Georgian National Agency for Standards and Metrology

KAZAKHSTAN

Mrs. Duysebayeva K.K., KazInMetr, Almaty branch

Mrs. Nasibulina A. KazInMetr, Karaganda branch

Mr. Khalmetov S.B., KazInMetr

KYRGYZSTAN

Mr. Botoyev N.A., CSM under the KR ME

Mrs. Denisova M.G., CSM under the KR ME

Mrs. Savina T.V., CSM under the KR ME

Mr. Bayaliev A.D., CSM under the KR ME

MOLDOVA

Mr. Bordianu K.I., NIM

Mr. Buzuk G., NIM

RUSSIAN FEDERATION

Mr. Pokhodun A.I., VNIIM

Mr. Fuksov V.M., VNIIM

Mr. Razhba Ya.E., VNIIFTRI

Mr. Osadchiy S.M., VNIIFTRI
Mr. Lazovik I.N., Eastern-Siberian Subsidiary of VNIIFTRI
Mr. Vinge M.A., Eastern-Siberian Subsidiary of VNIIFTRI
Mr. Nikoneno V.A., SPE Etalon
Mr. Drobotov D.D., SPE Elemer
Mr. Polunin S.P., SPE Elemer
Mr. Melnichin I.O., TEK-Tech Ltd.

SLOVAKIA

Mr. Duris S., Slovak Institute of Metrology

UZBEKISTAN

Mr. Allamuradov B.Kh., SE Center on Rendering Metrological Services of Uzstandard Agency

Mr. Zakhidov D.Kh., SE Center on Rendering Metrological Services of Uzstandard Agency

Mr. Kholiv A.U., SE Navoiyskiy CTC of Uzstandard Agency

UKRAINE

Mrs. Sergiyenko R.P., NSC "Institute of Metrology"

FRANCE

Mr. Bonnier G., Isotech

The participants of the meeting approved the following agenda.

Agenda

- 1 State of works on redefinition of temperature unit on the base of Boltzmann constant
- 2 Prospects of practical implementation of the new definition of the temperature unit on the base of Boltzmann constant
- 3 Discussion of the progress of works on COOMET Projects in the field of thermometry and thermal physics
- 3.1 544/RU/11 "Regional comparison humidity standards of gases. Dew/frost point temperature -50 °C to +20 °C"
- 3.2 592/SK/13 (704/RU/16) "Regional key comparisons of temperature national standards at the triple point of mercury"
- 3.3 593/RU/13 "Regional key comparisons of national measurement standards of temperature in the range from 0.01 °C to 660.323 °C"
- 3.4 623/Ru-a/13 "Bilateral comparisons of national measurement standards for combustion energy by means of solid and liquid fuels"
- 3.5 633/KG/14 Development of COOMET recommendations "Calibration of resistance thermometers by comparison method"
- 3.6 642/MD/14 "Comparisons for measurements in the calibration of industrial platinum resistance thermometers"
- 4 On the prospects of comparisons in the measurement of dew point of hydrocarbon gases
- 5 New proposed Projects
- 6 Progress in the field of measurement of thermophysical quantities
- 7 State of the problem of increasing the measurement capabilities of metrology institutes of COOMET member countries
- 8 Reelection of Chairperson of the Technical Committee

- 9 Reelection of Executive Secretary of the Technical Committee
- 10 Miscellaneous
- 11 About the time and venue of the next COOMET TC 1.10 meeting

1. State of works on redefinition of temperature unit on the base of Boltzmann constant.

2. Prospects of practical implementation of the new definition of the temperature unit on the base of Boltzmann constant

Reporters: Pokhodun A.I. (VNIIM), Osadchiy S.M. (VNIIFTRI).

These items were traditionally covered at the previous meetings of TC 1.10. It was noted that in order to determine the temperature unit in terms of Boltzmann constant, the latter should be determined by two independent methods with the uncertainty of its assessment of better than 1 ppm. Increasing the accuracy of the determination of Boltzmann constant is associated with the development of primary thermometry methods. The best results of determining the Boltzmann constant were obtained by the acoustic thermometer and the thermometer that works on the basis of measurement of dielectric constant. It is supposed that the new definition of the unit will be formulated as follows “one Kelvin is the change of thermodynamic temperature, which results in a change of thermal energy of exactly $1.38065XX \cdot 10^{-23}$ joule.”

The *Mise en pratique* (*MeP-K*) under development regulates the practical application of the new definition of the temperature unit. As follows from this document, the implementation of the new definition in the near future will not change the status of practical temperature scales ITS-90 and PLTS-2000. It is expected that the transition to the primary methods in the ranges below 20 K and above 1300 K will provide higher accuracy of reproduction of the unit than within ITS-90. As for the rest of the range, a platinum resistance thermometer at present has no alternative with regard to ease of reproduction and accuracy achieved at this.

Currently the main emphasis is put on the reestablishment of SI in connection with the redefinition of a number of units in 2018. The relevant information materials related to redefinition will be sent to COOMET National Metrology Institutes, as the new definition of the temperature unit will affect different areas of activity, such as education, science and industry.

Pokhodun A.I. made a presentation on the research scientific work “Carrying out research in order to improve the metrological characteristics of the national primary standard of the unit of temperature in the range from 0 °C to 3200 °C”, which is carried out in VNIIM and involves the development of methods of reproduction of the temperature unit on the base of the expected redefinition of this unit. It was noted that in the range of above 962 °C, the use of the direct method of reproduction of the new temperature unit is expected to include the following in the composition of the primary standard: absolute cryogenic radiometer, frequency and power tunable lasers, trap detectors, integrating sphere, precision thermal radiation sources and reference radiation thermometer. Such method of realization requires expensive equipment and takes considerable efforts. The second one, “indirect” method of reproduction of the temperature unit, is based on the use of high-temperature reference points - eutectics “metal-carbon”, for example, cobalt-carbon, platinum-carbon, rhenium-carbon, and tungsten carbide. VNIIM carries out works on implementing both methods, but preference is given to the second one, so-called “indirect” method.

Head of Laboratory of VNIIFTRI, Osadchiy S.M., presented a detailed report “On the status of works of redefinition of the temperature unit on the base of Boltzmann constant in FSUE VNIIFTRI. The reporter provided information about the work on the development of

primary methods in the field of acoustic gas thermometry that is carried out in VNIIFTRI. Several equipment complexes are developed in VNIIFTRI, one of which is designed to determine the Boltzmann constant, and second - for reproduction and transfer of the temperature unit in relation to its forthcoming redefinition. As the reporter noted, work is carried out on the basis of acoustic resonators of domestic and France production. It is expected that VNIIFTRI will take part in EURAMET Project Ink2 on determining the quantities ($T - T_{90}$), where T - thermodynamic temperature measured by acoustic gas thermometer. The reporter also presented a summary of the prospects for improvement of VNIIFTRI equipment for the determination of the Boltzmann constant and for the new definition of the temperature unit.

During the consideration of information provided under this agenda item, a discussion on the possibility of realization of temperature scale by primary thermometers in COOMET NMIs was held. It was noted that the reproduction of scale by primary thermometers is extremely expensive, requires considerable efforts and practically disadvantageous procedure. The joint realization of the determination of temperatures of reference points by primary thermometers and further simplification of methods of transfer of temperature scale are seemed to be more feasible. In this case, realization of temperature scale will be available to most of COOMET countries.

Resolution

To take note of information on the state of works on redefinition of temperature unit on the base of Boltzmann constant.

3. Discussion of the progress of works on COOMET Projects in the field of thermometry and thermal physics

Project 593/RU/13 “Regional key comparisons of national measurement standards of temperature unit in the range from 0.01 °C to 660.323 °C”

Reporter: Pokhodun A.I. (VNIIM).

Participants of the Project are NMIs of Russia (coordinator), Belarus, Kazakhstan, Ukraine and Georgia. The Project is registered on BIPM website as key comparisons COOMET.T-K3.3. Technical protocol of the comparison was peer reviewed in CCT WG7. The experimental part of the work was carried out in BelGIM and KazInMetr. In October 2016, the transfer standard will be transferred to the NSC IM (Ukraine), and then will be sent to NMI of Georgia. It is expected that the experimental part of the work will be completed in 2016.

Resolution

To take note of information on the progress of works on the Project 593/RU/13.

Project 623/Ru-a/13 “Bilateral comparisons of national measurement standards for combustion energy by means of solid and liquid fuels”

Reporter: Pokhodun A.I. (VNIIM).

VNIIM (coordinator) and BelGIM (Belarus) take part in these pilot comparisons. In the 1st quarter of 2016, coordinator prepared Report A and sent it to BelGIM. Evaluation of the results of comparisons was carried out in accordance with COOMET Recommendation R/GM/19:2008 “Guideline on COOMET supplementary comparison evaluation.” The results of comparisons are consistent and confirm the uncertainty stated by the participants of the comparisons. The preparation of Report B has been started. The report for X International Scientific and Technical Conference “Metrology and Measuring Equipment”, which will be held in Kharkov in October 2016, was prepared based on the results of

comparisons.

Resolution

To take note of information on the progress of works on the Project 623/RU-a/13.

Project 642/MD/14 “Comparisons for measurements in the calibration of industrial platinum resistance thermometers”

Reporter: Bordianu K.I., (NIM, Moldova).

Coordinator of the Project is NIM of Moldova. Participants of comparisons are NMIs of Moldova, Kazakhstan, Kyrgyzstan, Azerbaijan, Georgia, Bosnia and Herzegovina, and Turkey. The technical protocol of comparison has been corrected according to the results of peer review in CCT Working Group. Transfer of transfer standards is carried out by the scheme “star”. Experimental work is being carried out in NMIs of Georgia, Azerbaijan, Moldova and Kyrgyzstan. After that, transfer standards will be transferred to Bosnia and Herzegovina, Turkey and Kazakhstan.

During the discussion, Mr. G. Bonnier (France) proposed to extend cooperation with other regional organizations, namely, to propose NMI of Cote d'Ivoire to participate in this Project. Given the scope of completed and upcoming work within the project, as well as timing of the comparisons, participants of the meeting decided not to change the number of participants in the project. It is possible to organize new, similar comparisons for those interested NMI in the future.

Resolution

1. To take note of information on the progress of works on the Project 642/MD/14.

2. To leave the composition of participants of the Project 642/MD/14 unchanged.

Project 633/KG/14 “Development of COOMET Recommendations “Calibration of resistance thermometers by comparison method”

Reporter: Denisova M.G. (CSM under the KR ME, Kyrgyzstan).

Coordinator of the project is NMI of Kyrgyzstan. COOMET Recommendations were developed in order to provide the uniformity of calibration of resistance thermometers by method of comparison in the thermostat. The Draft Recommendations were sent to COOMET NMIs and modified on the base of comments and proposals. The Draft Recommendations were also discussed with specialists from Germany.

M.G. Denisova initiated a discussion on the possibility of combining such components of calibration budget as hysteresis and instability of resistance thermometer. The representatives of Belarus (Givoyno V.S.), France (Bonnier G.), Russia (Pokhodun A.I., Razhba Ya.E.), and Moldova (Bordianu K.I.) expressed their points of view.

Denisova M.G. noted that developed COOMET Recommendations will actually be tested during accreditation of laboratory of Kyrgyzstan NMI by international organizations. The reporter proposed to complete the Recommendations with a separate section, which will contain the procedure of research and the requirements to thermostats, which are used for the calibration of platinum resistance thermometers by comparison method.

Resolution

1. To take note of information on the progress of works on the project 633/KG/14.

2. To recommend the coordinator of the project to send the latest version of the Draft Recommendations to COOMET NMIs for the next review.

3. To recommend the coordinator of the project to complete the Recommendations with a section about thermostats.

4. To recommend the Secretary of TC 1.10 to initiate the registration of developed Recommendations “Calibration of resistance thermometers by comparison method” in

COOMET.

Project 704/RU/16 (592/SK/13) “Regional key comparisons of temperature national standards at the triple point of mercury”

Reporters: Pokhodun A.I. (VNIIM), Razhba Ya.E. (VNIIFTRI, coordinator of comparisons).

A.I. Pohodun read out a letter sent to his address by NMI of Moldova, which contained a request to accelerate the work on key comparisons of the national standards of the temperature unit at the triple point of mercury.

The form of the proposed Project 704/RU/16 was sent by Secretariat to COOMET NMIs. It was expected that the group of participants would consist of NMIs of Kazakhstan, Moldova, Georgia, Belarus, Slovakia, and Ukraine. Coordinator of the comparisons received a confirmation letter for participation in the project only from BELGIM.

Comparisons involve transportation of standard platinum resistance thermometers of the participant of the comparisons to coordinator. The scheme of comparisons includes sequential graduation of these thermometers at the triple point of mercury of the participant of comparison, at the triple point of mercury of coordinating laboratory and regraduation at the triple point of mercury of the participant.

During the discussion, the representatives of Kazakhstan, Moldova, Georgia and Belarus confirmed their wish to participate in the Project.

Resolution

1. The interested NMI to send the coordinator of the Project their confirmation on participation in the Project until 09.10.2016.

2. To recommend the coordinator of the Project to draw up and send the form of the agreed Project to COOMET Secretariat (coomet@vniims.ru).

3. To recommend the coordinator of the Project to begin the development of the Technical Protocol of the comparison.

Project 544/RU-a/11 “Regional comparison humidity standards of gases. Dew/frost point temperature -50 °C to +20 °C”

Reporter: Vinge M.A., (FSUE VNIIFTRI, Eastern-Siberian Subsidiary, coordinator of comparisons).

The Project was registered in KCDB. It is expected that the participants of the Project will be NMIs of Ukraine, Belarus, Kazakhstan, Slovakia, and Moldova. It was noted, that the coordinator didn't get written confirmation of participation in the project from some NMIs. At this time, the technical protocol is being completed; afterwards it will be directed for approval to the participants of comparisons. There were discussed scheme of comparisons and sequence of transfer of transfer standard. It is planned that the experimental part of works will be started in 2016, and in general comparisons will be finished by mid-2019. The role of co-pilot laboratory was proposed by NMI of Kazakhstan.

The reporter noted, that the final report was published on the similar key comparisons CCT-K6, which can serve as the basis for the successful implementation of the project 544/RU-a/11.

During the discussion, the wish to participate in the project was confirmed by the representatives of Kazakhstan and Moldova.

Resolution

1. To take note of information on the progress of works on the project 544/RU-a/11.

2. The interested NMIs should consider the possibility of participation in the project and direct the written confirmation about participation to the coordinator by 30.10.2016.

4. On the prospects of comparisons in the measurement of dew point of hydrocarbon gases

Reporter: Lazovik I.N. (VNIIFTRI, Eastern-Siberian Subsidiary).

Lazovik I.N. proposed for discussion the problem of metrological assurance in COOMET countries of dew point measurements (condensation) of hydrocarbon gases at pressure up to 35 MPa, which is provided in pipes, including the exported materials. In the Russian Federation, which is one of the world's largest hydrocarbon suppliers of raw materials, there is no primary standard for ensuring the unity of measurements in the infrastructure of measuring instruments for the determination of such an important commodity index as the dew point (condensation) of hydrocarbon gases from which depend the costs of delivered raw materials. According to the reporter, functioning of the full system of metrological support of measurements in this region will significantly prevent corruption component during commercial operations and save budgetary funds in commercial disputes. In this regard, VNIIFTRI made a proposal to Rosstandart to develop the project "Creation a new measurement technology as part of GET-151." Reporter submitted the detailed presentation on this issue. The practical significance of this work is to ensure the transfer of the unit size of dew point measurements (condensation) of real natural gases at influencing factors, namely, at pressure corresponding to the real conditions of exploitation of measuring instruments. As the reporter noted, the results of this work will allow updating of the "reference data" used in this field by COOMET countries. Expansion of capabilities of primary standard GET-151 will also allow the Russian Federation to participate in the relevant COOMET comparisons and inter-regional comparisons.

During the discussion, conducted by the participants of the meeting on this issue, there was formed an opinion that this direction of development of metrological assurance on the measurement of the dew point of real hydrocarbon gases is very important and preferred task for NMI COOMET as far as its solving affects commercial accounting of supplied and consumed hydrocarbon materials.

Resolution

1. Take note of the information on the prospects of the comparisons in the field of measurements of the dew point of hydrocarbon gases.

2. To support VNIIFTRI and to recommend for realization the project "Creation of a new measuring technology as part of GET-151."

3. The interested NMI should consider the possibility of participation in the project and submit the relevant information to VNIIFTRI (lin@vniiftri.ru).

5. New proposed Projects

Bordianu K.I. (Moldova) initiated the question concerning pilot project on carrying out comparisons in the field of measurements of relative humidity. Coordinator of the project agreed to become VNIIFTRI.

The project 633/KG/14 Development of COOMET recommendations "Calibration of resistance thermometers by comparison method" will be further developed in connection with the taken on the project decision about supplement of Recommendations with thermostat part.

It remains an actual issue on carrying out the workshop on questions of conducting comparisons in the field of humidity measurements, coordinator - Bordianu K.I, NIM of Moldova.

Resolution

The interested NMI should consider the possibility of participation in new projects and direct the relevant information to the address of the project coordinators.

6. Progress in the field of measurement of thermophysical quantities

Reporter: Pokhodun A.I.

As the reporter noted, most of the comparisons in TC 1.10 in the field of energy of combustion and thermal conductivity measurements were carried out at the level of the pilot, as under the guidance of CCT there were no similar key comparisons. The positive results obtained by NMI COOMET in pilot comparisons demonstrate the applicability of the organization of inter-regional key or supplementary comparisons within COOMET, the results of which would allow to confirm the equivalence of standards and/or to confirm the CMC entries claimed in this field.

Regarding the pilot inter-regional comparisons conducted in the field of thermal conductivity measurements, there was reached an agreement with the head of working group WG9 CCT about re-issuance of the materials of comparisons in the status of "supplementary" comparisons in order to support CMC entries of the participants of comparisons. At this time the publication of the report B on these comparisons is being prepared and the work on development of the protocol of CMC review is being carried out.

Resolution

To take note of information about the state of works in the field of measurements of thermal physics quantities.

7. State of the problem of increasing the measurement capabilities of metrology institutes of COOMET member countries

Reporter: Pokhodun A.I.

Currently, CMC entries of Ukraine are being inter-regionally reviewed (18 CMC entries, of which 6 for non-contact thermometry), Russian Federation (12 CMC entries in the field of humidity measurements) and Kazakhstan (4 CMC entries in the field of non-contact thermometry). CMC entries were edited according to the expert's notes and other regional organizations - SIM, APMP, EURAMET and AFRIMET. It is expected that the new CMC data of NMI COOMET will be published by the end of 2016.

Resolution

To take note of information about the state of measurement capabilities of metrological institutes of COOMET member countries.

8. Reelection of Chairperson of the Technical Committee

Reporter: Pokhodun A.I.

A.I. Pokhodun as the head of the Technical Committee for thermometry and thermal physics of one of 5 regional metrological organizations submitted a detailed report on the work of TC 1.10 for the period since 2001. The report presents the stages of development of the activities of TC 1.10, which was aimed at carrying out the key and supplementary comparisons in the field of thermometry and humidity measurements, for supplementary and pilot comparisons in the field of measuring thermal physics quantities, to conduct regional and interregional review of CMC NMI entries, for the development of regulations of COOMET documents regarding the calibration of measuring instruments. During this period, the national metrology institutes of COOMET gained considerable experience as members of comparisons and coordinators of projects TC 1.10, as evidenced by the dynamics of the measurement capabilities of NMI COOMET. At the present time, Russian Federation, Belarus, Ukraine, Cuba, Moldova, Georgia and Kazakhstan have the published CMC data, confirmed by comparisons.

After the report of Pokhodun A.I. there was discussed the candidacy and carried out the voting on the re-election of Chairperson of TC 1.10. Representatives (correspondents) from Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Slovakia, Ukraine

and Uzbekistan took part in the re-election of Chairperson of TC 1.10. Voting results are: 9 votes (unanimous) "for" Chairman of TC 1.10 Pokhodun Anatoly Ivanovich.

Resolution

As Chairman of TC 1.10 Pokhodun Anatoly Ivanovich was elected.

9. Reelection of Executive Secretary of the Technical Committee

Representatives (correspondents) from Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russian Federation, Slovakia and Uzbekistan took part in the re-election of the Executive Secretary of TC 1.10. Voting results are: 9 votes (unanimous) "for" the Secretary of TC 1.10 - Sergiyenko Rymma Petrovna.

Resolution

As Secretary of TC 1.10 Sergiyenko Rymma Petrovna was elected.

10. Miscellaneous

Mr. G. Bonnier informed the participants of the meeting about the planned reorganization of the link between the Consultative Committee for Thermometry (CCT) and COOMET, which is to establish the technical committee - correspondent in the framework of COOMET, who will represent the interests of the COOMET in the CCT.

Osadchiy S.M. informed the participants about EURAMET project on the redefinition of the unit.

Melnichin I.O. provided information on the activities of "TEK-Tech Ltd". The company supplies the reference equipment for temperature, pressure and electromagnetic quantities. Reporter described in detail the technical and metrological characteristics of the delivered equipment, which can be used in automated workplaces for the calibrations in the field of temperature measurements.

Director of "POINT Ltd." Givovno V.S. provided informational materials about the company, as well as an invitation to participate in a methodological seminar for the calibrations.

For the participants of the meeting there was organized a tour at the standard base of the Center for Standardization and Metrology at the Ministry of Economy of the Kyrgyz Republic.

Resolution

- 1. To take note of the presented information.***
- 2. Regarding information of Mr. G. Bonnier, to recommend to the Chairperson of TC 1.10 to study this question at the meetings of structural bodies of COOMET and CCT.***

11. About the time and venue of the next COOMET TC 1.10 meeting

Preliminary the meeting is planned to conduct on the base of metrological institute of Bosnia and Herzegovina in the 3rd quarter of 2017.

Resolution

To take note of information about the planned place and date of the next meeting.

Minutes were prepared by Secretary of COOMET TC 1.10 "Thermometry and Thermal Physics", R.P. Sergiyenko