

ANNUAL REPORT

of the COOMET Joint Committee for Measuring Standards for 2021-2022¹

1. GENERAL DESCRIPTION OF COOPERATION, INCLUDING INFORMATION ON CARRYING OUT THE COOMET STRATEGY AND COOMET DEVELOPMENT PROGRAM

JCMS members are the TC 1.1 – TC 1.12 Chairpersons. In 2021, the COOMET D5.1 “*Regulations of the COOMET Joint Committee on Measurement Standards (COOMET JCMS)*” was updated (replacing COOMET D5.1/2018). The document is submitted for approval of the COOMET Committee in 2022.

In 2021, under the guidance of the JCMS the following activities were carried out, outlined in the COOMET Development Program for 2020 – 2022 and the Roadmap for Implementation of the COOMET Strategy for 2020 – 2025:

- **9. (Ind-a.1.9)** Analysis of timeframes of the COOMET comparisons and implementation of corrective measures to reduce them: joint work with the TC 1.1 – TC 1.11 Chairpersons was carried out on official completion of the KCB D comparisons.
- **16. (Ind-a.3.2)** Translation of new versions of the CIPM MRA documents into Russian and posting the translations on the COOMET information resources: the work was carried out within 794/RU/19 topic (see Section 3).
- **19. (Ind-a.4.1)** Development and realization of the Roadmap for TC 1.2 – TC 1.11 on implementation of decisions related to the redefinition of the SI basic units: work was carried out on the planned Roadmap events.
- **46. (Ind-e.1.3)** Development of two-year COOMET Training Plans: JCMS participated in the development of the COOMET Training Plan for 2021 – 2022².
- **56. (Ind-f.1.1)** Assessment of interest of the COOMET member-countries NMIs/DIs in innovative scientific projects.
- **57. (Ind-f.1.2)** Preparation of table of Metrological activity areas of the COOMET member-countries NMIs/DIs, where specific NMIs/DIs are active.
- **58. (Ind-f.1.3)** Identification of promising areas in innovative research in the field of metrology within the COOMET: JCMS representatives participated in the survey of COOMET member-countries NMIs/DIs and processing of the results. The results were submitted at the 27th meeting of the COOMET President’s Council (10-11 March 2021) and 28th meeting of the COOMET President’s Council (24-25 November 2021). The works continue.
- **78.** Development and realization of the COOMET Recommendations Development Plan containing requirements for calibration of different types of measuring instruments (Calibration Guidelines): a discussion was held on approaches to develop the Plan. The issue will be discussed further at the next JCMS meeting.
- **79. (Ind-g.2.6)** Verification of scientific and technical level (STL) of the COOMET publications, preparation by the COOMET Structural Bodies of schedule for updating the COOMET publications and its realization: in 2021, three COOMET publications within the framework of 828/RU/21 were updated; draft COOMET Publication “*Expression of expanded uncertainty in measurements (excess method)*” developed as a part of 796/UA/19 was recommended for approval by the COOMET Committee (see Sections 2 and 3).

¹ The Report provides a summary of the JCMS activities in 2021-2022. Detailed information on cooperation within the JCMS area of responsibility is given in the reports of the TC 1.1 – TC 1.12 Chair.

² Detailed information on the training activities held in 2021 is provided in the TC 4 Annual Report.

Information on TC 1.1 – TC 1.12 meetings in 2021-2022 is given in Table 1.

Table 1.

TC	Time and place of the meeting
TC 1.1	October 15, 2021, video conference October 17, 2022, video conference
TC 1.2	September 29, 2021, video conference
TC 1.3	October 5-6, 2021, video conference
TC 1.4	March 24, 2021, video conference
TC 1.5	November 10–11, 2021, video conference
TC 1.6	not available
TC 1.7	October 12–13, 2021, Moscow, Russia and video conference
TC 1.8	October 28–29, 2021, St. Petersburg, Russia
TC 1.9	November 22–23, 2021, video conference
TC 1.10	November 17–18, 2021, video conference
TC 1.11	November 29, 2021, video conference
TC 1.12	August 25–26, 2021, Yekaterinburg, Russia and video conference September 12, 2022, Yekaterinburg, Russia and video conference

2. JCMS MEETING

The 20th JCMS meeting was held online on June 3, 2021. The following issues were discussed:

- Implementation of the CIPM MRA.
- Assuring metrological traceability of the COOMET NMIs' measurement standards.
- Updating the COOMET Roadmap for implementation of decisions related to the redefinition of the SI basic units.
- COOMET concept on digitalization in the field of metrology, including using FAIR-data.
- Translation of the JCRB documents and COOMET publications.

The following decisions were made at the meeting:

- To ask TC 1.1 – TC 1.12 Chairpersons to discuss the need to develop standard calibration techniques with the COOMET framework at the next TC meetings.
- To approve in general the draft of updated Roadmap taking the discussion into account, and to recommend it for approval as COOMET Program at the 31th online meeting of the COOMET Committee.
- To take into account information on posting translations of the CIPM MRA documents of P and G series (made within the topic 794/RU/19) on the JCMS web page at www.coomet.net. The topic will be closed.
- Based on the discussion, to approve changes to the COOMET Recommendations R/GM/7:2014, COOMET R/GM/11:2017, and COOMET R/GM/12:2015 prepared within the framework of 828/RU/21; to discuss the finalized projects by correspondence and submit them for approval at the 31th online meeting of the COOMET Committee.

The 21th JCMS meeting was held online on February 10, 2022. The following issues were discussed:

- Discussion of the Draft COOMET Plan on development of standard calibration techniques for different types of measuring instruments
- On COOMET comparisons ongoing for more than 5 years
- Discussion of the Draft Activity Plan on cooperation between the COOMET and EURAMET for 2022

- Discussion of the COOMET training activities using the BIPM e-learning platform
- On the results of updating the lists of COOMET Technical Experts on CMC review and NMIs/DIs QMS assessment

The following decisions were made at the meeting:

- To ask TC 1.2 – TC 1.11 Chairpersons to consider assisting in development of calibration techniques when conducting supplementary comparisons and pilot comparisons with NMIs from Countries and Economies with Emerging Metrology Systems (CEEMS) upon request from CEEMS Representatives
- Based on the discussion results, to consider it expedient to adopt the following procedure for long-term comparisons in order to complete them in a timely manner:
 - In case a comparison is delayed by the fault of the Pilot NMI, and a TC Chairperson has exhausted their means to accelerate its completion, at the request of a TC Chairperson, to prepare and forward a notice to the Pilot NMI's administration on behalf of the COOMET President. Based on the discussion results, to ask the COOMET Secretariat to forward notices to the Directors of the Pilot NMIs of the following comparisons: COOMET.AUV.V-K1, COOMET.EM-S6, COOMET.EM-S10, COOMET.EM-S7, COOMET.EM.RF-S1, and COOMET.EM-S19 in February 2022.
 - Additionally, in case a comparison is delayed by the fault of the Pilot NMI, to consider appointing a new Pilot NMI from the interested participants with execution of relevant protocol entry and a COOMET approved project form on behalf of the new Pilot NMI.
 - If a comparison is delayed by the fault of the participating NMI (e.g. NMI does not present its measurement results or does not answer requests from the Pilot and/or TC Chairperson at the discussion stage), to consider excluding its data from the comparison report.
 - To ask Chairpersons of the JCMS and the relevant TCs to assist the Pilot in processing the comparison results if requested.
- To apply to the COOMET Committee to adopt a resolution addressed to the Directors of NMIs of the COOMET Member States with a request to support activities of the NMIs – Members of the COOMET TCs, and to consider TC Members' reports at Scientific Council meetings and its sections in order to control execution periods of the COOMET TCs Decisions and/or discussions of issues related to COOMET Projects.

The 22th JCMS meeting was held online on September 22, 2022. The following issues were discussed:

- Implementation of the CIPM MRA in terms of monitoring comparisons, CMC review, and supporting countries with developing metrology systems (CEEMS).
- Discussion of implementation and updating the COOMET P6/2021 "COOMET Roadmap for the Implementation of Decisions Related to the Redefinition of the Basic Units of the International System of Units (SI) for 2020-2025".
- Completion of works on preparation of the COOMET Plan on development of calibration techniques for sets of measuring instruments.
- Functioning and updating the composition of the Appeal Board on Comparisons of National Measurement Standards and CMC Data Review.

The following decisions were made at the meeting:

- To ask the TC Chairpersons to update the list of Technical Experts (TE) on CMC review and identify, if necessary, TE candidates, and to send this information to the COOMET Secretariat, as well as register TEs' accounts in the KCDB. In cases, where it is not possible to carry out an interregional CMC review, to ask TC Chairpersons to inform the KCDB Office in advance of the impossibility of conducting a review on COOMET's behalf.
- To ask the TC 1.2 – TC 1.11 Chairpersons to discuss on their 2022 meetings or by correspondence the issue of suspended comparisons within their TC's responsibilities (including proposed comparisons, that were not implemented due to various reasons), and to prepare proposals for possible actions by

COOMET. The information should be sent to the JCMS for subsequent submission to the COOMET President's Council.

- To ask the TC Chairpersons to discuss on their 2022 meetings or by correspondence the information submitted by the CEEMS' NIMs in terms of carrying out comparisons and calibrations. In case of agreement on the topics and terms of comparisons, to draw up COOMET Topics as appropriate.
- When reviewing the COOMET R/GM/31:2016, to ask the JCMS and its Coordinator to specify the procedure for development of techniques, its structure and content, as well as the process of its validation in a calibration laboratory. When planning comparisons, to ask the TC Chairpersons to request the Pilots to draft Comparison Protocols in more detail, including measurement preparation stages, measurements, data processing, etc. To ask the TC Chairpersons to recommend that interested CEEMS develop calibration procedures by their own efforts based on the priority of their needs, and to submit draft procedures for review at TC meetings.

3. REVIEW OF THE COMPLETED TOPICS AND INFORMATION ON THE USE OF OBTAINED RESULTS

Information on the COOMET projects completed in 2021 is given in the Table 2a.

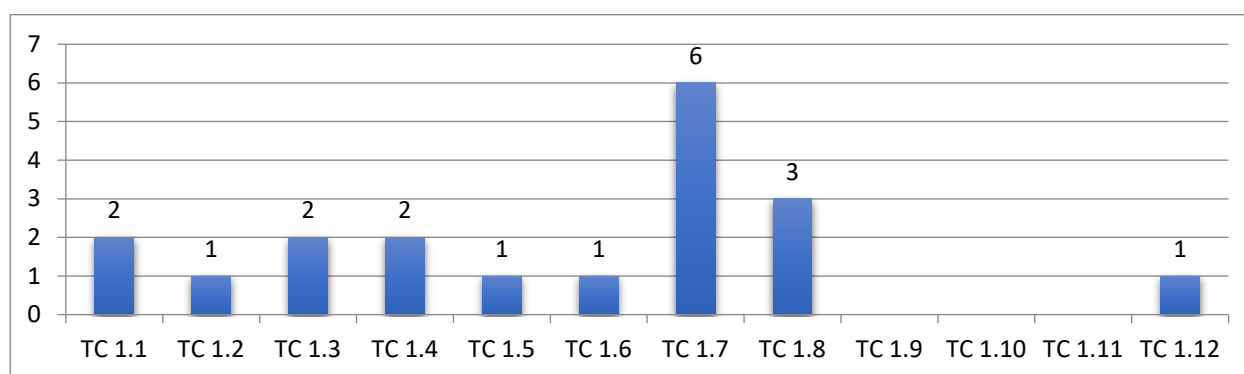
NN	Project ID	Name	Pilot	Participants
1	828/RU/21	Updating of COOMET Recommendations COOMET R/GM/7:2014, COOMET R/GM/11:2017, and COOMET R/GM/12:2015	VNIIM	JCMS Chairperson, JCMS Deputy Chairperson, JCMS Secretary, TC 1.2 – TC 1.12 Chairpersons
2	618/RU-a/13	Pilot comparison "Analysis of elemental composition of Ni-based alloys"	VNIOFI	BelGIM (Belarus), Ukrmetrteststandart (Ukraine), VNIIOFI (Russia), VNIIM (Russia), SMU (Slovakia)
3	794/RU/19	Translation and updating of the new versions of the CIPM MRA documents, as well as the CIPM document "Recommendations of the Working Group on Implementation and Operation of the CIPM MRA"	VNIIM	VNIIM (Russia) - coordinator, COOMET TCs Chairpersons, other participants of cooperation concerned
4	756/RU-a/18	Pilot comparison in the field of measuring mass fractions of oxygen and nitrogen in steel	UNIIM	UNIIM (Russia), BAM (Germany)
5	267/RU-a/02	Supplementary comparison of electromagnetic energy flux density standards (W/m ²) at 2.45 GHz and 10.0 GHz frequencies	VNIIFTRI	VNIIFTRI (Russia), BelGIM (Belarus), Ukrmetrteststandart (Ukraine)
6	784/RU/19	Pilot comparison "Water content in crude oil"	VNIIM	VNIIM (Russia), NIM (China)
7	682/RU-a/16	Pilot comparisons of standards of pulse electric and magnetic field intensity units with pulse rise time in the range from 20 ps to 10 ns	VNIOFI	VNIOFI (Russia), KRISS (Republic of Korea), Tsinghua University (China)
8	736/RU/17	Diffuse absorbance of transmitted samples	VNIOFI	CJSC "NBSM" (Armenia), BelGIM (Belarus), NIM (China), INM-MD (Moldova), VNIOFI (Russia), UzNIM (Uzbekistan), NSC "Institute of Metrology" (Ukraine)
9	684/MD/16	Pilot comparisons of national standards of gas flow rate	INM-MD	INM-MD (Moldova), SE "Ivano-Frankivskstandartmetrology (Ukraine)

10	706/RU-a/16	Pilot comparison of longitudinal ultrasonic wave propagation velocity in solid media	Far Eastern Branch of VNIIFTRI	BelGIM (Belarus), NIM (China), Ukrmetrteststandart (Ukraine), Dniπροstandartmetrology (Ukraine), Far Eastern Branch of VNIIFTRI (Russia)
11	406/UA/07	Supplementary comparisons of national standards of liquid flow	PTB	PTB (Germany), BelGIM (Belarus), VNIIR (Russia), LEI (Lithuania), SMU (Slovakia), NSC of the Republic of Uzbekistan (Uzbekistan)
12	529/RU/11	Comparisons of interferometers for measurement of tapes up to 20 m	VNIIM	VNIIM (Russia), BelGIM (Belarus), KazStandart (Kazakhstan)
13	599/RU-a/13	Comparisons of standards for unit of laser output average power at wavelength of 0.532 μm , 1.064 μm , and 10.6 μm	VNIIOFI	VNIIOFI (Russia), NIST (USA)
14	617/RU-a/13	Development of RM of composition of wolframite-hubnerite (hard-alloy) concentrate of KVG (T) grade	Vinogradov Institute of Geochemistry, Siberian Branch of RAS, Russia	Belarus, Bulgaria, Kazakhstan, Russia, Uzbekistan

Information on the COOMET projects completed in 2022 is given in the Table 2b.

No	Project ID	Название	Пилот	Участники
1	730/UA/17	Comparison of spectral regular transmittance in UV range from 200 nm to 380 nm	SE "Ukrmetrteststandart"	BelGIM (Belarus), SE "Ukrmetrteststandart" (Ukraine), INM-MD (Moldova), NSC "IM" (Ukraine), NIM (China)
	689/RU-a/16	Supplementary Comparison on Wavelength for Fiber Optics	VNIIOFI	VNIIOFI (Russian Federation) BelGIM (Belarus) INMETRO (Brazil ()) NIM (China) NMISA (South Africa) PTB (Germany)
	688/RU/16	Supplementary comparison on polarization mode dispersion in optical fiber	VNIIOFI	VNIIOFI (Russian Federation) INMETRO (Brazil) KRISS (Korea, Republic of) METAS (Switzerland)
	560/UA-a/12	The comparison of the national hardness standards of Rockwell and Super-Rockwell scales.	NSC IM	NSC IM (Ukraine) BelGIM (Belarus) CMI (Czechia) KazStandard (Kazakhstan) PTB (Germany)
	366/RU-a/06	Comparison of whiteness samples using the secondary standard of the units of colour coordinates and the coloration coordinates	VNIIOFI	VNIIOFI (Russian Federation) BelGIM (Belarus) NSC IM (Ukraine) SE "Ukrmetrteststandard" (Ukraine)

The following diagram shows distribution of the projects completed in 2021-2022 by TCs.



4. PARTICIPATION IN IMPLEMENTATION OF THE CIPM MRA

From January 1, 2021 to December 31, 2021 **90 CMCs** were published in the BIPM KCDB.

From January 1, 2022 to October 21, 2022 **79 CMCs** were published in the BIPM KCDB.

Area	Country	NMI	Number of CMCs 2021	Number of CMCs 2022
EM	UA	SE "Ukrmetrteststandard"	6	
L	BY	BelGIM	10	
	KZ	KazStandard	2	
	RU	VNIIM	2	
M	BY	BelGIM	6	
	GE	GEOSTM	1	
	KZ	KazStandard	4	1
	RU	VNIIM	6	
	UA	NSC "Institute of Metrology"	1	5
	AZ	AzMI		1
PR	KZ	KazStandard	7	
	UA	NSC "Institute of Metrology"	2	
	RU	VNIIOFI		3
T	GE	GEOSTM	3	
	RU	VNIIM	37	
	RU	VNIIFTRI	2	
	UA	SE "Ukrmetrteststandard"	1	
QM	RU	VNIIM		66
	RU	VNIIFTRI		1
	KZ	KazStandard		2
		Total	90	79

For implementation of the CIPM MRA in 2021, COOMET Structural Bodies formed the COOMET Comparisons Programme (P2/2021).

In 2021, works were performed (in different stages) on 88 comparisons.

In November 2021, an analysis was carried out on the number of COOMET key and supplementary comparisons, number of completed and published comparisons, and number and percentage of COOMET pilot comparisons by NMIs/DIs as part of the Progress report on realization of the Comparisons Programme to the COOMET President's Council.

Lists of the COOMET Technical Experts on CMC review were updated. The updated information is posted on the TCs web pages at www.coomet.net.

On October 15, 2021, JCMS members took part in the webinar "Practice of using the CIPM MRA documents and COOMET Publications on conducting and evaluating of calibration and comparisons results".

5. ISSUES OF COOPERATION WITH INTERNATIONAL AND REGIONAL ORGANIZATIONS IN THIS FIELD OF COOPERATION

JCMS representatives took part in 43th JCRB meeting (March 15–17, 2021) and in 44th JCRB meeting (September 14–16, 2021) as part of the official COOMET delegation.

Within the JCMS, Action Plan for cooperation between the COOMET and EURAMET was discussed.

JCMS Chairperson is a member of JCGM Working group on the International Vocabulary of Metrology (JCGM-WG2:VIM).

6. PROPOSALS FOR THE COOMET COMMITTEE RESOLUTIONS

- To approve the updated document COOMET D5.1 "*Regulations of the COOMET Joint Committee on Measurement Standards (COOMET JCMS)*" replacing COOMET D5.1/2018 – Appendix 1.
- To approve the updated document COOMET D5.2 "Regulations of the COOMET Technical Committee « Acoustics, Ultrasound, Vibration » (TK1.2)" (replacing COOMET D5.2/2003)
- To approve the updated document COOMET D5.15 "Regulations of the COOMET Technical Committee "Electricity and magnetism" (TC 1.3)" (replacing COOMET D5.15/2006)
- To approve the updated document COOMET D5.4 "Regulation on the COOMET Technical Committee "Length and Angle" (TC 1.5)" (replacing COOMET D5.4/2012)
- To approve the updated document COOMET D5.5 "Regulation on COOMET Technical Committee "Photometry and Radiometry" (TC 1.7)" (replacing COOMET D5.5/2003)
- To approve the updated document COOMET D5.6 "Regulations for Technical Committee COOMET "Physical Chemistry (TC 1.8)" (replacing COOMET D5.6/2014)
- To approve the updated document COOMET D5.10 "Regulations of the Technical Committee "Thermometry and thermal physics" (TC 1.10)" (replacing COOMET D5.10/2004)
- To approve the updated document COOMET D5.11 "Regulation on COOMET Technical Committee "Time and Frequency" (TC 1.11)" (replacing COOMET D5.11/2006)
- To approve the updated document COOMET D5.7 "Regulations on COOMET Technical Committee "Reference Materials" (TC 1.12)" (replacing COOMET D5.7/2013)
- To approve the COOMET Recommendation "*Expression of expanded uncertainty in measurements (excess method)*" developed as a part of 796/UA/19 – Appendix 2.

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