ANNUAL REPORT
COOMET TC 1.6 "Mass and Related Quantities" for 2022.

1. GENERAL CHARACTERISTICS OF COOPERATION, including information on the list of activities and/or projects performed and on the participants of cooperation, as well as problems and prospects for the development of cooperation in the field "Mass and Related Quantities";

1.1 General characteristics of cooperation in this field

COOMET TC 1.6 is composed of representatives of 18 COOMET member countries: Azerbaijan, Armenia, Belarus, Bulgaria, Bosnia and Herzegovina, Germany, Georgia, Kazakhstan, Kyrgyzstan, Cuba, Lithuania, Moldova, Russia, Slovakia, Tajikistan, Turkey, Uzbekistan and Ukraine*.

**Notification from the Ministry of Economy of Ukraine on suspension of participation in the RMO was received in October 2022. Notification from the Ministry of Economy of Republic of Lithuania on the termination of participation in the RMO was received in December 2022.*

The main task of the TC is to implement the cooperation of COOMET member countries in the field of "Mass and Related Quantities", including such areas of activity as:

- organization of key and supplementary comparisons of national measurement standards of COOMET member countries in support of CMCs, which are currently submitted or will be submitted in the near future by COOMET member countries;
- preparation and regional review of data on calibration and measurement capabilities (CMC) of COOMET member countries;
- cooperation with the relevant technical committees of other regional metrology organizations, participation in interregional reviews of CMC of those RMOs.

There are the following subcommittees within TC 1.6:

- SC 1.6.1 "Mass" (Chair – Ms. Irina KOLOZINSKAYA, NSC "IM", Ukraine);
- SC 1.6.2 "Force" (Chair – Mr. Aleksandr TSIPORENKO, Ukrmetrteststandart, Ukraine);
- SC 1.6.3 "Pressure" (Chair – Mr. Aleksandr CHERNYSHENKO, VNIIM, Russia);
- SC 1.6.4 "Hardness" (Chair – Mr. Andrey ASLANYAN, VNIIFTRI, Russia);
- SC 1.6.5 "Density, Viscosity" (Chair – Mr. Aleksey DEMIANOV, VNIIM, Russia).

1.2 Information about the list of activities and/or projects performed and about the participants of cooperation

Information on the list of activities and/or projects performed is given in Table 1.

Table 1

Project number	Project title	Participants	Progress information and problems related to the organization and conduct of comparisons
259/RU/02 COOMET.M.F-S1	COOMET comparison in the field of force measurements 20 кН, 50кН, 100кН, 250кН, 500кН, 1000кН и 2000кН.	VNIIM (pilot), BelGIM, Ukrmetrteststandart	Currently, the draft Draft B is in the process of preparation. The expected date of approval is April 2023.
665/UA-a/15 COOMET.M.M-S2	Bilateral supplementary comparison of mass standards	NSC IM (pilot), INM-MD	The measurements are completed, the results are presented by the participants of the comparisons. The draft Draft A is being prepared by the topic coordinator. The approximate date of approval of Draft A and preparation of Draft B is May 2023.

546/UA-a/11 COOMET.M.M-S5	Supplementary comparison in the field of mass measurement	NSC IM (pilot), BelGIM, INIMET, KazStandard, PTB, VNIIM, VMC, GeoSTM, UME	The measurements are completed, the results are presented by the participants. , with the exception of INIMET (Cube) and KazStandart (Kazakhstan). The approximate deadline for preparation of draft Draft A is two months after the presentation of the measurement results o by all participants.
764/UA/18 COOMET.M.M-S6	Supplementary comparison in the field of mass measurement (kettlebell 20 kg)	NSC IM (pilot), BelGIM, VNIIM, IPQ, GEOSTM, AzMI	Measurements continue: a 20 kg kettlebell from IPQ (Portugal) was received by GeoSTM (Georgia). The technical protocol was amended in connection with the accession of the AzMI (Azerbaijan) to the comparison.
694/MD-a/16 COOMET.M.M-S3	Supplementary comparison of mass standards of 100 mg, 20 g, 1 kg and 10 kg	INM-MD(pilot), PTB, NIM-RO	The report was agreed at the TC 1.6 meeting in 2019. Work is underway to complete the publication of the Draft B in the KCDB.
638/UA-a/14 COOMET.M.H-S3	Comparison of national hardness standards using the Super-Rockwell scale	NSC IM (pilot), PTB, KazStandard, CMI, BelGIM	The Draft B was prepared. Coordination with the participants of the comparisons is carried out.
822/GE/20	Pilot comparisons of small volumes	GeoSTM (pilot), KazStandard, CSM (Kyrgyzstan), UzNIM, AzMI, State Reference Center	Not all participants of the comparisons have not submitted results of the comparisons. It is possible to join comparison Tajikstandard (Tajikistan). The approximate deadline for the preparation of the Draft A is one month after the provision of measurement results from all participants.
766/GE-a/18 COOMET.M.FF-S7	Pilot comparisons of small volumes	GeoSTM (pilot), INM-MD, NSC IM, VNIIM, IMBIH	Measurement results are expected from NSC IM. The approximate deadline for preparation of draft Draft A is one month after the provision of measurement results from all participants.
789/KZ-a/19	Pilot comparisons in liquid density in the range from 600 to 1000 kg/m3	KazStandard (pilot), UzNIM	Comparison in progress.
788/KZ-a/19	Pilot comparison of liquid kinematic viscosity unit standard at temperatures: 20 °C (250-400 mm^2/s), 25 °C (50-100 mm^2/s), 40 °C (20-70 mm^2/s)	KazStandard (pilot), UzNIM	Comparison in progress.
651/RU-a/14 COOMET.M.H-S2	Supplementary bilateral comparison of national standards in the field of nanoindentation	VNIIFTRI (pilot), PTB	Measurements completed.
711/TR-a/16 COOMET.M.P-K15	Comparison of absolute pressure standards in the range from 0.3 MPa to 0.9 Pa	UME (pilot), VNIIM	At present, coordinates the final report with participants of comparisons. Completion of the work has been postponed to 2023.
717/DE-a/17	Supplementary comparisons of national pressure unit standards in the range from 250 MPa to 1500 MPa	PTB (pilot), VNIIFTRI	Measurements are completed. Draft A is getting ready.

589/UA-a/12 COOMET.M.P-S1.	Supplementary comparison of national gauge pressure standards in the range from 1 MPa to 10 MPa	NSC “IM” (pilot), VNIIM, BelGIM, KazStandard, INIMET, VMT/VMC, INM-MD	Final draft (Draft B) has been agreed upon. At the moment, the project is reviewed by CCM’s experts

2. RESULTS OF RECENT MEETINGS OF TC 1.6 AND ITS SUB-COMMITTEES

On December 8, 2022, took place the 26th online meeting of COOMET TC 1.6 "Mass and related quantities" attended by 48 specialists from 11 COOMET member countries (Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, Cuba, Russia, Tajikistan, Uzbekistan).

The main task of the meeting was to discus the progress of all TC 1.6 comparisons (14 projects) and possible actions to complete them. A detailed information about the progress of the work is given in section 1.2.

The proposals of Armenia, Kyrgyzstan, Tajikistan and Uzbekistan on the organization of comparisons at accuracy levels meeting the needs of CEEMS were discussed in detail. The discussion will be continued at the next TC meeting.

The meeting participants also discussed the implementation of the COOMET 6/2021 program "COOMET Roadmap for the Implementation of Decisions related to the Redefinition of the basic units of the International System of SI Units for 2020-2025", in application to the kilogram.

Further actions have been agreed upon relating to the preparation of the COOMET training course on topics in the area of responsibility of T K 1.6 for the BIPM training platform.

During the meeting, elections were held to fill the vacant positions of TC 1.6. Dr. Ilya Shmigelsky, Head of the Mass and Force Laboratory of VNIIM, was elected Chairman of TC 1.6 and SC 1.6.2 "Force". Ms. Victoria Bogdanova, Deputy Head of the this laboratory, was elected Chair of SC 1.6.1 "Mass". Ms. Tamilla Shabieva, a representative of the Azerbaijan Institute of Metrology, was elected Deputy Chair of TC 1.6. The authority of Chairs of SC 1.6, SC 1.6.1 and SC 1.6.2 will be submitted for approval to the COOMET Committee in 2023.

The lists of COOMET technical experts for CMC reviews and COOMET technical experts for the assessment of the NMI/DI’s QMS in the area of responsibility of TC 1.6 have been updated.

3. RESULTS OF THE IMPLEMENTATION OF THE COOMET STRATEGY AND COOMET DEVELOPMENT PROGRAM (concerning the activities of TC 1.6), AS WELL AS TC 1.6 WORK PROGRAM

TC members took part in a number of activities provided for in the COOMET Development Program for 2020-2022 and Roadmap for the implementation of the COOMET Strategy for 2020-2025, namely:

- 9. (Ind-a.1.9) Carrying out of an analysis of the timeframe for conducting COOMET comparisons and taking corrective actions for its reduction: one COOMET project was completed and 6 COOMET topics were excluded (section 4), work is underway to register the completion of the comparisons in the KCDB;
- 19. (Ind-a.4.1) Preparation and implementation of a Roadmap for TC 1.2 – TC 1.11 to adopt the decisions related to the redefinition of the SI base units; no work was carried out in 2022, but further steps to implement the planned work in the area of responsibility of TC 1.6 were discussed at the TC meeting.

4. COMPLETED PROJECTS AND INFORMATION ON THE USE OF THE AVAILABLE RESULTS

In 2022, COOMET projects 560/UA-a/12 and COOMET.M.H-S5 (comparison of the national hardness standards of Rockwell and Super-Rockwell scales) were completed.

The following projects were excluded from the COOMET Work Program due to the loss of relevance:

- 295/RU/03 "Mutual Comparison of He leaks in range (10^{-6}-1) m^3·Pa/s";
- 737/UA/17 “Bilateral comparison of national force standards”;
- 758/CU/18 "Supplementary bilateral comparison of mass standards aimed at determination of more details on uncertainty components to for the submission of CMC;

- 762/UA/18 “Supplementary comparison in the field of the determination of density (volume) of solid body (weights)”;
- 769/UA/18 "Supplementary bilateral comparison of small volumes";
- 854/UA/22 "Supplementary trilateral comparison of mass standards".

5. PARTICIPATION IN ACTIVITIES OF INTERNATIONAL AND REGIONAL METROLOGY ORGANIZATIONS IN THIS AREA OF MEASUREMENTS

In 2022, TC 1.6 participated in the the following events held by international and regional organizations:

- seminar of the International Committee of Weights and Measures (CIPM) and the World Meteorological Organization (WMO) "Metrology for Climate 2022";
- meeting of the Working Group for Fluid Flow (WGFF) of the CCM.

6. ACTIVITIES RELATED TO INTERNATIONAL AGREEMENTS (CIPM MRA, ETC.)

Technical experts of TC took part in the interregional reviews of CMCs in the field of mass, force, pressure, torque and static volume measurement. In total, more than 40 CMCs were reviewed.

In 2022, CMCs of KazStandart (Kazakhstan) and BelGIM (Belarus) in the field of hardness were published.

The lists of COOMET technical experts for CMC reviews and COOMET technical experts for the assessment of the NMI/DIs’ QMS in the area of responsibility of TC 1.6 have been updated.

6.1 STATUS OF CMCS IN NMI/DI OF COOMET

In 2022, two CMCs of COOMET were confirmed in the field of mass and related quantities measurements.

7. INFORMATION ON THE EXPECTED VENUE AND DATE OF THE NEXT MEETINGS OF TC 1.6 AND ITS SUB-COMMITTEES

It is planned to hold the next TC meeting (presumably, off-line) in September 2023 at VNIIM, Russia. The final decision on the date and form of the meeting will be made depending on the situation.

8. PROPOSALS FOR RESOLUTIONS OF THE COOMET COMMITTEE

- To approve Dr. Ilya SHMIGELSKY (VNIIM, Russia) as the Chair of TC 1.6 and SC 1.6.2 "Force" for the period of 4 years.
- To approve Ms. Victoria BOGDANOVA (VNIIM, Russia) as the Chair of SC 1.6.1 "Mass" for the period of 4 years.

Acting Chair of TC 1.6
Ilya SHMIGELSKY