

Bureau International des Poids et Mesures

Consultative Committee for Acoustics, Ultrasound and Vibration (CCAUV)

Report of the 14th meeting
(25-26 November 2023)
to the International Committee for Weights and Measures



Comité international des poids et mesures

**LIST OF MEMBERS OF THE
CONSULTATIVE COMMITTEE FOR ACOUSTICS, ULTRASOUND AND VIBRATION**

as of 25 October 2023

President

Dr H. Laiz, Instituto Nacional de Tecnología Industrial [INTI], Argentina, CIPM member.

Executive Secretary

Dr G. Panfilo, International Bureau of Weights and Measures [BIPM], Sèvres.

Members

Central Office of Measures/Główny Urząd Miar [GUM], Warsaw.

Centro Nacional de Metrología [CENAM], Querétaro.

D.I. Mendeleev Institute for Metrology, Rosstandart [VNIIM], St Petersburg.

Danish Fundamental Metrology A/S [DFM], Hørsholm.

Federal Office of Metrology [METAS], Bern-Wabern.

Instituto Nacional de Metrologia, Qualidade e Tecnologia [INMETRO], Rio de Janeiro.

Korea Research Institute of Standards and Science [KRISS], Daejeon.

Laboratoire National de Métrologie et d'Essais [LNE], Paris.

National Institute of Metrological Research/Istituto Nazionale di Ricerca Metrologica [INRIM],
Turin.

National Institute of Metrology [NIM], Beijing.

National Institute of Standards and Technology [NIST], Gaithersburg.

National Measurement Institute, Australia [NMIA], Lindfield.

National Metrology Institute of Japan, AIST [NMIJ/AIST], Tsukuba.

National Metrology Institute of South Africa [NMISA], Pretoria.

National Metrology Institute of Turkey/TÜBİTAK Ulusal Metroloji Enstitüsü [UME], Gebze-Kocaeli.

National Physical Laboratory [NPL], Teddington.

National Research Council of Canada [NRC], Ottawa.

Physikalisch-Technische Bundesanstalt [PTB], Braunschweig.

The Director of the International Bureau of Weights and Measures [BIPM], Sèvres.

Observers

All-Russian Scientific Research Institute of Physical Technical Measurements, Rosstandart [VNIIFTRI], Moscow.

Bulgarian Institute of Metrology [BIM], Sofia.

Bundesamt für Eich-und Vermessungswesen [BEV], Vienna.

Centro Español de Metrología [CEM], Madrid.

CSIR National Physical Laboratory of India [NPLI], New Delhi.

Czech Metrology Institute [CMI], Brno.

Industrial Technology Research Institute/Center for Measurement Standards [CMS/ITRI], Hsinchu.

Instituto Português da Qualidade [IPQ], Caparica.

Kenya Bureau of Standards [KEBS], Nairobi.

National Institute of Metrology/Institutul National de Metrologie [INM], Bucharest.

National Metrology Centre, Agency for Science, Technology and Research [NMC, A*STAR], Singapore.

Slovak Metrology Institute/Slovenský Metrologický Ústav [SMU], Bratislava.

State Enterprise "Scientific and Research Institute for Metrology of Measurement and Control Systems" [SE "NDI Systema"], Lviv.

Liaisons

Comprehensive Nuclear-Test-Ban Treaty Organization [CTBTO].

International Electrotechnical Commission [IEC].

International Organization for Standardization [ISO].

FIRST SESSION – WEDNESDAY OCTOBER 25 (8:00 – 17:00 UTC)

1. OPENING OF THE MEETING

The Consultative Committee for Acoustics, Ultrasound and Vibration (CCAUV) held its fourteenth meeting at the International Bureau of Weights and Measures headquarters (BIPM), at Sèvres, and on-line, on Wednesday 25 and Thursday 26 October 2023.

The following delegates were present: R. Allen (NIST), S. Barrera Figueroa (DFM), T. Bruns (PTB), A. Canu (LNE), A. Chijioke (NIST), W.H. Cho (KRISS), R. Dias (INMETRO), L. Dickinson (NMIA), D. Dobrowolska (GUM), G. Durando (INRIM), J.S. Echeverría-Villagómez (CENAM), P. Hanes (NRC), R. Horiuchi (NMIJ/AIST), Y.T. Kim (KRISS), L. Klaus (PTB), C. Koch (PTB), T. Koukoulas (NRC), A. Kozliakovskii (VNIIM), H. Laiz (CCAUV President, CIPM, INTI), M.J.T. Milton (BIPM Director), A. Mlynska (GUM), R. Nel (NMISA), H. Nozato (NMIJ/AIST), E. S. Olsen (DFM), A. Pérez Matsumoto (CENAM), S. Rajagopal (NPL), G. Ripper (INMETRO), S. Robinson (NPL), D. Rodrigues (LNE), A. Ruiz Rueda (CENAM), E. Sadikoglu (UME), A. Schiavi (INRIM), Z. Siejda (GUM), W. Slater (NIST), Z.M.D. Soares (INMETRO), Q. Sun (NIM), C. Thomas (NMIA), A. Troia (INRIM), V. Tyalimpi (NMISA), C. Veldman (NMISA), J.H. Winther (HBK-DPLA), L. Wu (NRC), C. Wüthrich (METAS), P. Yang (NIM), A. Yankovsky (VNIIM), M. Yoshioka (NMIJ/AIST).

Observers: M. Blabla (CMI), S. Cui (NMC, A*STAR), P.K. Dubey (NPLI), S.R. Gacheru (KEBS), N. Garg (NPLI), A.E. Isaev (VNIIFTRI), A. Ivashchenko (SE “Ukrmetrteststandard”), M. Kamensky (SMU), I. Kizlivskyy (SE “NDI systema”), O. Kosterov (SE “NDI Systema”), G. Lukin (VNIIFTRI), A. Maina (KEBS), V. Marcos (CEM), J. Mou (NMC, A*STAR), W.H. Ng (NMC, A*STAR), A. Nikolaenko (VNIIFTRI), C. Taiti (KEBS), T.-H. Tu (CMS/ITRI), D. Virovska (BIM), A. Wiener (BEV).

Liaisons: B. Doury (CTBTO).

Representatives from Member States invited to attend as Observers: I.A. Aladhyani (SASO-NMCC), T.M. El-Basheer (NIS), P. Rattanangkul (NIMT).

Guests: F.N. Al Subaey (SASO-NMCC), C. Lomax (NIAAM), F.A. Serrano (INTI).

Also present: I. Ahmed (JCRB Executive Secretary), A. Cypionka (BIPM), G. Panfilo (BIPM, CCAUV Executive Secretary), S. Maniguet (BIPM, KCDB Coordinator), S. Rajagopal (NPLI).

The President, Dr Héctor Laiz, opened the meeting and welcomed the participants, noting that it was good to meet in person after 4 years. He informed the participants that the Director of the BIPM will give his address to the CCAUV on 26 October.

Each meeting participant in the room and online made a self-introduction.

2. APPOINTMENT OF THE RAPPORTEUR

D. Rodrigues from LNE and A. Chijioke from NIST were proposed as the Rapporteurs. This was approved by the participants.

3. APPROVAL OF THE AGENDA

H. Laiz introduced the agenda and asked participants if any changes or modifications were required. G. Ripper proposed an addition to agenda item 9: a presentation by him on the activities of IMEKO TC22. The agenda was approved with this addition and is available on the CCAUV website (CCAUV/2023-01).

4. REPORT OF THE 13TH MEETING OF THE CCAUV 2021, INCLUDING ACTIONS AND DECISIONS

The essential actions and decisions arising from the 13th meeting of the CCAUV (2021) are summarized below. The CCAUV President presented the actions and decisions for the benefit of the meeting.

CCAUV13/A1&A2: CCAUV President to nominate contact persons from CCAUV to the BIPM horizontal forums on Climate Change and Environment, Digital Transformation, Health and Life Sciences, Food Safety, and Energy.

T. Bruns (PTB) (digitalization) and G. Durando (INRIM) (climate change) were nominated.

CCAUV13/A/3: CCAUV President to circulate survey about plans and engagements regarding digital transformation activities (in AUV field) in every NMI.

This was done and the Evaluation Report - Survey on Digital Transformations is published on the BIPM website.

CCAUV13/A4: CCAUV members to review draft of revised CCAUV Strategy Document (version 01.11.2021) and to submit comments to CCAUV-SPWG Chair.

This was done and the CCAUV Strategy Document has been published on the BIPM website.

CCAUV13/A5: CCAUV KCWG to review the document CIPM MRA-G-11 v1.2 submitted by the JCRB Task Group on Statistical Methods for Key Comparisons.

This was done but due to a lack of consensus among Consultative Committees the document has not yet been released.

CCAUV13/A6: CCAUV KCWG to review the CCAUV guidance document “Guidance for carrying out key comparisons within the CCAUV, November 2015.”

This was done and the document was approved during the last CCAUV KCWG meeting.

CCAUV13/A7: CCAUV KCWG to review the CCAUV guidance document “Rules of Procedure of the Key Comparison Working Group of CCAUV, October 2013”.

This was done and the document was approved during the last CCAUV KCWG meeting.

The Chairs of the CCAUV Working Group were re-elected at the last meeting.

CCAUV President H. Laiz announced that NIS (Egypt) has requested to become an official Observer of the CCAUV. NIS (Egypt) will make a presentation to the CCAUV in the Laboratory Reports section of this meeting (Agenda Item 11).

5. OUTCOMES FROM CIPM MEETING

The CCAUV President, H. Laiz, reported on the 27th meeting of the CGPM, which was held in November 2022. The conference focused on developing the CIPM Strategy 2030+. There were seven resolutions of this conference:

- 1 On the report prepared by the International Committee for Weights and Measures on the “Evolving Needs in Metrology”. The resolution encourages the CIPM to develop a long-term vision for the international measurement system; the new vision is to be presented at the 28th CGPM in 2026 for approval. It also encourages the CIPM to establish inter-disciplinary (“horizontal”) groups.
- 2 On the global digital transformation and the International System of Units. The resolution encourages the CIPM to undertake the development and promotion of an SI digital framework.
- 3 On the extension of the range of SI prefixes. The resolution decides to extend the range of SI prefixes to include ronna (10^{27})(R), ronto (10^{-27})(r), quetta(10^{30})(Q), and quecto (10^{-30})(q).
- 4 On the use and future development of UTC. In aid of use and future development of UTC, the resolution decides that the maximum value for the difference (UT1-UTC) will be increased in, or before, 2035. The intention is to select a maximum value that will ensure continuity of UTC for at least a century.
- 5 On the future redefinition of the second. Noting that optical frequency standards have surpassed the accuracy achievable by the current definition by a factor of up to 100, the resolution encourages the CIPM to bring proposals to the 28th CGPM (2026) for the choice of a new definition of the second, and for the further steps that must be taken for the new definition to be adopted at the 29th CGPM (2030).
- 6 On universal adherence to the Metre Convention. Recognizing that of the states that do not currently participate in the Metre Convention, many are states in development that face certain barriers to participation, the resolution decides that the CIPM shall examine the current application of the membership model described under Article III of the Metre Convention and report to the 28th CGPM (2026) on how this might be applied in order to facilitate lasting and universal adherence to the Metre Convention.
- 7 On the dotation of the International Bureau of Weights and Measures for the years 2024 to 2027.

The changes in the membership of the CIPM were presented.

The actions taken by CIPM in response to its resolutions were presented.

- A CIPM Sectorial Task Group on Climate Change and the Environment (CIPM-STG-CENV) was created.
- The creation of a forum on metrology and digitalization was approved. The forum has the goal of harmonizing processes related to digitalization between NMIs, CCs, RMOs, and the BIPM headquarters, including the creation of the authoritative reference for core SI information, and the digital transformation of services and products offered by

the BIPM. The kick-off meeting of the forum will be held online on Tuesday 21 November. The forum has eleven Members, while all are invited to participate as Observers.

- A Joint Statement Signatory Round Table on Metrology and Digitalization was created, comprising the CIE, CIPM, CODATA, IEC, ILAC, IMEKO, ISC, ISO, and NCSLI, for cooperation and coordination on this topic. The first activity of the Round Table will be a conference to be held on 5–6 March 2024 at the BIPM headquarters.
- Much progress has been made in providing BIPM digital services, including machine readable data for CMCs and time information. Permanent identifiers for Service Categories are to be worked on by each CC.
- A Task Group was developed on how to increase the number of countries that participate in the Metre Convention; currently there are 85 UN Member States that do not adhere. A new Metre Convention membership category “Affiliate”, which does not have a fixed fee but instead operates on a “pay-as-you-go” basis to participate in BIPM activities, is to be proposed to the next CGPM in 2026.
- For modernization of its activities, the CIPM created a Sub-Committee on Governance, with the task of preparing By-Laws to address the governance and operation of the organization.

The CIPM document *Strategy 2030+* is available on the CCAUV 14th meeting website.

The JCGM - VIM4 2CD is open to comments until 1 November 2023. The VIM4 includes *nominal properties* for the first time.

The 150th anniversary of the signing of the Metre Convention is on the 20 May 2025. It will be marked by an event at the UNESCO headquarters, along with a 2-day scientific congress in Versailles.

H. Laiz’s presentation is available on the CCAUV webpage (CCAUV/23- 04).

6. REPORTS FROM WORKING GROUP CHAIRS

a. Report from the CCAUV Working Group on Strategic Planning (CCAUV-SPWG)

SPWG Chair, E. Sadikoglu reported on its activities. He presented an overview of the SPWG, which was established in 2010 and performs functions according to its terms of reference, which are posted on the CCAUV website. The SPWG membership consists of eleven institutions from four RMOs prior to this CCAUV meeting. It has four co-chairs, one for each of the technical domains (A, U, V, W). Meetings of SPWG are typically attended by around 20 experts, collectively covering all the sub-fields. The principal task of the SPWG is to update and revise the CCAUV Strategy Document.

The main activities of CCAUV-SPWG in 2022 and 2023 were presented. The most-recently revised CCAUV Strategy Document was published on 31 January 2022. Communication between members continued through 2022 and 2023. The last meeting was held on Tuesday 24 October, with 22 technical experts from five RMOs in attendance. At the meeting the following actions were taken:

- A plan for performing Strategy Document revisions was agreed. The Strategy Document currently has eleven chapters. A few minor updates and change in emphasis of some elements are needed. The Key Comparison schedule in it needs to

be updated and the bibliography will probably be updated. The new revised Strategy Document is planned to be published on the CCAUV website in January 2024.

- It was proposed that the CCAUV create an *ad hoc* group on digitalization.
- KRISS, LNE and NIST indicated a wish to become CCAUV members, which was endorsed by the SPWG, and is subject to approval by the CCAUV.
- It was agreed to propose to the CCAUV that it makes a recommendation for the CIPM to consider improved engagement with the global education sector.

The presentation is available on the CCAUV webpage (CCAUV/23-06.a).

b. Report from the CCAUV Working Group for Key Comparisons (CCAUV-KCWG)

KCWG Chair; G. Ripper reported on the activities of the KCWG. The KCWG met on 23 October 2023, and the agenda of that meeting is available on the CCAUV working documents area; only one item was added to the agenda, which was a review of the KCWG member contact persons and their areas of expertise. The meeting was attended by a total of 20 persons, including nine out of the eleven KCWG member contact persons, BIPM personnel, RMO TC chairs, and additional guests. There were three changes in KCWG contact persons in 2023: A. Oota (NMIJ/Japan) left, H. Nozato (NMIJ/Japan) and R. Allen (NIST/USA) joined. The KCWG membership currently lacks experts in Ultrasound and Underwater Acoustics, but additional experts are being sought to cover these areas. Until this CCAUV meeting the CCAUV KCWG membership has been applied to NMIs, with the persons identified as contact persons for the NMI. A proposal was made to change the membership from NMIs to persons, which is allowed by the document CIPM-D-01 *Rules of procedure for the Consultative Committees (CCs) created by the CIPM, CC working groups and CC workshops*.

The main activities of the KCWG are:

- Review and approve Technical Protocols for Key Comparisons, Supplementary Comparisons, Pilot Studies.
- Review Draft B reports of comparisons.
- Review and preapprove final reports of KCs and SCs for submitting to CCAUV for final approval.
- Review of final reports of pilot studies for publication in *Metrologia*.

The recent comparisons published and in progress were reported; there is no CCAUV Key Comparison currently in progress.

It was noted that EURAMET.AUV.V-K3.1 Key Comparison had been abandoned.

An update on the status of the old and nearly-completed comparison COOMET.AUV.V-K1 is needed, and a decision on whether it will be completed or abandoned.

Technical protocols submitted for a SIM Key Comparison, a SIM Supplementary Comparison, and a SIM Pilot Study were approved. COOMET.AUV.U-P1, which was reviewed in 2018, is on standby.

APMP.AUV.V-S1 and APMP.AUV.V-P2, which concern laser tachometers, were discussed. Q. Sun from NIM made a presentation on these comparisons and on rotational speed measurement. Concerns were expressed about the expertise of KCWG members, about the fact that the Consultative Committee for Time and Frequency (CCTF) currently has some CMCs concerning laser tachometers, and the large difference in the uncertainties of the participating NMIs in the bilateral comparison. There was an extended discussion, but no decision was reached on whether to proceed with evaluating the reports from these comparisons. It was proposed to contact the CCTF for discussion.

APMP.AUV.V-K3.1 had a change in the linking labs because of a change in service capability at one of the original linking labs. It is recommended by the KCWG that in cases where it becomes necessary to exclude an initially-identified linking lab, the reason for this should be expressed clearly in the final report.

KCWG guidance documents have been reviewed by G. Panfilo and G. Ripper, and they are now available in the KCWG working documents for members to review and approve. It is important to receive feedback and requests from CCAUV members to improve KCWG procedures.

The membership of the KCWG was discussed. G. Ripper is in his third term as Chair and R. Horiuchi is in his second term as Vice-Chair. The KCWG lost four members in recent years and added two: new members are sought. The next KCWG meeting is planned to be immediately before the next CCAUV in week 41 of 2025, although there could be additional remote meetings before then if the need arises.

The CCAUV plenary discussed the question of how to proceed with the reports for the comparisons APMP.AUV.V-S1 and APMP.AUV.V-P2 on laser tachometers. Q. Sun stated that the pilot lab for the comparison (NIM) recommends communication with the CCTF on how to proceed. H. Laiz stated that he supported this proposal and would contact the CCTF chair. G. Ripper stated that he had already communicated with the CCTF chair, who is very open to discussion. C. Veldman stated that he disagreed with proceeding this way, and that consideration of the comparison in the CCAUV should be stopped. T. Bruns stated that he supported the position of stopping the comparison in the CCAUV and suggested that the CCAUV communicate this to the CCTF. He observed that contributions from devices under test have not been taken into account in the listed uncertainties.

The presentation is available on the CCAUV webpage (CCAUV/23-06.b).

c. Report from the CCAUV Working Group for RMO Coordination (CCAUV-RMOWG)

RMOWG Chair Q. Sun reported on the activities of the WG. A meeting of the RMOWG, consisting of RMO TC Chairs and guests was held on Monday 23 October. The status of AUV CMCs was presented: there are 1 298 CMCs in the AUV area, with large variation between the different RMOs. Several CMCs are currently under review. In the area of CMC review performance, EURAMET TC AUV suffered no loss of rights in the past few years, while other TC RMOs each had 4-6 losses of rights. The duration of JCRB review from submission to publication is about 100 days.

It was proposed to add two new items to the RMOWG terms of reference:

- Strengthen cooperation between RMOs
- Provide guidance on the range of CMCs supported by particular Key Comparisons and Supplementary Comparisons

Reports from the BIPM Executive Secretary and from KCDB were received at the RMOWG meeting.

The SI digital framework service categories in AUV were discussed. The outcome of a meeting in 2022 was presented, which called for a renumbering for the classification of services in AUV because only three levels of classification are allowed in the digitization framework. C. Veldman and G. Ripper reviewed this classification and the document is now available on the CCAUV website.

The proposal from Q. Sun for a rotational speed subfield in the CCAUV was discussed.

The presentation is available on the CCAUV webpage (CCAUV/23-06.c.00).

7. CCAUV KEY COMPARISONS

Reported by G. Ripper, stated he already discussed much of this during KCWG report (see KCWG report).

a. CCAUV Key Comparisons and reports (published/in progress/proposal)

COOMET.AUV.V-K1 - In 2017, it was acknowledged that COOMET.AUV.V-K1 was already outdated and incapable of supporting CMCs. Despite this, there was an understanding that a final report should be concluded. However, as of now, the report remains incomplete, prompting a request for an update from COOMET. The question arises whether the CCAUV can consider the comparison to be abandoned or if it should continue to wait for the report. A. Isaev responded by highlighting the challenge in completing the comparison and mentioned a lack of information regarding whether it should be finalized. E. Sudikoglu suggested that the decision should be communicated in writing to gather more information after the meeting. G. Ripper inquired about a deadline to complete the task. The resolution agreed upon was to send an email to COOMET requesting a formal answer.

APMP-AUV.V-K5 status – The comparison will be restarted soon.

Repeat of EURAMET.AUV.A-K6 status (LNE is the pilot Lab) – The comparison will start soon [2024] (will link CCAUV.A.K6)

CCAUV.A-K7 status (repeat of CCAUV.A-K4) – DFM is the pilot lab – preparing draft protocol and will circulate to interested participants –start of measurements is expected in 2024.

b. CCAUV supplementary comparisons: published/in progress/proposal

COOMET.AUV.A-S3, COOMET.AUV.A-S4 – G. Ripper asked if these are running smoothly. H. Laiz said that he will contact COOMET by email about the status of these key comparisons.

H. Nozato made a proposal for new CCAUV Pilot Study of single-ended accelerometer sensitivity (without dummy mass). A TP will be submitted. Any NMI that wants to participate should contact H. Nozato.

S. Robinson asked about a follow-on of CCAUV.W-K2 – repeat of part of frequency range noted that for this comparison NPL willing to pilot + three additional participants (USA, Brazil, India). It was noted that it will be classified as CCAUV.W-K2.1. S. Robinson will circulate the protocol and submit to KCWG for approval.

8. REPORTS FROM KCDB, JCRB AND REGIONAL METROLOGY ORGANIZATIONS

a. KCDB

S. Maniguet presented information report from KCDB Office, covering activities of the last two years.

The KCDB 2.0 was launched in 2019. It is used by all CCs, with 1 635 individual user accounts, 25 979 published CMCs, and 1 846 comparisons.

Statistics are available on the website. The total number of CMCs remains fairly constant, while the number of comparisons is increasing. Approximately 100 users connect and use the platform each week. Improvements have been observed as a result of the KCDB web platform, such as fewer CMC draft errors, reduced public time, and a 50 % decrease in the time required to review CMCs over the past two years. The statistics are appreciated as a new tool, and the new structure allows for digitalization.

The KCDB includes 1 298 CMCs in AUV from 40 countries.

Digitalization – KCDB can be searched manually using quick search or advanced search. It is also possible to search by KCDB CMC Identifier. The information can now be obtained in a machine-readable format using the application programming interface (API). These details can be referenced by digital calibration certificates, allowing the tracking of the life cycle of CMCs, expanding statistical data, combining with other information, and adapting to languages other than English. Work is in progress on the SI Digital Reference Point, especially for the service categories. Collaboration from CCAUV experts is needed for these service categories. T. Bruns asked if new CMC submissions can be accessed from the API. S. Maniguet mentioned that it is not currently in the same link. T. Bruns explained that this access is for reviewers to verify the consistency of submitted CMCs with Key Comparisons. S. Maniguet added that it will be included in the future.

The presentation is available on the CCAUV webpage (CCAUV/2023-08.a).

b. Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB)

I. Ahmed, the JCRB Executive Secretary, reported that the 46th JCRB meeting took place at the BIPM headquarters in March 2023, with representation from all RMOs. The meeting saw both physical and online participation. Reports, including quality system reports, were presented. The

KCDB report for March was approved during the meeting and subsequently published on the BIPM website. O. Werhan reported on the performance of the KCDB.

There were three outcomes (one resolution, one recommendation, one action).

The recommendation was to use unique identifiers for the CMCs and versions in their documents, such as quality system and calibration certificates. Additionally, a quick start guidance document was developed. The quick start document has been made available on the BIPM website, and some NMIs have already begun implementing this recommendation.

The 47th JCRB meeting was held in September 2023 at LCM in Costa Rica, with representation from all RMOs in a hybrid format. The KCDB report was approved and is now available online. The system's performance was discussed, with notable reductions in CMC review durations since the previous JCRB meeting. Discussions were held on issues related to the loss of rights in CMC reviews, CMCs with long-duration of status JCRB: Revision Requested (hanging CMCs), uncompleted comparisons that are five years or older, and progress in the digitalization transformation, including CMC identifiers. The meeting resulted in five key outcomes.

- Action 1 – On use of comments sections in KCDB – guidance material to be provided on use of comments sections.
- Action 2 – On multiple iterations during JCRB review phase – encourage RMOs to carry out thorough intra-RMO reviews, and tasks CC WGs and RMO TCs to provide efficient and transparent comment exchange mechanics and to adopt each others best practices.
- Action 3 – Regarding the loss of rights, it is recommended that all RMOs acknowledge their intention to review or not review CMCs. If acknowledging the review, it is also recommended that they complete the review.
- Action 4 – Regarding digital information, it is recommended that NMIs and RMOs register with Research Organization Registry (ROR) to obtain a digital identifier from ROR.
- Action 5 – It was decided that having a second JCRB meeting in a year be on exceptional cases when necessary, and only one meeting is planned for 2024.

CMC review durations (both JCRB and Intra-RMO) have significantly decreased over both the long term and short term (last six months).

The JCRB executive secretary will continue monitoring the status of “hanging CMCs” and report regularly. For AUV, the issues to be resolved include both technical and editorial elements. It was observed that the quality of intra-RMO review is a factor. RMOs are tasked with following up on the status of “hanging CMCs” and determining the appropriate course of action (abandonment or not).

It was noted that uncompleted old comparisons, especially supplementary ones, are a major concern, and the matter has been escalated to CIPM for action. H. Laiz sought clarification on who is currently responsible for addressing the “hanging comparisons.” I. Ahmed clarified that it is the pilot who is responsible for resolution of outstanding issues with all relevant stakeholders.

H. Laiz noted that the JCRB is now stable and only requires one meeting per year with the exception of extraordinary years that may require two, focusing more on efficiency. I. Ahmed added that although the discussion of Quality Systems is still part of the proceedings, it may be moved to the main plenary meeting.

The presentation is available on the CCAUV webpage (CCAUV/2023-08.b).

c. Reports from Regional Metrology Organizations

i. AFRIMETS

C. Veldman, chair of AFRIMETS' TC-AUV Working Group presented progress within AFRIMETS.

Three NMIs are very active in the AUV field (KEBS, NIS, NMISA) and three countries showing interest (Ethiopia, Ghana and Rwanda).

AFRIMETS had convened online twice since the last CCAUV. It is actively engaged in CIPM activities and contributes to both inter- and intra-RMO initiatives. The results of the comparison AFRIMETS.AUV.A-S2 were recently reported, while the measurements for AFRIMETS.AUV.V-K5 have been completed, and the draft A is currently being reported. NMISA is set to participate in the seismic accelerometer calibration comparison study. KEBS took part in the EURAMET repeat of CCAUV.V-K5 using secondary means. The RMO is planning to investigate ISO 16063-43 on the calibration of accelerometers by model-based parameter identification.

H. Laiz inquired about the participation of the three active countries in these regional comparisons. C. Veldman pointed out that countries outside AFRIMETS participated, and not all three of the active AFRIMETS members took part in each comparison.

The presentation is available on the CCAUV webpage (CCAUV/2023-08.c.01.a).

ii. APMP

Y.T. Kim, chair of APMP TC-AUV Working Group presented progress within APMP.

The APMP meeting was held in 2022 at NMIJ in Odaiba Japan in a hybrid format. The APMP webpage has been revamped, and a new one launched in 2023 at <https://www.apmpweb.org/>. The APMP Chair was replaced in 2022.

The 39th APMP meeting is scheduled to take place in Shenzhen (Japan) in November 2023. The election for the next APMP TCAUV chair will be held at the upcoming APMP TCAUV meeting. Key comparisons APMP.AUV.V-K1 and U-K1 have been delayed: A-K4 is in progress, and A.K1 has been postponed and restarted. CMC reviews and peer review activities were reported.

The APMP TCI project on rotation speed metrology and comparison is ongoing with a budget of \$9000.

The presentation is available on the CCAUV webpage (CCAUV/2023-08.c.02).

iii. COOMET

A. Isaev, chair of COOMET TC-AUV Working Group presented progress within COOMET.

TC 1.2 Acoustics, Ultrasound, Vibration comprises representatives from 12 COOMET countries. The 16th meeting in 2021 had participation from five countries. The 17th meeting in May 2023 was conducted online, with eight participating countries.

There has been a change in COOMET.AUV.A-S3, with the Belorussian participant being replaced by one from the Russian Federation. A. Isaev expressed his opinion that old incomplete comparisons have lost significance, but there is a difference in perspective from the pilot. A. Isaev aims to bring closure to this matter soon.

Acoustics and Ultrasound comparisons are currently under consideration, with only Belarus and the Russian Federation having AUV CMCs at present.

The presentation is available on the CCAUV webpage (CCAUV/2023-08.c.03).

iv. EURAMET

E. Sadikoglu, chair of EURAMET TC-AUV Working Group presented progress within EURAMET.

EURAMET has expanded to include 39 NMIs and 77 DIs, with the addition of NIAAM from the UK as a new DI. Ukraine and Georgia transitioned from COOMET to EURAMET, while Iceland left EURAMET. Kazakhstan, although not a member, became a liaison organization.

There are currently 12 technical committees in EURAMET, comprising ten vertical and two horizontal committees. A notable addition to EURAMET is the establishment of European Metrology Networks (EMNs). The EURAMET TC-AUV consists of 24 members and three subcommittees, each with a convenor and a subset of TCAUV membership.

Annual meetings are typical, and the 2023 meeting was in a hybrid format. The upcoming meeting is scheduled for 23–24 April 2024, in Dublin, with other RMOs invited to participate.

EURAMET NMIs actively participated in three recent CCAUV key comparisons, and updates were provided on the completion of EURAMET.AUV.V-K5, EURAMET.AUV.V-S1, and EURAMET.AUV.V-S2.

Currently, there are 524 CMCs from 20 countries, with some being newly added.

A project piloted by DFM on data for pressure reciprocity calibration is in progress.

Recent EMPIR projects involving EURAMET TC-AUV include Factory for the Future (2018–2021), RaCHy (2019–2022), and InfraAUV (2020–2023). Project websites have been established to disseminate outputs.

European Metrology Networks (EMNs) act as structural units for coordinating activities across TCs. The TCAUV could potentially participate in the EMN activities on Climate and Ocean Monitoring as well as Mathematics and Statistics. EMNs are under preparation on medical devices with measuring function, and Autonomous Transport.

E. Sadikoglu discussed the 2021–2030 European Partnership on Metrology, with a budget of 700 million euros. The AUV did not secure funding in the three calls thus far.

G. Ripper inquired about the coverage under the Green Deal EMPIR funding theme, to which E. Sadikoglu explained its focus on clean energy, sustainability, and environmental goals aligned with Europe's 2050 objectives.

H. Laiz highlighted the significance of EMPIR projects for countries outside EURAMET, emphasizing the opportunity for participation by external partners with agreements with the European Union.

H. Laiz asked about the link between EMNs and TC Chairs. E Sadikoglu said that it is weak, mostly by cross-invitation of chairs from each to the other body's activities. Efforts are under way to enhance this connection, recognizing the potential risk of parallel actions in the absence of coordination.

The presentation is available on the CCAUV webpage (CCAUV/2023-08.c.04.a).

v. SIM

A. Chijioke, chair of SIM TC-AUV Working Group presented progress within SIM.

SIM MWG-9 comprises ten members, with eight being active recently.

Among the four SIM MWG-9 members involved in CCAUV, five have contributed CMCs to the KCDB. Virtual meetings were held in October 2021, February 2023 and July 2023.

There is an ongoing comparison, SIM.AUV.A-K6, focused on LS2P microphone pressure field calibration.

Plans are under way for additional comparisons in the areas of acoustics, vibration, and ultrasound.

The next SIM MWG-9 meeting is scheduled for March/April 2024 and is intended to be a hybrid meeting.

The presentation is available on the CCAUV webpage (CCAUV/2023-08.c.06.a).

9. REPORTS FROM INTERNATIONAL OBSERVERS AND INTERNATIONAL MEETINGS

a. IEC Technical Committee 29

S. Barrera-Figueroa presented the activity report of IEC TC 29: Electroacoustics

The last meeting was held in San Francisco (USA) in 2021.

One ongoing project involves creating a documentary standard on transfer standard microphones for the calibration of sound level meters and sound calibrators. Parameters have been determined through measurements on combinations of microphones and calibrators from various participating laboratories.

Several standards have been published, including an addition to the low-frequency calibration standard and a pistonphone low-frequency microphone calibration standard.

The strategy for alignment and cooperation between the CCAUV and TC29 is a topic for discussion.

TC29 has an *ad hoc* group focused on uncertainty, addressing simplified procedures for uncertainty determination in conformity testing. Collaboration with this group may be beneficial for the CCAUV.

A new TC29 website for stakeholders has been launched, allowing non-members to register and view activities.

The next meeting is scheduled for 2024 in Warsaw (Poland).

A proposal was made to provide a simplified guide with basic concepts (not GUM) for non-metrologists.

E. Olsen emphasized that the work of the TC29 *ad hoc* group focuses on methods of acceptance, considering the large uncertainty associated with the types of instruments involved, and understanding the different approaches and concepts is crucial.

H. Laiz pointed out that CCAUV currently has no formal liaison to IEC TC29. The proposed action is to seek formal liaison, and S. Barrera-Figueroa mentioned that IEC will appoint someone to serve as a liaison to the CCAUV.

The presentation is available on the CCAUV webpage (CCAUV/2023-09.a).

b. IEC Technical Committee 87

S. Robinson reported on IEC TC87 activities.

IEC TC 87 focuses on instruments for sound/ultrasound in water, with BSI (UK) serving as the secretariat and V. Wilkens from PTB as the chair. The committee comprises 16 full (P) participating states and 14 observer (O) participating states.

The most recent meeting took place in October 2022 in San Francisco (USA), with the next meeting scheduled for 2024 in Madrid (Spain).

Working Group 8 (WG8) and Working Group 15 (WG15) are specifically dedicated to calibration within the committee.

Ongoing efforts involve the development of standards for underwater microphone calibration and acoustic wave vector devices (particle motion).

The presentation is available on the CCAUV webpage (CCAUV/2023-09.b.a).

c. ISO Technical Committee 108

H. Laiz mentioned that the technical committee has submitted a written report, but there is no accompanying presentation. The report has been uploaded to the website for review. H. Laiz raised a query regarding whether the BIPM has a formal liaison with TC108, emphasizing the importance of having a formal agreement in place. H. Laiz expressed the intention to verify the existence of a formal liaison. In response, I. Veldman mentioned that he believes he serves as the formal liaison in both directions.

The presentation is available on the CCAUV webpage (CCAUV/2023-09.c).

d. ISO Technical Committee 43 SC3

S. Robinson reported ISO/TC43/SC3 activities to the CCAUV.

ISO/TC43/SC3 focuses on underwater acoustics and comprises six working groups. Currently, ANSI (USA) serves as the secretariat, but there are plans to transition to a new one.

The most recent meeting took place in May 2023, with the next meeting scheduled for October 2024. In between, regular online working group meetings occur.

Active projects include ISO 17208-3 (addressing ship noise in shallow water acoustics), ISO 7447 (dealing with the insertion loss of barrier control measures for underwater pile driving), ISO 7605 (concerning the measurement of underwater ambient sound), ISO 20073 (establishing the standard-target method of calibrating active sonars for imaging and measuring scattering), and ISO 28990 (terminology for bioacoustics).

In response to a query from T. Bruns about the effectiveness of the bubble curtain method for sound damping, S. Robinson replied that it does have a significant effect, attenuating sound by approximately 10 dB in the applicable frequency range of around 10 Hz to 100 Hz. He noted that wind farm developers often rely on these bubble curtains to meet regulatory standards for underwater noise. However, alternative methods, such as a cylindrical sleeve with aerated foam material inside, are also being explored for this application.

The presentation is available on the CCAUV webpage (CCAUV/2023-09.d.a).

e. Comprehensive Nuclear-Test-Ban Treaty Organization Preparatory Commission

B. Doury presented CTBTO activities, highlighting the significant progress made over the last six years since the start of the relationship with the CCAUV. The CTBTO is actively developing its verification regime in anticipation of when it comes into force when all 44 Annex 2 states have signed. Four monitoring technologies, including seismic, infrasound, hydroacoustic, and radionuclide, are employed for credible data, particularly for rare events that are not very energetic in comparison to earthquakes.

The quality assurance system was emphasized, requiring transparency, benchmarking, peer review, and alignment with objectives. Validated CMCs are essential across International Monitoring System (IMS) monitoring ranges.

Collaboration with the CCAUV, which was initiated over five years ago, has focused on infrasonic microbarometers as transfer standards, with well-aligned calibration concepts among independent methods. Revised IEC standards (IEC-61094-2 and IEC TR 61094-10:2022) and CMC preparations have been undertaken.

An Infrasound Comparison was organized between CEA, LNE, UMISS, Penn State and SNL. The CTBTO Science and Technology conference took place in June 2023 with over 1 400 participants in Vienna, placing a strong emphasis on the significance of metrology. The event featured an invited talk by T. Usuda, followed by a panel discussion. A side event on metrology was organized by the infra-AUV group, and videos of the conference are available on YouTube. Future plans include the transfer of knowledge to the CTBTO community and beyond, the establishment of new call-off contracts for metrological services, and the initiation of studies on environmental sensitivities.

T. Bruns presented the CCAUV-CTBTO liaison report, summarizing metrology community activities, including the Infra-AUV project and research by NMIs such as NMIJ and INRIM.

H. Laiz mentioned that B. Doury gave a presentation at the 27th meeting of the CGPM (2022) on CTBTO activities and the relationship between the CTBTO and the CCAUV.

The presentations are available on the CCAUV webpage (CCAUV/2023-09.e.01 and CCAUV/2023-09.e.02).

f. ISO Technical Committee 12

S. Robinson presented the report for ISO/TC12 and IEC/TC 25 (these two committees are linked and have joint working group on the topic being presented).

These committees contribute to the ISO 80000 series, which take the SI and codify it into standards. Notably, ISO 80000-8 (acoustics) was published in 2020. The ongoing project involves ISO 80000-15 (logarithmic quantities and their units), currently in the drafting stage under the auspices of IEC/TC 25. The project faced challenges, necessitating termination and a restart due to the retirement of the project leader. The revision process from CD to CDV involves collaboration with musical acousticians and electrical engineers. The approach adopted, based on Mills and Morfey¹, addresses the usage of decibels and nepers, allowing traditional practices to

¹Mills I. and Morfey C., On logarithmic ratio quantities and their units, 2005, *Metrologia*, **42**(4), 246 <https://doi.org/10.1088/0026-1394/42/4/008>

continue. An issue related to asymmetry arises when decibels are used as a concise way to express linear uncertainties that are not very small. Prior to publication, the draft will be circulated to the CCAUV for comments.

The presentation is available on the CCAUV webpage (CCAUV/2023-09.f.02).

g. IMEKO TC-22

G. Ripper, presented the report for IMEKO TC22.

He highlighted the recent IMEKO TC22 online workshop hosted by NIST, featuring eleven technical discussions spanning two days, with a predominant focus on NMIs engaged in low-frequency vibration work. The next IMEKO TC22 event is scheduled to take place in Hamburg (Germany) during the IMEKO 2024 XXIV World Congress from 26–29 August 2024. Participants will have the opportunity to visit PTB’s acoustics, ultrasound, and vibration labs. Additionally, there are plans for IMEKO TC22 to hold a joint conference with several other TCs (TC3, TC5, TC15, TC16) in Czechia in 2025 or 2026 (to be determined soon). While many IMEKO TC22 members are from NMIs, there is no restriction on the number of representatives per country, and CCAUV members are encouraged to apply for membership. The committee aims to increase the number of active members.

The presentation is available on the CCAUV webpage (CCAUV/2023-09.g).

SECOND SESSION – THURSDAY 26 OCTOBER (8:00 – 17:00 UTC)

10. WELCOME BY THE DIRECTOR OF THE BIPM

The Director of the BIPM, M. Milton, welcomed the delegates to the 14th meeting of the CCAUV and presented his report.

He highlighted the current status of the Metre Convention, noting that there are presently 64 Member States and 36 Associate States and Economies of the CGPM. Estonia and Costa Rica joined as new Member States in 2021 and 2022, while Cambodia and Zimbabwe became new Associates in 2021 and 2022, respectively. M. Milton pointed out that 252 institutes participate in the CIPM MRA, with the number of CMCs reaching around 25 000. The count of Key Comparisons has been steadily increasing and currently stands at 1 800.

He delivered an update on World Metrology Day, where the chosen theme for 2023 was “Measurements Supporting the Global Food System.” INTI from SIM took the lead in collaborating with the BIPM to design the poster. There was notable participation from non-Member or Associate States such as Bahrain, Tajikistan, Nigeria, and Haiti, signifying significant interest in the work of the BIPM. In 2024 the World Metrology Day poster will be designed in collaboration with EURAMET, and the topic will be sustainability. He emphasized that World Metrology Day holds significant importance for the BIPM, as they have been actively striving to attain recognition from UNESCO as an official UNESCO day. Obtaining acknowledgment from UNESCO would enhance their ability to promote World Metrology Day and advance metrology across the entirety of the UNESCO network.

Capacity building is a crucial role for BIPM, and efforts persist in various forms, including laboratory activities, online training initiatives, and workshop-based engagements. A new way of getting more impact for the capacity building is through e-learning. A dedicated e-learning platform has been established, which is accessible on the BIPM website.

An additional key aspect for the CIPM strategy, involves inviting young metrologists to formulate a vision for the future, specifically looking ahead to 2050 and beyond. To facilitate this, a dedicated group has been established in collaboration with the regions, each appointing coordinators to contribute to this initiative.

A significant highlight in BIPM planning revolves around the upcoming 150th anniversary of signing the Metre Convention. The BIPM is actively preparing for a series of events scheduled to take place in Paris during the week of 20 May 2025.

The presentation is available on the CCAUV webpage (CCAUV/2023-10).

11. DIGITAL REFERENCES FOR METROLOGY – NEW SERVICES FROM THE BIPM

M. Milton presented the current work at the BIPM headquarters on new digital services.

This initiative originates from the General Conference’s decision for the CIPM to establish an SI digital framework. The SI digital framework aims to offer a comprehensive digital representation of the SI, serving as the globally accepted “anchor of trust” in metrology, aligning with Resolution 2 of the 27th CGPM (2022) *On the global digital transformation and the International System of Units*. Its implementation will support various applications, with a particular emphasis

on the utilization of digital certificates. Additionally, it anticipates future adoption of the FAIR principles, emphasizing data that is findable, accessible, interoperable, and reusable.

M. Milton outlined the SI digital framework using three core pillars. The initial pillar involves the “BIPM digital references.” The second pillar incorporates various “external digital references”. The third pillar involves the “BIPM online databases”. He further developed on concrete examples, specifically emphasizing the “SI Reference Point,” “Measurement service categories,” and “Key Comparison Database C”. He outlined that the new digital reference for all CMCs is now accessible, following the agreement by the JCRB earlier in 2023. A “quick start document” detailing the utilization of unique CMC Identifiers is also accessible on the KCDB help page. He presented examples of integration of CMC Identifiers in certificates, including QR Codes that provide the linkage to the CMCs. He encourage everybody to get involved and to let the BIPM know how they can improve the system.

The presentation is available on the CCAUV webpage (CCAUV/2023-11).

12. CCAUV AND DIGITALIZATION

T. Bruns presented the current work at CCAUV on Digitalization.

T. Bruns emphasized the existence of digital identifiers for various entities, specifically citing digital identifiers for CMCs. He provided an example of a URL for a German CMC, highlighting its use in ensuring traceability and the possibility of including it as a QR code on a calibration certificate. The presentation highlighted the manner in which CMC identifiers are showcased in the KCDB. Concerning the categorization of services, an excerpt from the outset of the list of AUV CMCs was presented, emphasizing the presence of complex results with magnitude and phase. He provided an illustration of service categorization, showcasing the pre-prepared format and pinpointing the specific data that the CCAUV will be required to provide. It was emphasized that a decision has been made to form a working group with volunteers who will actively participate in the tasks associated with this specific duty. T. Bruns inquired about individuals interested and motivated to join this task group for working on the digital representation, and five volunteers came forward.

The presentation is available on the CCAUV webpage (CCAUV/2023-12).

13. LABORATORY REPORTS

The presentations given during this section are available on the CCAUV webpage.

A. Chijioke presented on ongoing research projects at NIST in the area of optical acoustical metrology methods (This presentation was given at the end of Day 1 due to time available in the schedule). He described the development of a secondary microphone calibration method using laser vibrometry to measure the microphone volume velocity. This method has been validated and determined to yield uncertainties better than the previously implemented secondary calibration system for microphones at NIST, while also being simpler and faster to carry out. He reported that the system is currently being put into service for customer calibrations by NIST. A. Chijioke also described the development of acousto-optic-based calibration of microphones using a Fabry-Pérot interferometer. He presented experimental data comparing calibration by this method to reciprocity calibration, showing agreement within 4 % (0.35 dB) (CCAUV/2023-13.08).

W.-H. Cho presented the recent and ongoing AUV research projects at KRISS (Republic of Korea). In the field of sound in air, the projects include an optical method for absolute pressure measurement, research on the uncertainty of audiometer calibration and PTA, and the development of reference sound sources. In the vibration field, the focus is on traceability for *in situ* calibration of seismometers and research on the digital (MEMS) accelerometer calibration. In the ultrasound field, the projects involve a highly focused ultrasonic transducer, focused ultrasound thermometry, and the development of sound-absorbing targets for high ultrasonic power measurements. The research on data encompasses the requirements for reliable acoustic data and the development of a reliable data generation method (CCAUV/2023-13.12).

A. Troia presented the INRIM (Italy) project on cavitation measurements, outlining the fundamental principles of acoustic cavitation, the generation of high-intensity ultrasounds in liquids, and their various applications. Following an overview of the current state of the art in measuring ultrasonic cavitation, he introduced a novel set-up developed at INRIM and presented results obtained using an optical probe coupled to acoustic emission (CCAUV/2023-13.13).

P. Rattanangkul provided an overview of the current status of the NIMT (Thailand) AUV laboratory. He began with a brief history of NIMT and highlighted the institution's activities in sound in air, vibration, and ultrasound. Currently employing eleven staff members, NIMT actively participates in AUV activities under APMP and engages in key comparisons. Additionally, P. Rattanangkul introduced the new vibration lab and discussed upcoming projects for 2024–2025, including one-site calibration of seismometers (CCAUV/2023-13.14).

I. Veldman highlighted the activities within acoustics, ultrasound, and vibration at NMISA (South Africa). He began by introducing the staff involved in AUV activities. In the field of acoustics, NMISA actively participates in key comparisons and holds representation in international organizations related to standardization. The ultrasound and underwater acoustics segment has made progress in establishing radiation force balance capabilities and continued participation in key comparisons. In the field of vibration, new capabilities include primary shock capabilities and an extension of rectilinear acceleration frequency to 0.1 Hz - 20 kHz. I. Veldman provided updates on the status of CMCs and accreditation at NMISA (CCAUV/2023-13.03.a).

CCAUV COMMITTEE ISSUES

a. Applications for new members or observers

A presentation from NIS (Egypt) in support of its membership application, was given.

T.M. El-Basheer presented the capabilities and activities related to AUV metrology at NIS. He began with an overview of the NIS missions, location and organization, emphasizing the eight staff dedicated to the acoustic and vibration field. In the acoustic domain, NIS has capabilities in reciprocity calibration for LS microphones, calibration of sound calibrators, SLM, audiometers, sound power measurements in reverberant chambers, and more. Similarly, in the vibration field, NIS offers secondary calibration for accelerometers and vibration meters. In the ultrasonic field, NIS provides calibration of ultrasonic probes. T.M. El-Basheer elaborated on ongoing research activities, including the extension of audiometer calibration to the high-frequency range of 8-16 kHz and the study of the effect of Ni additives in Yba2Cu3O7-sigma superconducting

composites using ultrasonic measurements. The presentation covered calibration and uncertainty estimation for the reference sound source in a reverberation room, NIS's method for uncertainty estimation of airborne sound insulation measurements in the field, and measurements and limits of vibration affecting sensitive equipment in some metrological laboratories. T.M. El-Basheer concluded by providing the status of CMCs, which amounts to seven in the AUV field, along with updates on participation in international comparisons and the role of NIS in AFRIMETS.

The CCAUV President thanked the institute for its membership application. The delegates met after the plenary meeting to discuss the application. No objection was raised from the delegates for the application of observer status.

Decision: The CCAUV President will recommend to the CIPM the application by NIS for observer status.

The presentation and additional material to sustain the request to be CCAUV Observer are available on the CCAUV webpage (CCAUV/2023-14.a.01, CCAUV/2023-14.a.02 and CCAUV/2023-14.a.03).

a. Chairs and members of Working Groups.

Regarding the chairs of Working Groups, the CCAUV President emphasized that there is no need to undertake any actions as they have been appointed for a term of four years.

14. RECOMMENDATIONS AND ACTIONS

Recommendations to the International Committee for Weights and Measures (CIPM)

The CCAUV President made a recommendation to the CIPM to accept the application by NIS for observer status.

Actions resulting from the 14th CCAUV meeting

The list of actions arising that was compiled during the meeting was presented. Some corrections were proposed and duly made. The actions arising from the meeting, including these corrections are recorded in Appendix 2 of these minutes.

15. DATE OF NEXT CCAUV MEETING

It was proposed that the 15th CCAUV meeting, and meetings of the CCAUV Working Groups, be held in October 2025 (week 41). The participants agreed this proposal.

16. CLOSING THE MEETING

H. Laiz thanked the participants for their valuable contributions.

The meeting closed at 12:00 UTC on 26 October 2023.

APPENDIX 1

Working documents of the CCAUV can be found on the BIPM website (after logging in):

<https://www.bipm.org/en/committees/cc/ccauv/>

Documents

CCAUV/2023-01	Agenda for 14th CCAUV meeting
CCAUV/2023-02	Minutes of CCAUV meeting (2021)
CCAUV/2023-04	CCAUV presentation
CCAUV/2023-05	Documents for CIPM report
CCAUV/2023-05.05	CIPM report for CCAUV 2023
CCAUV/2023-06.a	CCAUV SPWG Report
CCAUV/2023-06.b	CCAUV KCWG Report
CCAUV/2023-06.b.01	CCAUV guidance for key comparisons
CCAUV/2023-06.b.02	Rules of procedure CCAUV KC
CCAUV/2023-06.c.00	CCAUV RMOWG Report
CCAUV/2023-06.c.01	AUV service of categories
CCAUV/2023-07.00	Summary of comparisons CCAUV
CCAUV/2023-07.01	A short report of APMP.AUV.V-S1&P2
CCAUV/2023-08.a	KCDB report
CCAUV/2023-08.b	JCRB Report
CCAUV/2023-08.c.01	AFRIMETS TC-AUV report
CCAUV/2023-08.c.01.a	AFRIMETS TC-AUV presentation
CCAUV/2023-08.c.02	APMP report
CCAUV/2023-08.c.03	COOMET report
CCAUV/2023-08.0.04	EURAMET report
CCAUV/2023-08.c.04.a	EURAMET report (presentation)
CCAUV/2023-08.c.06a	SIM MWG9 (presentation)
CCAUV/2023-08.c.06b	SIM MWG9 report
CCAUV/2023-09.a	IEC TC29 report
CCAUV/2023-09.b	IEC TC87 report
CCAUV/2023-09.b.a	IEC TC87 presentation
CCAUV/2023-09.c	ISO TC 108 report
CCAUV/2023-09.d	ISO TC43 SC3 Report
CCAUV/2023-09.d.a	ISO TC43 SC3 Report (presentation)
CCAUV/2023-09.e.01	CTBTO contribution
CCAUV/2023-09.e.02	CTBTO contribution (CTBTO)
CCAUV/2023-09.f.01	ISO TC12 IEC TC25 report
CCAUV/2023-09.f.02	ISO TC12 IEC TC25 (presentation)
CCAUV/2023-09.g	IMEKO TC22
CCAUV/2023-10	CCAUV BIPM update
CCAUV/2023-11	DT BIPM Workshop for CCAUV
CCAUV/2023-12	CCAUV discussion - digitalisation
CCAUV/2023-13.01	CENAM report
CCAUV/2023-13.02	PTB report
CCAUV/2023-13.03	NMISA report
CCAUV/2023-13.03.a	NMISA report (presentation)

CCAUV/2023-13.04	USRD report
CCAUV/2023-13.05	NRC report
CCAUV/2023-13.06	GUM report
CCAUV/2023-13.07	NMIA report
CCAUV/2023-13.08	NIST report
CCAUV/2023-13.09	NPL report
CCAUV/2023-13.10	NMIJ report
CCAUV/2023-13.10.01	Proposal of Pilot comparison (NMIJ)
CCAUV/2023-13.11	DFM and BKSVDPLA Report
CCAUV/2023-13.12	KRISS report (presentation)
CCAUV/2023-13.12.a	KRISS report
CCAUV/2023-13.13	INRIM report
CCAUV/2023-13.14	NIMT report
CCAUV/2023-13.14.a.01	NIS report
CCAUV/2023-13.14.a.02	NIS report (presentation)
CCAUV/2023-13.14.a.03	NIS bibliography

APPENDIX 2

LIST OF ACTIONS AND DECISIONS RECORDED FOR THE MEETING

H. Laiz went through the list of actions and decisions from the meeting, as recorded by the Rapporteurs.

Decisions of the 14th meeting of the CCAUV

CCAUV14/D1.	The CCAUV decided to establish a Task Group on Digitalization (CCAUV-TG-DIG) and appointed T. Bruns as Chair, with Q. Sun, S. Barrera-Figueroa, G. Ripper, S. Rajagopal and C. Veldman as members. The ToR are: To support the development of the SI Reference Point and BIPM digital services in the field of AUV. To support the activities of the CIPM Forum on Metrology and Digitalization in AUV.
CCAUV14/D2.	The CCAUV decided to change the membership of KCWG and SPWG from institutions to persons.
CCAUV14/D3.	The CCAUV decided to add D. Rodrigues (LNE), A. Chijioke (NIST) and W.H. Cho (KRISS) as members of the CCAUV SPWG.
CCAUV14/D4.	The CCAUV decided to add I. Veldman (NMISA), L. Dickinson (NMIA) and A. Canu (LNE) as members of CCAUV KCWG.
CCAUV14/D5.	The CCAUV decided to modify the ToR of the RMOWG. The new ToR are : keep RMO representatives abreast of relevant CCAUV developments strengthen the cooperation between the RMOs resolve inter-RMO CMC review obstacles review the guidelines for CMC table entries provide guidance on the range of CMCs supported by particular KCs and SCs review the list of relevant service categories, in line with the stakeholder requirements harmonize intra-RMO CMC review processes maintain a technical assessor database.
CCAUV14/D6.	The CCAUV decided to repeat part of CCAUV.W-K2 for some participants.
CCAUV14/D7.	The CCAUV decided to stop evaluation of the laser tachometer rotational speed comparisons and to request the CCTF to review the Draft B report since there are already CMCs currently published for such measuring instruments under Time and Frequency.
CCAUV14/D8.	The CCAUV supports observer status at the CCAUV to the National Institute of Standards (NIS), Egypt, and a recommendation will be presented to the CIPM.

Actions of the 14th meeting of the CCAUV

CCAUV14/A1.	The CCAUV to propose that the CIPM encourages the promotion of metrological education in the academic system by the RMOs and NMIs.
CCAUV14/A2.	CCAUV President to request a liaison with IEC Technical Committee 29.
CCAUV14/A3.	CCAUV Executive Secretary to contact COOMET TC-AUV Chair for a formal answer regarding the status of comparison COOMET.AUV.V-K1.
CCAUV14/A4.	CCAUV members to review the working document "Rules of Procedure for the Key Comparison Working Group of the Consultative Committee for Acoustics, Ultrasound and Vibration" for October 2023.
CCAUV14/A5.	CCAUV members to review the working document "Guidance for carrying out key comparisons within the Consultative Committee for Acoustics, Ultrasound and Vibration" for October 2023.