The footsteps from the first to 10th CCAUV meetings and the future activities

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10th CCAUV meeting
25, Nov. 2015

Bureau International des Poids et Mesures

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Creation of CCAUV (1996)

Working group on acoustics, ultrasound and vibration

As part of the extension of the range of work proposed for the Comités Consultatifs, Dr Blevin suggested that a study be made of the needs in acoustics, ultrasound and vibration. He said that there is a strong CSIRO group in these fields which cooperates actively with groups in Europe, but has difficulty in establishing wider international cooperation. The President suggested that a CIPM working group be set up to investigate the matter and see if a new Comité Consultatif should be created, or the topic be given a home in one of the existing committees. Dr Wallard was asked to draft terms of reference for this group.

The CIPM agreed to establish an *ad hoc* working group to review the needs for world-wide uniformity of measurement in the fields of acoustics, ultrasound and vibration. Its terms of reference are:

- to assess specific needs for world-wide uniformity in the fields of acoustics, ultrasound and vibration;
- to review the extent to which these needs are met by existing arrangements outside the Convention du Mètre;

85th CIPM meeting in 1996

Creation of CCAUV (1996)

- to consider whether it would be desirable for the CIPM to establish a programme within these fields, including key comparisons of measurements, in either an existing or a new Comité Consultatif;
- to report back in time for the 1997 meeting of the CIPM.

It was agreed that the working group should comprise Dr A. Wallard (Chairman) and representatives of the BIPM, CSIRO, DFM, NIST, NPL, NRLM and PTB, with the chairman empowered to appoint one or two additional members should this be desirable.

Finally, it was decided to call a meeting of Directors of national metrology institutes of all member States of the Convention du Mètre for 17-18 February 1997 to sound out their opinion on the future needs of metrology and to discuss proposals related to the international equivalence of national measurement standards.

85th CIPM meeting in 1996

Creation of CCAUV (1997)

Dr Wallard's study shows that the ISO and IEC groups would welcome a CIPM initiative covering key comparisons in this area and confirms that they do not cover this sort of activity at an international level. He conc1udes that the field is sufficiently mature that it attracts industrial, commercial and scientific interest at a level such that research work of the national metrology institutes needs to be coordinated, and that a programme of international comparisons is timely.

86th CIPM meeting in 1997

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Creation of CCAUV (1998)

9.3 Acoustics, ultrasound and vibration: creation of a new Consultative Committee

Dr Wallard presented his report of a meeting on acoustics, ultrasound and vibration, held at the NPL on 10-11 March 1998. The meeting was attended by twenty-two experts from seventeen countries. …they proposed five key comparisons; formed a key comparison monitoring group and expressed a strong wish that the substantial worldwide effort in the subject should be recognized by the CIPM and endorsed by the creation of a new Consultative Committee.

Airborne, Ultrasonic, Free-field, Vibration, Underwater

…Dr Wallard strongly supported the call for the creation of a new Consultative Committee for acoustics, ultrasound and vibration. Dr Kaarls agreed that there is a need for BIPM/CIPM coordinated activity in the field of acoustics and vibrations, but asked whether this would be better undertaken by a working group attached to an existing Consultative Committee rather than by the creation of a new one. …

87th CIPM meeting in 1998

Creation of CCAUV (1998)

Dr Blevin expressed strong support from the CSIRO for the establishment of an umbrella body for the acoustics and vibration field. No international platform currently exists. …. In national metrology institutes, for example, the affiliation of the acoustics/ vibration section is sometimes with the electricity section and sometimes with the mass section. …. After a vote by the Committee members, the immediate creation of the Consultative Committee for Acoustics, Ultrasound and Vibration (the CCAUV) was approved by fourteen votes to two, with one abstention. The President asked Dr Wallard to act as interim President of the Committee and to organize its first meeting. Dr Allisy-Roberts from the BIPM will act as executive secretary for the new Consultative Committee.

Consensus :

- Aiming un umbrella body for a dialogue in interdisciplinary field (A, U, V) at international level.
- Internal collaboration (mechanical and electrical section) is also expected.
- To meet CIPM-MRA requirements

87th CIPM meeting in 1998

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Major issues discussed and obtained in the past meetings

Year and round	Major issues
1999, 1st	16 members participated CIPM MRA was established
2001, 2nd	17 members, 9 observers + 2 Int. organization officially participated
2002, 3rd	WG on Future needs reported the first draft (by Dr. Zeqiri). Draft of the survey on global metrology needs (Kaals' report) presented.
2004, 4th	Publication completed original 3 comparisons (A-K1, U-K1, V-K1) Discussion on SI Brochure in terms of description of biological effects Working group on CMCs held a meeting (RMO-WG). Transition period of the MRA was terminated.
2006, 5th	Members' views were forwarded to CIPM working group for material metrology. WG on "Future needs" and "KC" were formally called.
2008, 6th	Future needs WG were replaced by SPWG . Established KCWG.
2010, 7th	17 members, 11 observers + 2 Int. organization
2012, 8th	17 members, 9 observers + 2 Int. organization
2014, 9th	Revision of th GUM, SP document published

Where are we now?

Consensus :

- Aiming un umbrella body for a dialogue in interdisciplinary field (A, U, V) at international level.
- Internal collaboration (mechanical and electrical section) is also expected.
- To meet CIPM-MRA requirements

Feedback from the

Consultative Committee for Acoustics, Vibration and Ultrasound

on a future CIPM MRA Review

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Introduction

The CCAUV organized a feedback on the implementation of the CIPM MRA. To avoid bias , the CCAUV did not use a questionnaire. The areas listed in the table below were given as examples to which a motivation on *keep / improve / remove* was invited.

Area	Issue (this list is not exhaustive)
CMC	Number and coverage of service categories.
	Process of generating, formatting and presenting CMCs.
	CMC review process.
	Intended stakeholders for submitted CMCs.
	Information provided for each CMC.
	Experience of feedback from stakeholders.
	CMCs with no associated key comparison.
	Access and comprehensibility of guidelines.
Comparisons	Coverage.
	Number.
	Repeat interval.
	Piloting.
	Reporting.
	Report review process.
	Access and comprehensibility of guidelines.

Benefits

CCAUV was established in 1998 (1st meeting was held in 1999) based on a strond need for discussing AUV measurement trancparentry with other fora such like ISO/IEC at international level. It was also noted the CC includes implementation of the CIPM-MRA in its discussion from the begininng.
Thus...

- *Many protocols and parameters for calibration are also fixed and standardized through the process of intercomparisons (e.g. standard frequencies per decade) associated liaisons with ISO/IEC.*
- *Current number of service categories and KCs are adequate.*
- *Credibility of AUV measurements has been greatly improved in those 15 years. It also revealed that how the actual measurement in industry and regulatory lacks traceability to the primary standards (overestimated in its measurement capability at industrial level).*

Drawbacks

The following drawbacks were pointed out:

- *Assessors from accreditation bodies are not aware of the CCIPM MRA and do not recognize CMCs or calibration certificates from non-accredited NMIs.*
- *Regulators (safety, environmental assessment, health, etc.) are not sometimes aware of the CMCs; the best capability of the measurement. Thus too strict regulations might be decided.*
- *Unstable and fragile transfer standard may introduce problems in KC reporting.*
- *Compilation of CMC tables is complicated and the rules not easy to understand.*
- *The criteria to accept CMCs which are not supported by a comparison are not clear.*
- *There are frequent problems with transport and customs in comparisons. For example, accelerometers used for measurements of vibration is filed under the regulations for arms and weapons.*

Suggestions

Suggestions and questions:

- *To stimulate awareness from accreditation bodies and regulators of the CIPM-MRA/KCDB.*
- *To develop and evaluate stable transfer standards; MEMS sensors may have such potentials.*
- *It is impossible to cover the entire range of measurement needs in AUV by CMCs. Could a "How far does the light shine?" rule also be established at the ILAC level? It is also important to further develop technical standards (ISO/IEC documents) to support the traceability and transparency of measurements of industry.*
- *Overall, CCAUV is performing a good practice.*

Where should we go?

Original consensus :

- Aiming un umbrella body for a dialogue in interdisciplinary field (A, U, V) at international level.
  - At RMO level (Euramet, APMP), collaborative works have been started (not by CCAUV initiative)
- Internal collaboration (mechanical and electrical section) is also expected.
  - How do you think?
- To meet CIPM-MRA requirements
  - Well done, but users' awareness? Who is our customer? What is their needs?

Where should we go?

Safety, health, and regulations

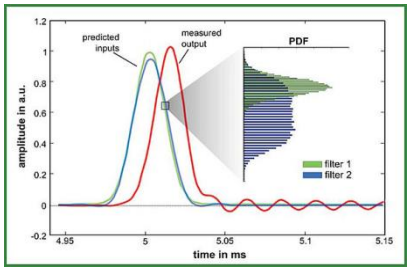
Interdisciplinary issues

Perception mechanism

LOW PASS FILTERS AND DIFFERENTIAL TYMPANAL TUNING, Prof. D. Robert, Univ. of Bristol

VR in terms of physiological quantity

Prof. Tachi, Univ. of Tokyo



Traceable dynamic measurement

EMRP

MEMS sensors

Regulation and safety

- **Shock testing**
  Automobile, aerospace, transport
- **Occupational safety**
  Vibration, noise
- **Medical diagnosis**
  High power ultrasound, audiology, activity monitoring
- **Environmental protection and assessment**
  Vibration, noise
- **Construction**
  Seismology, non-destructive testing, monitoring
- **Plant**
  Maintenance for machinery, monitoring
- **Sports and leisure**
  Motion analysis, safety of protector

Interdisciplinary issues

- **Acoustic thermometry**
  to determine the Boltzmann constant via the speed of sound
- **Acoustic and length/frequency**
  to use optical interferometric methods to provide a direct basis for traceability and move away from artefact-based primary standards
- **Materials metrology and Testing**
  To use for materials metrology and material properties (e.g. elastographic imaging techniques)
- **Ultrasound and chemistry**
  To characterize liquid composition or evaluate protein solutions, molecular imaging
- **Ultrasound and biochemistry**
  To quantify membrane permeability using ultrasound, issues on drug absorption
- **Ultrasound and ionizing radiation**
  Concepts of radiation dosimetry in ultrasound environment
- **Perception mechanism in terms of physiological quantity**
  VR in motion, audio, and tactile
  Neuro science

Future Strategy and management

- CCAUV strategy to be revised by 2017
- Rationality of comparison, clear demands from industry or scientific sector, hidden risks (safety and health, or trade)
- Discussion tool for collaborative work with stakeholders, which may not be provided from other sectors (IEEE, IEC, ISO, IMEKO)

- Sustainable WG management: ToR and membership

- Collaborative work
  - Within NMI (interdisciplinary area outcomes may not be always related with calibration techniques. Documentation will be much likely.

- Review of the CIPM-MRA from the CCAUV perspective