



1. General Aspects

This report summarises activities of the EURAMET Technical Committee for Acoustics, Ultrasound and Vibration (TC-AUV) for 2015-2016.

TC-AUV has representatives from 24 of the 38 members of EURAMET.

New contact persons from NSAI, Ireland and EIM, Greece have joined TC-AUV since the 2015 GA.

Three Sub-Committees (SCs) are organised under the Technical Committee covering different technical areas. These Sub-Committees are:

SC-A "Sound in Air":	16 members
SC-U "Ultrasound and Underwater Acoustics":	4 members
SC-V "Vibration and Acceleration":	16 members

The SCs assume responsibility for technical activities within their own specialisms and are coordinated by an appointed Convener, whereas the TC is concerned with general issues including aspects coming from EURAMET, technical activities cutting across all three AUV themes, and EMPIR activities in particular.

2. Projects

Project 1281 *Reference data for pressure reciprocity calibration according to the standard IEC 61094-2:2009*: The objective of this project is to prepare a set of reference data to enable the results of analytical calculations used in primary calibration of microphones to be compared. Beyond this particular exercise, these data files will enable the developers of software for implementing the models given in IEC 61094-2 to validate their systems. The preparation of the reference data is underway.

In addition, a project to study the discrepancies at very low frequencies in the vibration measurement results of EURAMET.AUV.V-K3, was suggested previously, but the objectives have been achieved through informal collaboration, and a specific project is now unnecessary.

Potential future projects under discussion (*project likely to start in 2016)

- Pressure calibration of type WS3 (quarter-inch) microphones*
- Validation of heat conduction models for close-coupler reciprocity calibration*
- (Extraneous) vibration sensitivity of sound level meters and microphones
- Calibration methods for transducers with digital or embedded acquisition* (cross-cutting all SCs)
- Key comparison reference curves
- Dosimetry for cosmetic ultrasound treatment
- Bilateral comparison in underwater acoustic, CNR-IDASC and NPL



3. Comparisons

EURAMET.AUV.A-K5 *Pressure calibration of laboratory standard microphone.* Will link to the KCRV established in CCAUV.A-K5. Measurements at 12 EURAMET NMIs were completed in June 2015. However the pilot laboratory, NPL had agreement from CCAUV to hold back publication of the Draft A until all results from AFRIMETS.AUV.A-K5 had been confirmed, since this project used the same microphones to increase efficiency and reliability. However, the publication of the Draft A for EURAMET.AUV.A-K5 is imminent.

EURAMET.AUV.A-S2 (EURAMET Project 1302) *Secondary free-field calibration of working standard microphones.* The comparison has suffered from unstable reference devices in the past, but the pilot laboratory LNE has brought the project back on track. The last participant to receive the microphones was INMETRO, Brazil. Unfortunately after these measurements the microphones were trapped in customs in Brazil for several months, and exposed to unknown environmental conditions. However, LNE measurements indicate that the stability of the microphones is acceptable and the project is ongoing. Following the discovery of an equipment fault in their system NPL, has requested another chance to calibrate the devices.

EURAMET TC-AUV is also participating in the following CCAUV and RMO comparisons

CCAUV.U-K4 *Comparison of laboratory reference hydrophone calibrations.* This key comparison is an update of CCAUV.U-K2 but with enhanced scope. The participating EURAMET NMIs are NPL (UK), and PTB (DE), with just one other (NIM, CN) taking part. NPL is the pilot laboratory. The measurement have been completed and a Draft A report is in preparation.

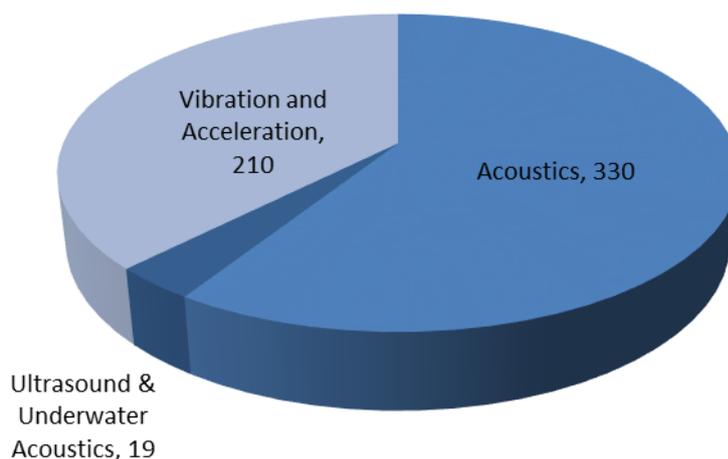
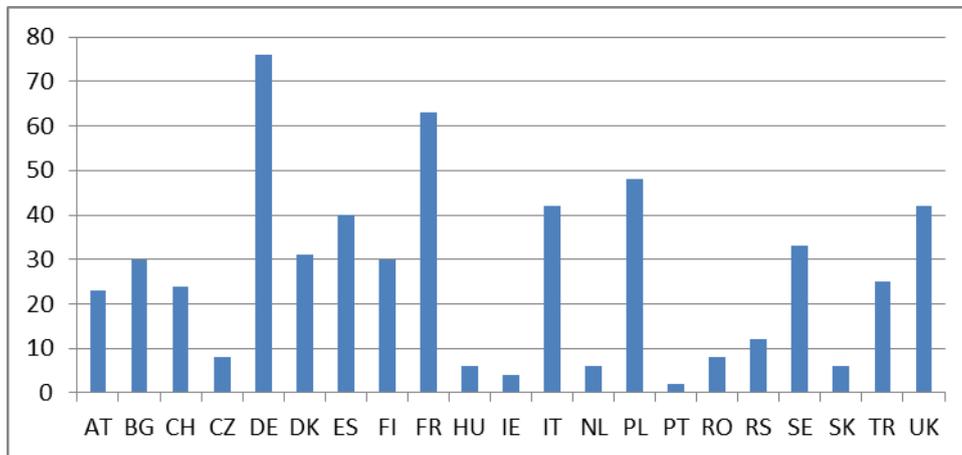
CCAUV.W-K2 *Comparison of free-field hydrophone calibrations in water.* This key comparison is piloted by NPL and had nine participants (significantly more than its predecessor), including two further DIs from EURAMET. The protocol has been prepared and is under review by the CCAUV-KCWG.

CCAUV.V-K3 *Complex acceleration sensitivity.* This project has 14 participants. NIM, China is the principal pilot laboratory, with NMISA, S. Africa and LNE, France acting as co-pilots. Accelerometer measurements in the frequency range 0.1 to 40 Hz have been completed and a Draft A is in preparation.

AFRIMETS.AUV.A-K5 will link to the KCRV established in CCAUV.A-K5. It has five participants three of which are from EURAMET. CMI were unable to participate in the EURAMET KC and MIKES did not perform low frequency measurements at the time. NPL is assisting NMISA, South Africa in piloting the project and is the linking laboratory. Due to the small number of participants it was decided to use the same microphones used in EURAMET.AUV.A-K5, as they had proven stability. Measurements were completed in March 2016, and Draft A report is in preparation.

4. CMCs

21 EURAMET NMIs & DIs have a total of 559 CMC entries approved and published on the BIPM KCDB. The distribution by country and technical area is shown below.



Number of AUV CMC entries in the KCDB by country and technical area

New or revised CMC submissions from CEM, Spain and LNE, France were added to the database in 2015. Overall, the number of CMCs appearing for review is not excessive, and the situation is manageable. However TC-AUV's position is to resist expansion of the service categories into tertiary application area as promoted by other RMOs.

TC-AUV discussed the procedures for reviewing and confirming existing CMCs and are awaiting guidance from EURAMET on whether local or centralised procedures will be established. Meanwhile, the completion of the second wave of CCAUV KCs is expected to trigger CMC updates in all fields.

5. Activities of the Subcommittees

The activities of each Sub-Committee are coordinated by the appointed Convener. The level of membership in Sub-Committees varies significantly, and it is common for invited guests from other RMOs and additional technical experts to attend as observers. Each Sub-Committee meets annually. The work of the Sub-Committees is reflected mostly in the variety of past collaborative TC- projects.

However it has been noted by all SCs that recent focus on EMRP has reduced the capacity for initiating new TC-projects.

The 2016 SC meetings were notable by the number of attendees. SC-U in particular attracting a record attendance of 15 experts.

Issue around the calibration of digital sensors was also raised separately in all three SCs and brought together in the new cross-SC project proposal.

6. Participation in EMRP/ EMPIR

Two EMRP projects from the 2011 Health Call were completed in 2015.

EARS developed new metrology for the measurement of airborne ultrasound and infrasound and associated brain responses. It also initiated the development of the next generation of ear simulators for hearing assessment, focussing on neonate and children as test subjects.

DUTy developed definitions of dose metric for high amplitude therapeutic ultrasound, together with new Standards and measurement methodologies. It also made an enormous scientific contribution with 45 published papers and 75 conference presentations.

In addition:

SoundPwr is developing new optically based primary realisations of the sound power unit, enabling the quantity to be realised independent of sound pressure. This project will end in 2016.

Two new projects begin in 2016 under EMPIR

EARS2 will continue the work of the very successful original EARS project, under the Health Call. The project consortium is extremely pleased to have gained the top ranking in both the 2011 and 2015 Health calls, indicating the high value that the stakeholder community places in this work. The new project will introduce additional NMIs and academic partners into the consortium. The original project has already formed links with external bodies including IEC and these will be exploited as the project enters the second phase in May 2016.

Underwater Acoustics RPT: UNAC-LOW

UNAC-LOW is the first underwater acoustics project to feature in EMRP or EMPIR, and aims to increase research capacity and improve low frequency traceability for hydrophones and recording systems. It is led by TUBITAK, and begins in May/June 2016.

7. Capacity Building: Activities of the last year and future needs

The presentation on behalf of the EURAMET BoD at the 2016 TC-AUV meeting seeded some interesting discussion which raised more questions than could be answered.

Most significantly, TC-AUV saw a dichotomy between the goals for Capacity Building and efforts to avoid duplication of capability and foster greater co-ordination across NMIs.

TC-AUV awaits further guidance from EURAMET on how to take this initiative forward, and notes with interest the proposed 'Study on Co-ordination in Metrology'.

8. Meetings

The TCAUV and the three Sub-Committees meet typically on a yearly basis. In recent years the objective has been to hold meetings of the TC and all SCs together, providing greater opportunities for cross-theme discussions and greater exposure of all delegates to wider EURAMET issues.

The 2015 meetings were held at DFM, Denmark on 24-25 February 2016 and followed the now established 2-day format consisting of Plenary and Sub-committee sessions.

The Plenary sessions provided the opportunity to report on and discuss general EURAMET matters and information arising from the EURAMET General Assembly and joint meetings of the Board of Directors and TC-Chairs. This year, the main points discussed were:

1. Key questions on the review of the BIPM MRA
2. The draft EURAMET Guide for comparisons
3. The coherent metrology infrastructure objective
4. Capacity building within EURAMET
5. NMI strategic goals

A report on the 10th meeting of CCAUV was also provided.

9. Issues

TC-AUV needs to propose a new Chair before the end of 2016. The first call for (self-) nominations has produced 0 candidates.

Despite a small number of very successful projects, well developed PRTs that align with strategic goals, and strong support from a wide range of stakeholders, the AUV field remains very under-represented in EMPR and EMPIR. Attempts to change perceptions about this technical area within the EMPIR Committee appear to be short-lived or ineffective, and not in accord with the stakeholder community or society.

10. Strategic Planning

The agenda item on Strategic Goals drew some comment from the usually active participants during the TC-AUV Plenary meeting, but nothing from the smaller NMIs that the item was particularly aimed at. The lack of contributions necessitated follow up, and a short email survey was initiated, asking:

- What drivers, strategies and goals are relevant to your NMIs?
- Do you need to survey your national stakeholders?
- What coordination activities do you/could you undertake in your country?
- What expectations do you have of EURAMET and what are your main reasons for attending TC-AUV?
- What can we do to improve degree of coordination within TC-AUV?

However even this survey has produced no response, and further attempts at producing the information need to be tried.

The TC-AUV meeting also established an ad-hoc working group to review and update the 2012 Roadmaps.



11. Outlook for 2016/2017

TC-AUV received an invitation from MIKES, Finland, to host the 2017 meeting, which will take place in February or March.

Some progress with review of roadmaps is expected.

Richard Barham
EURAMET TC-AUV Chair