TC-AUV Report for the 8th EURAMET GA

June 2014

1. General aspects

This report summarises activities of the EURAMET Technical Committee for Acoustics, Ultrasound and Vibration (TC-AUV) since the 7th General Assembly in 2013.

Dr Salvador Barrera-Figueroa competed his term as TC-Chair in June 2013 and the members of TC-AUV wish to thank him for his representation and support for the efficient operation of the TC. Dr Richard Barham has now taken over the role of TC-Chair.

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

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

SC-A “Sound in Air”	: 15 members
SC-U “Ultrasound and Underwater Acoustics”	: 4 members
SC-V “Acceleration and Vibration”	: 15 members

The SCs are responsible for technical activities within their own specialisms and are coordinated by an appointed Convenor, whereas the TC is concerned with general issues and technical activities cutting across all three AUV themes, and EMRP/EMPIR activities in particular.

2. Collaborative research projects

Project 1062 *Bilateral comparison in hydrophone calibration up to 50 MHz* : The project is extending the boundaries of current measurement capability in ultrasound measurement. It is investigating and comparing results beyond the current upper frequency limit and is a pilot study for a future key comparison. The project has recently been completed and established a number of areas for further investigation, including the need for significantly lower levels of ambient vibration to improve the measurement uncertainty.

Project 1099 *Investigation of measurement methods for the essential properties of ultrasonic cleaning systems* **:** Due to the technical complexity of measurements in ultrasonic cleaning applications, there is a pressing need for a collaborative approach to the investigation and establishment of potential methods. This is a collaborative project and staff exchanges between NPL and PTB are being arranged to carry out the research using specially adapted commercial cleaning systems.

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.

3. Key and supplementary comparisons

NMIs from EURAMET are participating in the following CCAUV comparison:

CCAUV.A-K5 *Comparison of laboratory standard microphone calibrations*. This key comparison is an update of CCAUV.A-K1 but with enhanced scope. Among the participants from EURAMET there are three NMIs: GUM (PL); INRIM (IT); NPL (UK); and one DI: BKSV-DPLA (DK). The comparison is piloted by NPL. The Draft B was submitted to the CCAUV-KCWG in Mar-14 and only minor comments have since been received. The final report should therefore be submitted and published in the near future.

CCAUV.U-K3 *Ultrasonic power***.** This key comparison covered the measurement of the time-averaged, ultrasonic power output of an ultrasonic standard transducer. Among the participants there are four NMIs from EURAMET: INRIM (IT), NPL (UK), PTB (DE), and UME (TR). Final results were published in Dec-13 and have been added to the KCDB. However EURAMET NMIs are involved in a proposed follow-on KC (CCAUV.U-K3.1) to enable some NMIs from other RMOs to resolve their discrepant results.

CCAUV.U-K4 *Comparison of laboratory reference hydrophone calibrations.* This planed 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. A protocol has been prepared by NPL and is under review.

CCAUV.V-K2 *Complex charge sensitivity, measurement according to ISO 16063-11.* PTB was the pilot laboratory for this comparison and a further 6 EURAMET NMIs (CMI (CZ), GUM (PL), LNE (FR), METAS (CH); PTB (DE), UME (TR)) and one DI (BKSV-DPLA (DK)) took part. The final report was published in Mar-14 and the results entered in the KCDB.

CCAUV.W-K2 *Comparison of free-field hydrophone calibrations in water.* This planed 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.

The following EURAMET AUV comparisons are in progress:

EURAMET.AUV.A-K5 *Comparison of laboratory standard microphone calibrations*. This RMO KC will link to CCAUV.A-K5 and enable the many EURAMET NMIs with capability to maintain their CMCs in microphone calibration. Eleven EURAMET NMIs and NIS (EG) are taking part. The protocol has been approved and measurements are underway.

EURAMET.AUV.A-S2 (EURAMET project 1302) *Comparison of secondary free-field calibration of WS2 microphones* : Recent publication of IEC 61094-8 provides the basis for the first international comparison for this measurand, to underpin measurement service provision in a number of NMIs. The protocol was approved and the project registered in the BIPM database. Measurements are now underway and are running smoothly. LNE is the pilot laboratory.

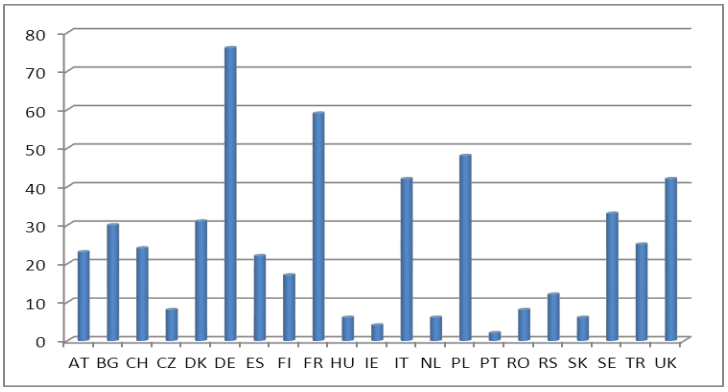
EURAMET.AUV.V-S1 (EURAMET project 1204). 9 NMIs participate CEM (ES), CMI (CZ), GUM (PL), INRIM (IT), LNE (FR), METAS (CH), MIKES (FI), PTB (DE), SP (SE), and one DI BKSV-DPLA (DK). The protocol has been prepared by the pilot laboratory, LNE and approved by the CCAUV-KCWG.

EURAMET NMIs are also involved in the following key comparison within other RMO.

COOMET.AUV.V-K1: 3 participants from EURAMET (GUM, UME, INM). VNIIM (RU) is the pilot of the comparison. The Draft B of the comparison report is under preparation.

4. CMCs

DMDM (RS) published their first CMCs in AUV in 2013, making a total of 21 EURAMET NMIs and DIs having CMC entries approved and published on the BIPM KCDB. The overall number of published CMCs is 524. The distribution by country is shown below.



Number of AUV CMC entries in the KCDB by country

A new CMC submissions (EURAMET.AUV.14.2014) from MIKES (FI) is under inter-RMO review, and further submission from LNE (FR) is currently under intra-regional review. The overall 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.

5. Activities of the Sub-Committees

The activities of each Sub-Committee are coordinated by the appointed Convenor. The level of membership in Sub-Committees varies significantly, but it is also 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 collaborative TC-projects. However is has been noted by all SCs that a focus on EMRP has reduced the capacity for initiating new TC-projects.

At the 2014 meeting, the idea of establishing a Strategy WG was discussed and is under consideration. Its terms of reference need to be defined, but its main purpose would be to co-ordinate EMPIR activity. A decision on whether to go ahead will be taken later in 2014.

6. Participation in EMRP

TC-AUV participates actively in the European Metrology Research Programme EMRP. There is an active Joint Research Project (JRP) from the 2010 Call, two from the 2011 call and a new one from the 2012 call.

The project IND09 “Dynamic” (Call 2010 Industry) is concerned with the generation of the knowledge and infrastructure needed for establishing and ensuring the traceability for the mechanical quantities force, torque and pressure for measurements under dynamic conditions. For more information please see: http://www.ptb.de/emrp/ind09.html

The project HLT01 “EARS” (Call 2011 Health II) is concerned with the metrology underpinning the development of a universal ear simulator and methods for quantifying the perception of non-audible sound. For more information please see: http://www.ears-project.eu/emrp/ears.html

The project HLT03 “DUTy” (Call 2011 Health II) deals with the challenges of establishing the metrological basis for therapeutic ultrasound. For more information please see: http://www.duty-project.eu/emrp/dosultrasound-home.html

SIB56 “SoundPwr” (Call 2012 SI Broader Scope) is investigating a new means of establishing traceability for sound power measurement using optical measurements of a vibrating source as a primary standard. For more information please see: http://www.ptb.de/emrp/sib56-home.html

No new JRPs with AUV content came out of the 2013 calls, but PRTs relating to cavitation and industrial ultrasound applications have been submitted for the 2014 Industry call in the new EMPIR.

7. TC-AUV input to the EURAMET Strategic Research Agenda

The output from the exercise to review and revise roadmaps for all SCs in 2012, was used as the basis for developing the strategic priorities for TC-AUV in the Grand Challenge and thematic areas of EMPIR. The opportunity was taken during the TC-AUV meeting in 2014 to identify the triggers and challenges that can be addressed by each of the SCs across the whole scope of EMPIR. A brainstorming process was used to capture and develop ideas originating in the roadmaps. These were then reviewed by the TC as a whole to identify the topics that cut across the different SCs.

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.

In 2013 it was decided to reformat the meeting to foster even greater interaction between the SCs, and increase the level of technical content in the TC meeting, as well as reduce the overall duration of the meetings (from 3 days to 2 days). A new 2-day format was subsequently formulated with plenary sessions at the start and end of the meeting, and the SCs running in parallel in between. The format was tested at the 2014 meeting, which was held at INRIM (IT) on 7-8 May 2014. The format proved effective and it was agreed to continue with this for future meetings.

GUM (PL) kindly offered to host the next meeting, which will take place in April or May 2015.

It was also suggested that the proposed TC-AUV Strategy WG should meet separately in November 2014 to prepare for the 2015 EMPIR calls.

Richard Barham
TC-AUV Chair