# Celebrative seminar at the occasion of the 10th Meeting of the Consultative Committee for Acoustics, Ultrasound and Vibration

## 25 November 2015 14:00

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

**Takashi Usuda, CCAUV President, NMIJ (Japan)**

Following the recommendation to setup the new CC for Acoustics, Ultrasound and Vibration by the CIPM in 1996, the CCAUV was set up in 1998 and its first meeting was held in 1999. Since then, a lot of inter-comparisons have taken place. Those comparisons enabled to review the degree of equivalence of calibration services of member NMIs. They also provided standard protocol and procedure of measurements which were not well prepared in the past. So far CCAUV activities greatly improved measurement capabilities of "member NMIs". But do our customers and stakeholders recognize well our activities? Do we know their needs? What are their expectations to AUV measurements? In this talk, we review our outcomes from CCAUV activities. We also discuss our possible future activities.

### Invited talk: CANCELLED

**Daniel Robert – University of Bristol (United Kingdom)**

***Selected topics from CCAUV members:***

### Pressure calibration of microphones using calculable pistonphones

**Richard Barham, NPL (United Kingdom)**

Reciprocity calibration of laboratory standard microphones provides the customary basis for realising primary standards for sound in air, and have been demonstrated to cover the frequency range from 1 Hz (by pressure calibration) to over 100 kHz (by free-field calibration). However in the infrasound region, established procedures face difficulties in accounting for the influence of thermal and viscous effects on the results. Fortunately this is not the only means of calibrating microphones. Pistonphone devices where the sound pressure can be calculated, were the basis for calibrating the very first electrostatic microphones and modern versions of such devices can yield levels of uncertainty commensurate with reciprocity calibration. There is therefore good potential to compare these independent calibrations methods so that one may validate the other, adding another dimension to the BIPM key comparisons that instil confidence in these measurement standards.

## Heat conduction correction in reciprocity calibration of microphones, ambiguities and recent findings

**Erling Sandermann Olsen, BKSV (Denmark)**

There is an increasing interest in sound level measurements at very low frequencies, and at the same time the IEC standard is ambiguous on how to make these corrections. The presentation will be on the most recent findings in the subject from discussions in the IEC TC29 and research made in the UK and in Denmark.

## Using the water tank transfer function to suppress the reverb distortion of signal during calibration of underwater receiver

**A.E. Isaev, FSUE VNIIFTRI (Russia)**

Reverberation of sound in laboratory water tank distorts the projector signal and does not allow using the signals similar in shape and spectral composition to the radiated by the sea objects (noise of ship or sound impulse of marine pile driver) for laboratory calibration of underwater sound receiver.

Method of suppressing the reverb distortion based on the use of the water tank transfer function (WTTF), which sets for the receiving point the relationship between the sound pressure in the water tank reverberant field and in the free sound field depending on the frequency is considered in the report. The WTF is obtained experimentally as the ratio of the frequency dependence of the complex transfer impedance of the projector-receiver pair measured in the noise reverb sound field in the water tank to result of treatment this dependence by method of complex moving weighted averaging CMWA. The results of the use the WTTF to suppress the reverb distortion of spectrum and form of a stationary noise signal and impulse sound are shown.

## Characteristics of Sounds Emitted During High Resolution Marine Geophysical Surveys

**Steven E. Crocker, NIST-USRD (United States of America)**

The Bureau of Ocean Energy Management (www.boem.gov) is the U.S. government agency charged with advancing environmentally responsible offshore energy development. The bureau works to balance resource development on the outer continental shelf with protection of the environment. The bureau supports science-based decision making through an Environmental Studies Program with more than $1 billion in research investments.

The U.S. Navy's Underwater Sound Reference Division (USRD) is currently supporting an environmental study to better understand and mitigate the impact of high resolution marine geophysical surveys. A necessary first step toward that research objective is improved characterization of acoustic source levels, frequency content and directional radiation patterns of commonly used geophysical survey systems. The USRD in cooperation with the United States Geological Survey (USGS) has acquired calibrated acoustic source data for a variety of commercial sonar systems used in marine geophysical surveys including sub-bottom profilers, side-scan sonars and multi-beam bathymetric fathometers. Upon completion, a comprehensive report will be available to U.S. and international audiences through the bureau's Environmental Studies Program Information System (http://www.boem.gov/Studies/ ).

## Investigation of equivalency between dynamic and static acceleration calibrations

**Hideaki Nozato, NMIJ (Japan)**

A round robin test was carried out to investigate the validity of centrifuge calibration for piezo-resistive accelerometers among four participants in Japanese automobile field: KYOWA, TTDC (Toyota), JARI and NICS (Nissan). Besides the four participants, NMIJ/AIST provided reference values with the round robin test by using primary shock calibration system. In consequence, all calibration results accorded with each other. This means centrifuge calibration signifies technical equivalency to shock calibration.

## Report on Recent Research Activities of KRISS

**Wan-Ho Cho, KRISS (Republic of Korea)**

In KRISS, the research on the free-field reciprocity calibration was continued in this year and the system was modified to suppress the effect of cross-talk. Also, the research on the diffuse field calibration was started and aimed to establish the primary calibration system until end of the 2017. Several co-works were conducted with NPL via visiting research program of KRISS. An improved process suggested by NPL for the artificial ear calibration was tested and observed the feasibility. Also, the infrasound calibration using laser pistonphone was investigated to find the cause of difference from the result obtained by reciprocity. In the field of vibration, KRISS attended to CCAUV.V-K3 key comparison and the result was reported on August. In the field of underwater acoustics, the research on measuring material properties of sound absorption material in the underwater condition was started to attend the next planned KC.

## Environmental conditions during key comparison transportation

**Julian Haller and Christian Koch, PTB (Germany)**

In the course of the international key comparison CCAUV.U-K3.1, a data logger was used to monitor temperature, pressure, humidity, and acceleration during transportation of an artefact travelling between participating laboratories. From the recorded data, environmental conditions of different kinds of transportation have been investigated and analysed with respect to the risk of influencing the stability or even damaging the travelling standard. Corresponding recommendations for the safe and proper transfer of artefacts between laboratories could be deduced from the data.

In general, the suitability of a data logger to provide evidence of the transport conditions during a key comparison has been demonstrated and the use of such a device is recommended for all key comparisons. The data logger has also been successfully employed to validate the protection properties of the passively insulating packaging of the artefact against pressure and temperature changes.