



CCAUV activity report

Laboratory of acoustics and vibration METAS

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Organisation

METAS is the national metrology institute of Switzerland. Its primary purpose aims to ensure measurements which are correct and in compliance with legal regulations serving the protection of man and environment. It provides (or conveys) the necessary metrological infrastructure and competence required by the Swiss economy, research, administration and society. In order to achieve these goals, the following tasks have been allocated to our institute by the federal law about the institute of metrology:

- Provide internationally recognized units at an adequate level of accuracy
- Carry out the necessary scientific and technical investigations
- Develop state of the art measurement techniques
- Perform research projects to contribute to significant improvements of metrology in all its disciplines

The acoustics & vibration laboratory is implementing these objectives in its respective area of activities.

Activities in AUV (2016-2017)

The acoustics & vibration laboratory of METAS is in charge of both

- the primary realisation of the unit of sound pressure in the area of sound in air as well as
- the primary realisation of the unit of acceleration in the area of vibration.

The primary system in acoustics is based on the pressure reciprocity technique according to the IEC 61094-2-standard which was implemented in our laboratory based on an in-house development of both the data acquisition procedure (based on LabView) as well as the analysis of the measuring data (MatLab scripts).

The system has been extensively validated by internal comparisons (as well as the verification of partial aspects of the system). In addition, we have participated in the following recent comparisons:

- [EURAMET.AUV.A- K5](#)
- [AFRIMETS.AUV.A- S1](#)

The primary system in vibration consists essentially of an implementation of the standard ISO 16063-11 based on a Polytec laser vibrometer with digital demodulation and a system integration by Spektra.

We have had a rather intimate contact with the latter company within the context of the system verification. We have spent considerable amount of time to convince ourselves, that

the various aspects of the system integration performed according to the manufacturers' specifications. Finally, we also participated in the following recent comparisons within the area of vibration:

- [CCAUV.V- K5](#)
- [CCAUV.V- K3](#)
- [EURAMET.AUV.V- K3](#)

These units are then subsequently disseminated - mainly amongst national customers - in terms of calibrations and / or verification of measurement instrumentation.

Acoustics

Probably the most significant workload in the acoustic laboratory for the dissemination of the unit arises from the periodic verification of **sound level meters**. There have been issued 356 certificates in 2016 alone. These sound level meters are verified according to the respective standard (by which the instruments had been approved) using an automatic and custom-tailored measurement platform, which had been developed in-house.

Another key activity concerns **sound calibrators** for which 248 certificates have been issued in 2016 alone.

METAS is in charge of the periodic verification of **audiometers** in Switzerland. This service has been developed over the last few years by the laboratory of acoustics and vibration. In 2016, however, it has been transferred internally into a different division. While the acoustics and vibration laboratory performs its activities within the section "mechanical quantities and ionising radiation" assigned to the division "physics and chemistry", the verification of audiometers is now part of the section "verifications and tests" within the division "legal metrology". The acoustics laboratory, however, still provides its references to this business unit taking care of about 1000 individual instruments on-site.

Besides the above mentioned instruments we are calibrating accessories (such as **preamplifiers, measuring amplifiers, artificial mastoids, artificial ears, tapping machines**, and are in charge of the list of **hearing aids** entitled for reimbursement by the social security in Switzerland.

Vibration

In the area of vibration there has been less demand for our calibration services, which may be related to the absence of legal requirements. Nevertheless, we have calibrated annually about 100 vibration sensors, vibration calibrators or complete vibration measuring chains in the last few years.

Research

Since may 2016, METAS participates in the research project "[Ears II](#)" financed within the framework of the European metrology programme for innovation and research EMPIR. Our role has been concentrated on the implementation and verification of novel mobile sound measuring instrumentation, on calibration techniques for sound measuring instrumentation in the ultrasound as well as extending the application range of occluded ear simulators by designing, fabricating and testing appropriate adaptors.