

**Acoustics, Ultrasonics and Vibration
National Measurement Institute, Australia (NMIA)
Brief Report**

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The National Measurement Institute Australia (NMIA), a division within the Australian Government's Department of Industry, Innovation and Science, is Australia's peak measurement body responsible for biological, chemical, legal, physical and trade measurement. The NMIA's Acoustics, Ultrasound and Vibration (AUV) Standards Group maintains Australia's primary measurement standards in these fields, providing Australia's highest level measurement services to clients in industry and government.

Acoustics

From July 2017 to September 2019, the NMIA has performed 292 acoustic calibrations. This includes the calibration of 211 microphones, 48 calibrators and pistonphones, 22 artificial mastoids, 8 sound level meters and 3 measuring amplifiers.

The acoustics laboratory at the NMIA has recently undergone renovation which has included the installation of a new double-walled sound-proof room. This has been necessary as much refurbishing and building works have been planned for our site over the coming years.

The AUV group has explored the possibility of performing pattern approvals of sound level meters at the NMIA which has included the development of some prototype systems. This has included exploratory measurements of the angular free-field response of microphones and sound level meters, as well as developing a pressure vessel to test sound level meters at varying static pressures.

The NMIA will be participating in the upcoming key comparison CCAUV.A-K6 primary pressure calibration of laboratory standard microphones LS2P over the frequency range 2 Hz to 25 kHz, and the regional comparison APMP.AUV.A-K5 for LS1 microphones over the frequency range 2 Hz to 10 kHz.

Over the last two years, the NMIA has extended its capability to perform low-frequency calibrations of microphones down to 0.1 Hz. The principle method utilises two different traceability paths combining the pressure calibration of differential pressure gauges with the calibration of low-frequency microphones by comparison to primary LS2P references. This has resulted in a publication:

Traceable calibration of microphones at low frequencies, D A Scott, L P Dickinson, M J Ballico, Meas. Sci. Technol., **30** (2019) 035011

The AUV group has employed a new Staff member, Dr Christopher Thomas, replacing a retiring staff member (Dr Andrew Scott), in January 2018 to assume responsibilities for acoustics-related services.

The AUV group also underwent a successful international technical audit in July 2019 through the Australian accreditation body, the National Association of Testing Authorities (NATA), which represents ILAC and APLAC in Australia.

Vibration

From July 2017 to September 2019, the NMIA has performed 90 vibration related calibrations. This includes the calibration of 43 accelerometers, 27 charge amplifiers, 9 geophones, 8 vibration meters and 3 impedance heads.

To continue to provide as wide a range of services and support to Australian industry, the vibration group has been expanding its range of operations over the past few years. As previously reported we participated in the low-frequency intercomparison CCAUV.V-K3 in 2015, extending our calibration capability down to 0.1 Hz.

We have recently acquired and commissioned equipment (Spektra SE201) for the absolute calibration of accelerometers by shock excitation, participating in CCAUV.V-K4 in May 2018. This comparison was organised to compare measurements of accelerometer magnitude sensitivity when calibrated with Gaussian, half-sine or half-sine squared linear shock accelerations in the amplitude range of $500 \text{ m}\cdot\text{s}^{-2}$ to $5000 \text{ m}\cdot\text{s}^{-2}$, with pulse widths between 0.5 ms and 3 ms. Measurements and analysis were carried out according to the methods described in ISO 16063-13:2001 – *Primary shock calibration using laser interferometry*. Measurements were made on both back-to-back (BB) and single-ended (SE) accelerometers. A Draft report on the comparison has been prepared.

In July 2018 measurements were made for CCAUV.V-K5 for steady-state accelerations from 10 Hz to 20 000 Hz, again using both SE and BB accelerometers. A non-cylindrically symmetrical adapter plate for the SE accelerometer, and a poorly polished surface on the BB accelerometer presented difficulties to the measurement method. The Draft report has not yet been issued.

Ultrasound

The calibration of both ultrasonic transducers and ultrasonic power meters continues to be a low-volume service for the NMIA. In addition to the calibration of ultrasonic power meters, measurements of spatial distribution of ultrasound in water were made for clients who are developing transducers for customised applications.