



Strategy 2017 to 2027
Consultative Committee for Acoustics, Ultrasound, and Vibration (CCAUV)

Metrological challenges:

- Very specific quantities: Low frequency and dynamic metrology fields
- No primary standards available in any national metrology institutes.
- Strategic actions at the international level (BIPM – CCAUV)*

METROLOGICAL TRACEABILITY TO SI

- Away from disturbances (thermal vibration, human activities),
- Laboratory thermal controlled ($23\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$),
- Stability $\pm 0,2\text{ }^{\circ}\text{C}$ in the measurement area over one week,



*SI: International System of Units
BIPM: Bureau International des Poids et Mesures
CCAUV: Consultative Committee for Acoustics, Ultrasound and Vibration.



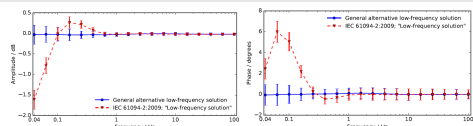
RESEARCH AND DEVELOPMENT IN METROLOGY

Infrasound: Development of an acoustic pressure standard and an associated reference calibration method for the calibration of infrasound sensors at 1 Hz. (Scientific collaboration with the French National Metrology Institute - LNE)

LNE-CEA infrasound primary standard development (under qualification).

EVALUATION AND IMPROVEMENT

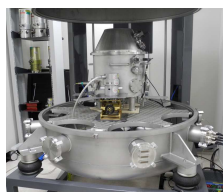
Infrasound: Investigation on the primary calibration of microphone at low frequency using the reciprocity method IEC 61094 -2:2009. Development of a theoretical general alternative low frequency solution [1][2][3]



Seismic: Evaluation and Improvement of the ISO 16063-11 primary vibration calibration by laser interferometry [4][5]

VALIDATION

Infrasound: Two Pilot studies organized by the PTS with Sandia National Laboratory, University of Mississippi, Los Alamos National Laboratory.



CEA infrasound sensors calibration with the new laser pistonphone



CEA – Horizontal and vertical low frequency vibration primary calibration benches

HARDWARE

SOFTWARE



VIBRATION ISOLATION



- Thermal chamber: $-20\text{ }^{\circ}\text{C}$ up to $60\text{ }^{\circ}\text{C}$
- Stability $\pm 0,5\text{ }^{\circ}\text{C}$

TEMPERATURE

STATIC PRESSURE

- Static pressure chamber
- Static pressure reference for infrasound sensor calibration,
- Stability $\pm 10\text{ Pa}$,
- Static pressure variation from 600 hPa to 1100 hPa.



INTERNATIONAL QUALITY ORGANIZATION STANDARD

International standard EN ISO/IEC 17025:2017
General requirements for the competences of testing and calibration laboratories:

- General requirements
- Structural requirements
- Ressource requirements
- Process requirements
- Management system requirements

[1] P. Vincent et al, Acoustic transfert admittance of cylindrical cavities in infrasonic frequency range, *Metrologia* 56 (2019)
 [2] P. Vincent et al, Analytical modeling and characterization of an infrasound generator in the air, *Applied Acoustics* 148 (2019)
 [3] F. Larsonnier et al, Infrasound sensors and their calibration at low frequency, *INTERNOISE* 2014, vol 249
 [4] F. Larsonnier et al, Seismometers calibration: Comparison between a relative electrical method and a vibration exciter based absolute method, *IMEKO* 2014
 [5] C. Bartoli, F. Larsonnier, Preliminary comparison on seismometer frequency response following ISO 16063-11 calibration by primary means, *Journal of Physics: Conf Series* 1065 (2018)