

INRiM Activities in AUV

Status Report for the 12th Meeting of CCAUV



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INRiM is active in Sound in Air, Ultrasound and Vibration.

Sound in Air and Ultrasound are a part of the Division of Advanced Materials Metrology and Life Science, Vibration of the Applied Metrology and Engineering Division.

Sound in water in Italy is an activity carried out by IDAC of CNR (National Research Council), whose application to become a DI for Italy is still in progress.

Sound in air.

INRiM is responsible for the national standards of acoustical pressure and provides traceability to 18 calibration laboratories in the Italian accreditation scheme. INRiM declares 23 CMCs for Sound in air, one for Reference Sound Sources Sound Power calibration.

Course on “Calibration procedure including uncertainty calculation template, uncertainty budget and Calibration Certificate templates drafted”.

Project: Support to Georgian National Agency for Standards and Metrology for further implementation of the EU-Georgia DCFTA requirement - GE/13/ENP/EC/02/16 (GE/25)-. 28/01/2019- 01/02/2019.

Course on “Practical training courses on calibration procedures practices provided. Calibration procedure including uncertainty calculation template, uncertainty budget and Calibration Certificate templates drafted”.

Project: Support to Georgian National Agency for Standards and Metrology for further implementation of the EU-Georgia DCFTA requirement - GE/13/ENP/EC/02/16 (GE/25)-. 29/10/2018- 02/11/2018.

Ultrasound

INRiM is responsible for the national standard of Ultrasonic Power, and declares 2 CMCs in Ultrasonic power. At present no accredited laboratories operate in Italy on Ultrasound calibration.

INRiM coordinated the EURAMET EMPIR 18HLT06 RaChy Radiotherapy Coupled with Hyperthermia. The project started on 1st June 2019 and it will end 31th May 2022.

Course on “Training on CMC procedures related to ACAA priorities and peer-review of draft CMCs – Ultrasound Power Measurement” at the National Institute of Standard (NIS) - Il Cairo (Egypt). Project: Twinning Contract. Building the Capacity of the Egyptian National Institute of Standard in the field of Metrology (EG/13/ENP/TR/22). 10 – 17 June 2017.

INRiM worked on study based on sonodynamic therapy (SDT). SDT is a therapeutic approach in which ultrasound (US) exposure is used to promote the generation of cytotoxic species *via* the excitation of particular chemical compounds (sonosensitizers). Specifically, the US used for inducing sonodynamic activity are “low intensity” US being their intensity lower than 5 W/cm² differentiating their activity by that of “high intensity” US that usually are used for their thermal activity in hyperthermia treatment such as high intensity focused ultrasound (HIFU).

INRiM developed and characterized various ultrasound generator system, for *in vitro* and *in vivo* sonodynamic treatment.

Vibration and acceleration

INRiM is responsible for the national standard of acceleration. INRiM provides traceability to two calibration laboratories dealing with accelerometer calibration. There are 17 CMCs in the field of vibration.

INRiM participated in EURAMET.AUV.V.S1 supplementary comparison on low frequency (0,5 to 160 Hz) accelerometer calibration.

Courses on “Dynamic Acceleration” have been organized and held at INRiM and

in cooperation with ACCREDIA (Italian accreditation body) in 2017 - 2019.

Support to Metrology Institute in capacity building in the preparation for further extension of the scope of international recognition. Corrective actions plan prepared and implemented by GEOSTM. Project: Support to Georgian National Agency for Standards and Metrology for further implementation of the EU-Georgia DCFTA requirement -GE/13/ENP/EC/02/16 (GE/25), 23-24 October 2018.

Course on “Feasibility studies on calibration activities and training on calibration issue – calibration of accelerometer by the comparison method” at the National Institute of Standard (NIS) - Il Cairo (Egypt). Project: Twinning Contract. Building the Capacity of the Egyptian National Institute of Standard in the field of Metrology (EG/13/ENP/TR/22). 18 – 24 February 2017.

INRIM developed a set-up for digital mems accelerometers calibration (from 0.1 ms^{-2} up to 20 ms^{-2} , from 0.5 Hz up to 3 kHz, on 3-axes simultaneously).

Within "ZeroNoise" founded project (Smart products and Manufacturing), a measurement system (based on the laser doppler velocimetry technique) is developed for the evaluation and control of vibration transmission in hydraulic systems.

Within “SustMetMat” founded national project (PRIN 2017 - Prot. 2017T8SBH9), measurement methodologies of dynamic mechanical properties of sustainable metamaterials for acoustic and vibration control are under investigation.