TC-AUV 2018 Report

Stephen Robinson

Borås , Sweden
22 – 23 May 2019

Summary

- TC-AUV
  - Report of general activities
- Highlights
  - Including EMPIR project outputs
- Emerging metrology challenges

Overview of TC-AUV

- Chair of TC-AUV
  - Stephen Robinson, NPL
- Members: 24
- Sub-committees:
  - SC-**A**: Sound in **A**ir
  - SC-**U**: **U**ltrasound & **U**nderwater acoustics
  - SC-**V**: **V**ibration & acceleration
- Working Group
  - CMC review
- TC-AUV Meeting:
  - April 4-5, 2019
  - PTB, Braunschweig, Germany
  - Guest delegates:
    - COOMET (x2)

Delegates at 2019 meeting of TC-AUV at PTB, Braunschweig, Germany

SC Convenors:

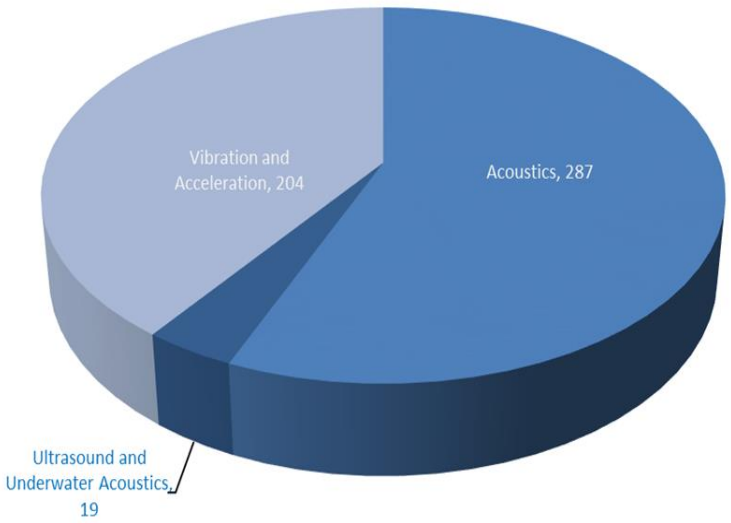
- SC-A; Erling Sandemann-Olsen (DPLA)
- SC-U: Gianni Durando (INRIM)
- SC-V: Thomas Bruns (PTB)
  - new SC-V convenor in 2019

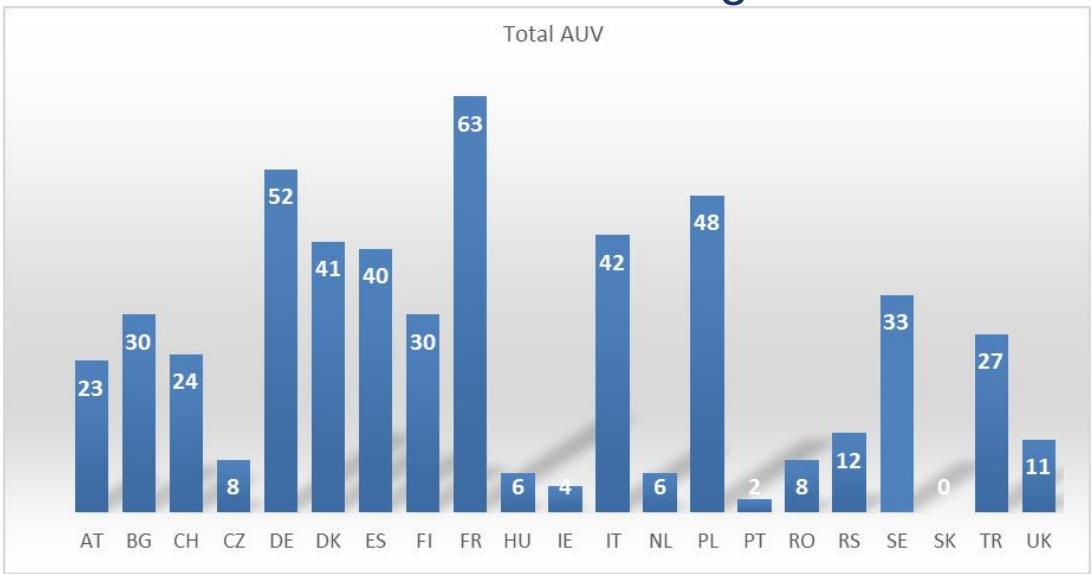
General activities - CMCs

- 20 EURAMET NMIs & DIs have a total of 510 CMC entries on BIPM KCDB

- CMC review – BIM (Bulgaria)
  - Vibration CMCs for BIM currently under review with action plan agreed regarding future acceptance

- CMCs re-submitted in the 2018-2019 period:
  - Germany, Turkey, with Serbia, France, Poland and Austria in progress.
- Overall, number of CMCs is not excessive - situation is manageable.

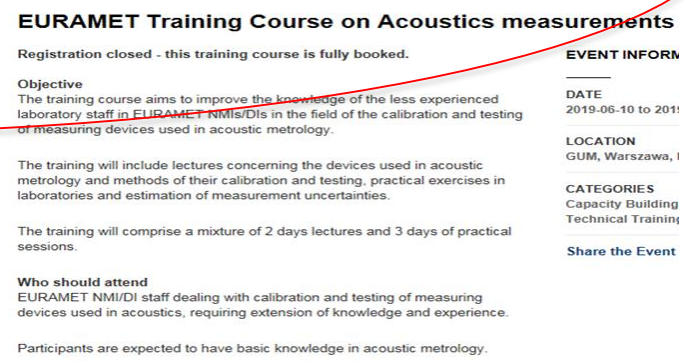




General activities

- EURAMET still in very strong position in world metrology
  - Major role in CCAUV and its working groups

- Capacity Building
  - Tanasko surveyed interest in **training courses** in air acoustics and vibration
  - Responses from TR, UK, PO, RS, EE, GR, MK, ES, IE, BG, MD
  - Two courses being run in June at GUM



EURAMET Training Course on Acoustics measurements

Registration closed - this training course is fully booked.

Objective
The training course aims to improve the knowledge of the less experienced laboratory staff in EURAMET NMIs/DIs in the field of the calibration and testing of measuring devices used in acoustic metrology.

The training will include lectures concerning the devices used in acoustic metrology and methods of their calibration and testing, practical exercises in laboratories and estimation of measurement uncertainties.

The training will comprise a mixture of 2 days lectures and 3 days of practical sessions.

Who should attend
EURAMET NMI/DI staff dealing with calibration and testing of measuring devices used in acoustics, requiring extension of knowledge and experience.

Participants are expected to have basic knowledge in acoustic metrology.

EVENT INFORM

DATE
2019-06-10 to 201

LOCATION
GUM, Warszawa,

CATEGORIES
Capacity Building
Technical Training

Share the Event

- Current comparisons:
  - Two EURAMET comparisons (A-K5 now finishe
  - Four CCAUV comparisons ongoing (W-K2, V-K4, V-K5 and A.K6)

- AUV interest in possible future EMNs
  - Environmental pollution monitoring…
  - Medical imaging…

EMPIR projects

15HLT03 EARS II

Metrology for modern hearing assessment and protecting public health from emerging noise sources

May 2016 – April 2019

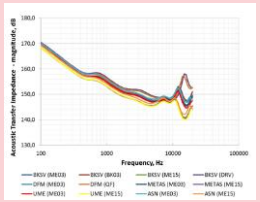
Project lead: Christian Koch (PTB)

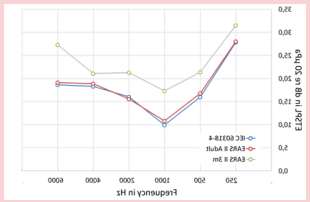
- New ear simulator and calibration strategies for improved audiometric diagnosis and new born screening
- Impact of infra- and ultrasound on humans
- Perceptual mechanisms of infra- and ultrasound
- Qualitative and quantitative characterisation of emerging sound in the public and at workplaces

EARS II Achievements

New ear simulator

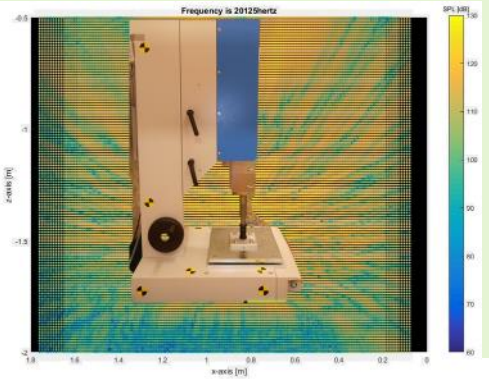
- new specifications set
- international comparison of transfer impedance measurement
- first set of normative data for application in audiological practice
- new idea for an improved definition of hearing threshold transfer values





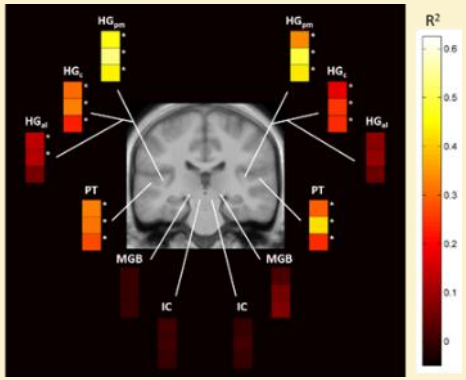
Ultrasound at workplaces

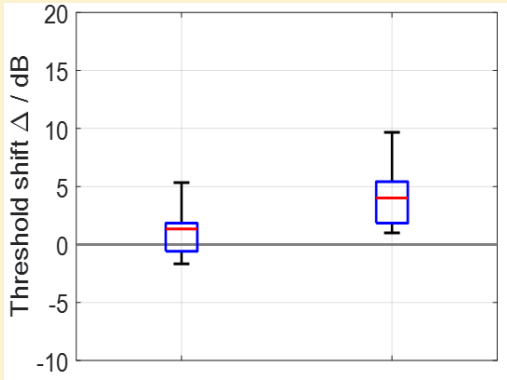
- study for long-time exposure with questionnaires and fMRI-scans showed significant correlations
- New practical measurement methods for ultrasound exposure at workplaces developed
- Successfully tested at real workplaces: Coca Cola, Ferrero



Infrasound Perception

- level, loudness, unpleasantness tested
- subjectively (questionnaires) and objectively (fMRT) investigated
- model of cochlea for LF hearing developed
- combination of sound and infrasound
- audible sound “disturbs” the infrasound but not vice versa!





EMPIR projects

15PRT02 UNAC-LOW

Underwater acoustic calibration standards for frequencies below 1 kHz

May 2016 – April 2019

TUBITAK – MAM (TR), NPL (UK), DFM (DK), FOI (SE), CNR & ISPRA (IT)

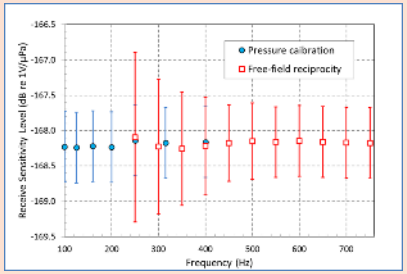
Project lead: TUBITAK-MAM (A. Biber)

Develop traceable measurement capabilities for calibration of **hydrophones** and **autonomous sound recorders** and systems

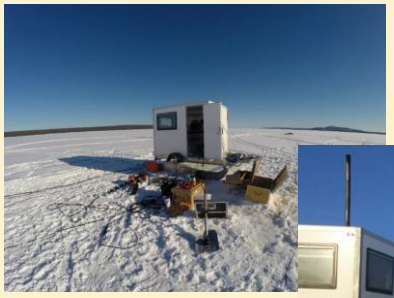
Develop a coherent strategy for long-term operation of the developed measurement capabilities

UNAC-LOW Achievements

- **LF hydrophone calibration**
- New pressure calibration capability in Turkey and Denmark
- Extended UK free-field calibration & new UK laser pistonphone standard
- Round-robin comparison (TR, UK, SE)



- **Autonomous recorder calibration**
- Comparison of calibration methods
- Field trials organised in Rome and at Hornavan, Lapland, Sweden
- New calibration services offered



- **Outputs**
- Publications (3 journal, 6 conferences)
- New calibration services offered by partners
- Contributions to IEC and ISO standards (new work Item in IEC TC87)
- Input to revision of TC-AUV road maps and coordinated strategy
- Traceability & support provided to EU MSFD monitoring projects (JOMOPANS, QUIETMED)

EMPIR projects

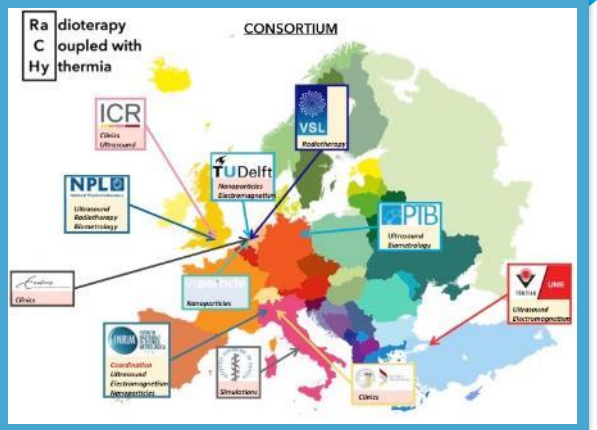
18HLT06 RaCHy Project

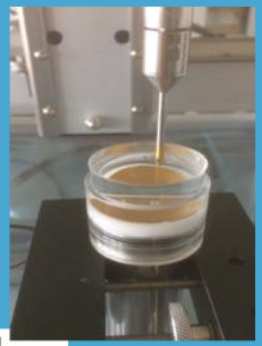
June 2019 – May 2021

- Aim: to provide a reliable metrology framework for the evaluation of a class of radiation-based therapies coupled with hyperthermia induced by Therapeutic Ultrasound (TUS), conventional Electromagnetic Radiation (EMR), magnetic nano-particles (MNPs).

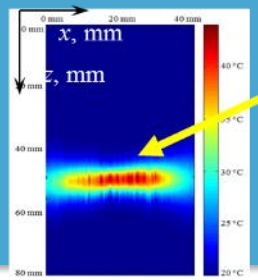
Since hyperthermia causes radio-sensitization and inhibition of recovery from radiation damage, its combination with radiotherapy creates a potent combination for treating human tumours

WP1: Heat delivery systems for hyperthermia treatments
WP2: Temperature exposure evaluation





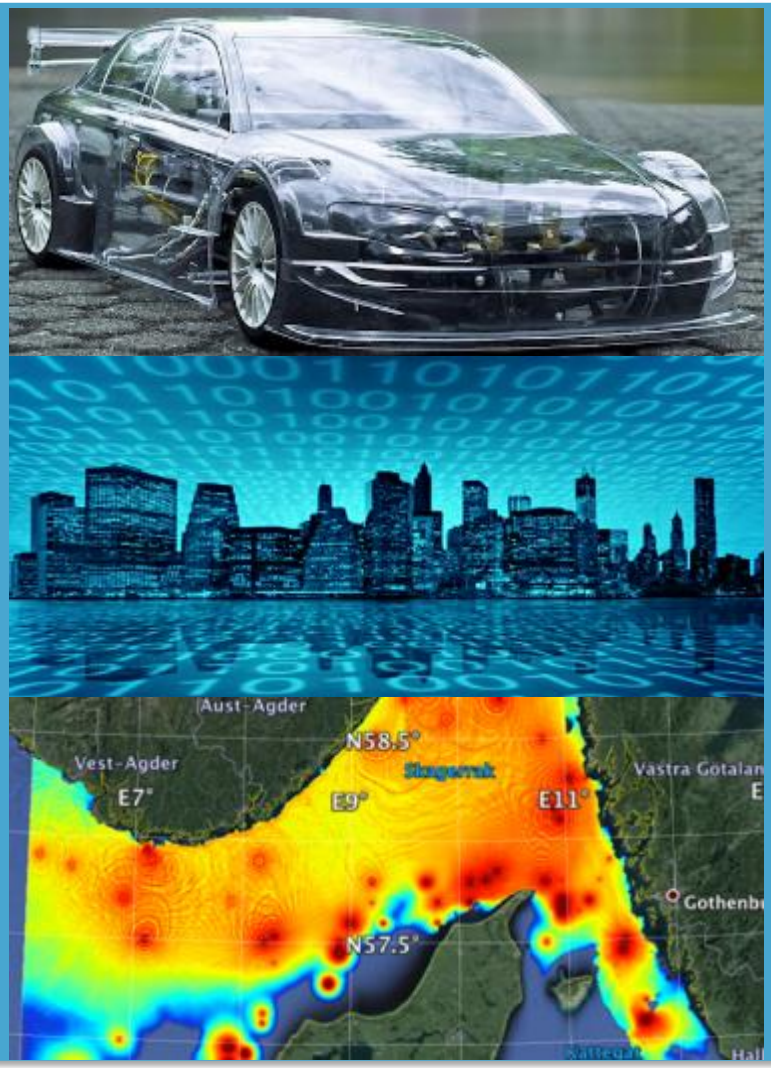
INRiM
ISTITUTO NAZIONALE DI RICERCA METROLOGICA



PTB
Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

TC-AUV

Emerging metrology challenges

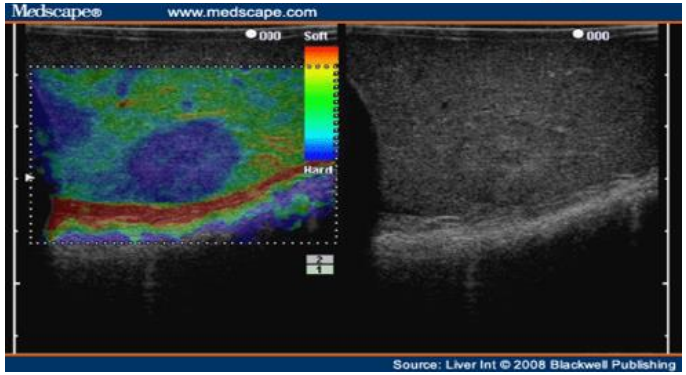


Very low frequency traceability

- International sensor networks
  - Seismic, infrasonic climate studies, nuclear weapons test ban monitoring, tsunami detection
- **But**: no calibration, no traceability, little QA
- Need for:
  - Development of calibration and traceability strategies, methods, devices - build up traceability infrastructure
  - Demonstration of impact on climate and marine environment monitoring, both disaster warnings and for forecasting of environmental variables
- <u>Example stakeholders</u>
- CTBTO
  - traceability badly needed for global sensor network for vibration, hydroacoustics, infrasound
  - traceability request made through CCAUV & CGPM
- Renewable energy
  - traceability for VLF sound emitted by land-based wind turbines and during offshore construction

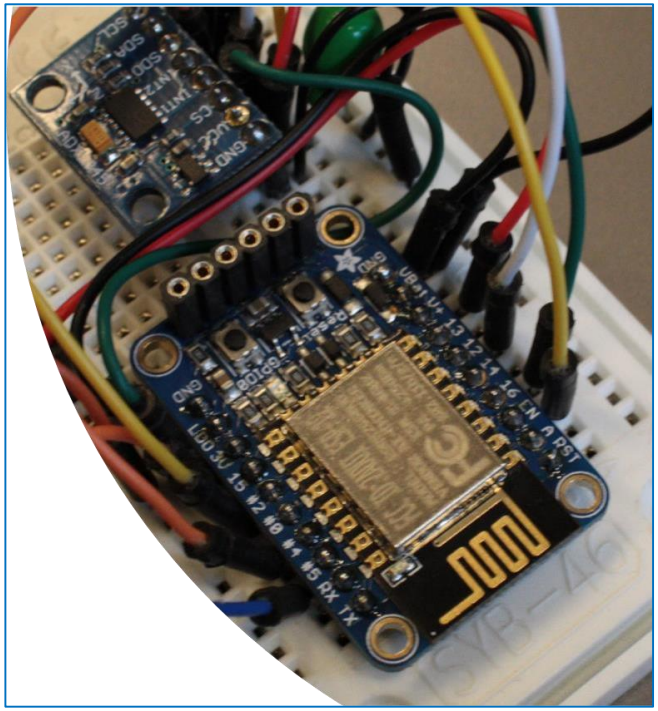
Quantitative acoustic imaging

- Medical ultrasound and marine acoustics
- Ability to relate image to physical properties
- Important for:
  - comparison between images (before and after)
  - classification of image features



Digital sensors and sensor networks

- Sensors play vital part in AUV metrology and applications
  - Increasingly the transducers have digital outputs and are distributed in networks
  - Devices are often embedded into their surroundings and cannot be separated for calibration (no access to analogue signals)
- Work in TC-AUV to examine the issues in preparation for more pre-normative work
- EMPIR 17IND12 Met4FoF (06/18 – 05/21)
  - Metrology for the Factory of the Future



Acoustics, Ultrasound
and Vibration

Thank you