



EURAMET TC-AUV Report to CCAUV11

Stephen Robinson

BIPM, Paris
21 – 22 September 2017



Summary



- TC-AUV
 - Introduction
 - General activities
- Current projects
 - EURAMET and EMPIR Projects
- Emerging challenges



Overview of TC-AUV



- Members: 24
- Meetings: February 2-3, 2017
 - MIKES, Espoo, Finland
 - Guest delegates
 - GULFMET, COOMET...
- New Chair of TC-AUV
 - Stephen Robinson, NPL
 - Replaces Richard Barham (NPL)



Delegates at 2017 meeting of TC-AUV at MIKES, Finland

Overview of TC-AUV



- Sub-committees:
 - SC-**A**: Sound in **A**ir
 - SC-**U**: **U**ltrasound & **U**nderwater acoustics
 - SC-**V**: Vibration & acceleration
 - CMC review
 - Strategy (road maps –ad hoc)

Convenors:

- SC-A; Erling Sandemann-Olsen (DPLA)
- SC-U: Gianni Durando (INRIM)
- SC-V: Claire Bartoli (LNE)

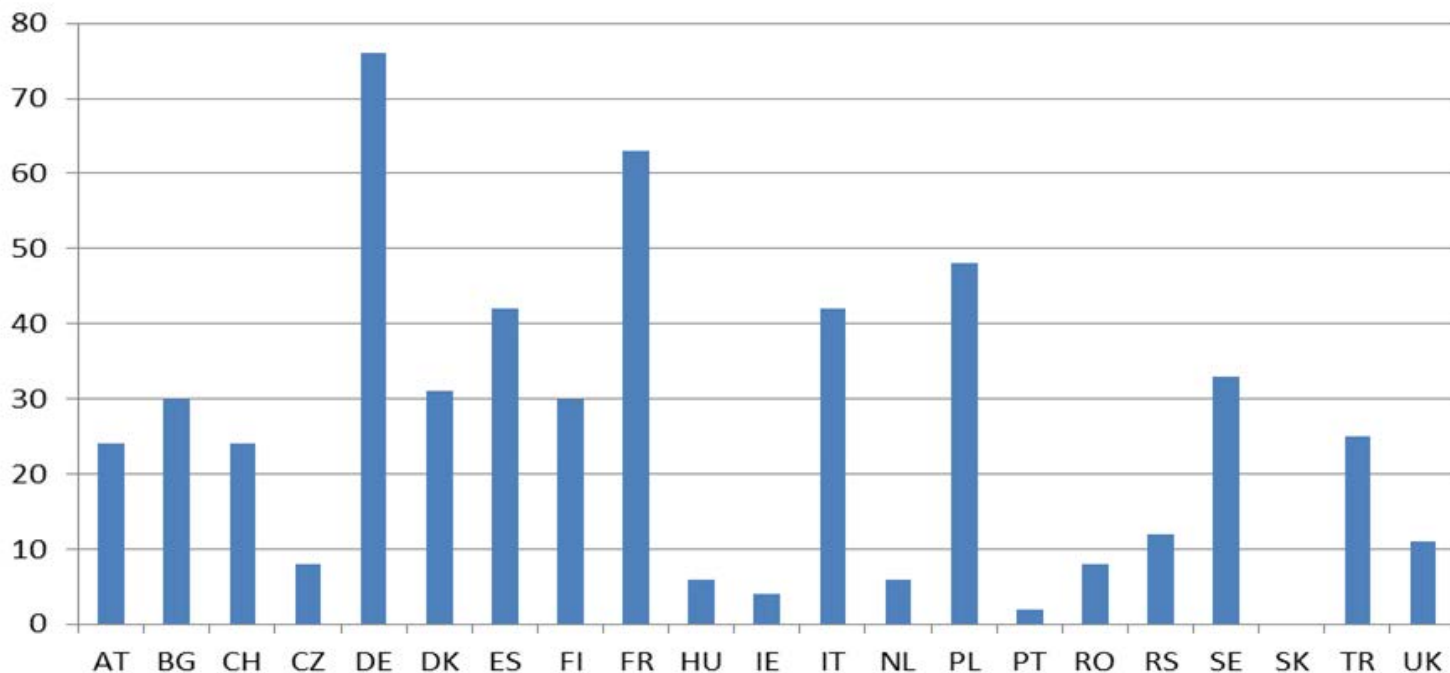
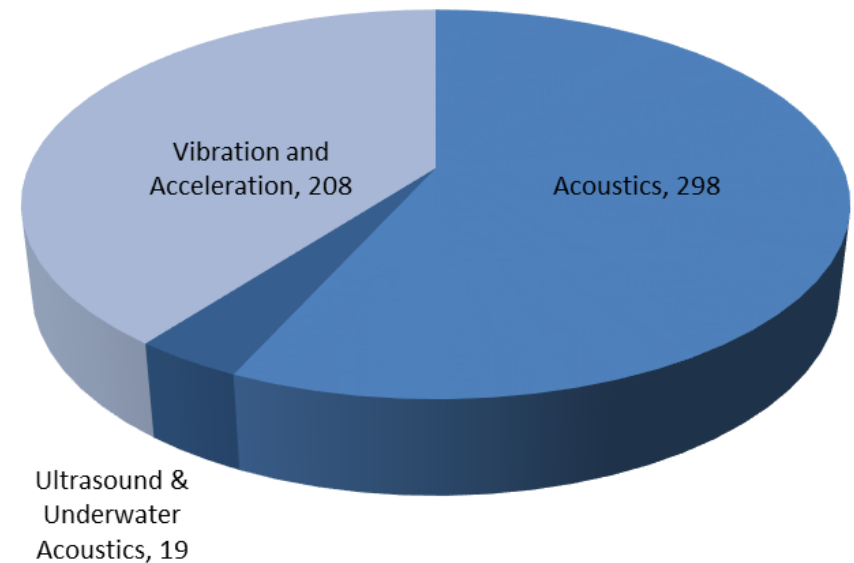


Delegates at 2017 meeting of TC-AUV at MIKES, Finland

General activities

- 21 EURAMET NMIs & DIs
 - 2 DIs (in DK and TR)
- 525 CMC entries on BIPM KCDB
 - reduction compared to 2016

- NPL has withdrawn from metrology for Sound-In-Air in 2016
- decision to focus resource on new technical areas has resulted in closure of some “mature” areas



Acoustics, Ultrasound and Vibration

- Recent comparisons:

- CCAUV.V-K3
- EURAMET.AUV.A-K5,
- EURAMET.AUV.A-S2,
- CCAUV.U-K4,
- AFRIMETS.AUV.A-K5,
- CCAUV.W-K2

- Road maps being updated

- RMO CMC review ongoing

Active projects (non-EMPIR):

- Project 1281 – reference data for microphone calibration (IEC61094-2)
 - prepare reference data to enable the results of analytical calculations used in primary calibration of microphones to be compared
 - DFM (Denmark), BKSVDPLA (Denmark), CEM (Spain), INRIM (Italy), LNE (France), METAS (Switzerland), PTB (Germany)
- Project 1418 – calibration of accelerometers at MF and HF
 - measurement of the magnitude and phase of the complex voltage sensitivity of two accelerometers, one single-ended and one back-to-back, in medium and high frequency domain (10 to 20 000 Hz).
 - ISO 16063-11 : 1999 "Methods for the calibration of vibration and shock transducers - Part 11 : Primary vibration calibration by laser interferometry"
 - LNE (France) (Coordinator), BKSVDPLA (Denmark), CEM (Spain), CMI (Czech Republic), GUM (Poland), INRIM (Italy), METAS (Switzerland), MIKES (Finland), PTB (Germany), RISE (Sweden), UME (Turkey).



Metrology for infrasound and airborne ultrasound



Further development of a Universal Ear Simulator and novel calibration methods

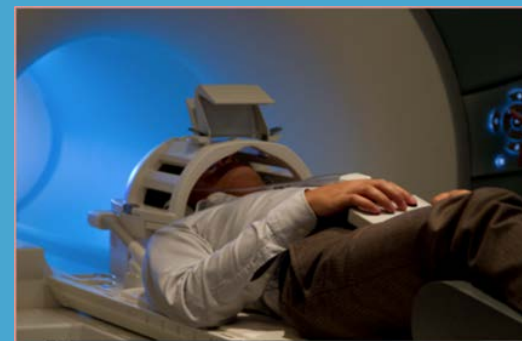
EARS II-Project



Metrology for modern hearing assessment based on the universal ear simulator concept and novel calibration methods

Understanding perception mechanisms and impact of **infrasound** and **ultrasound** on hearing, mental health and wellbeing

5+6 partners from 6 countries: CH, DK, DE, UK, SI, TK



Objectives

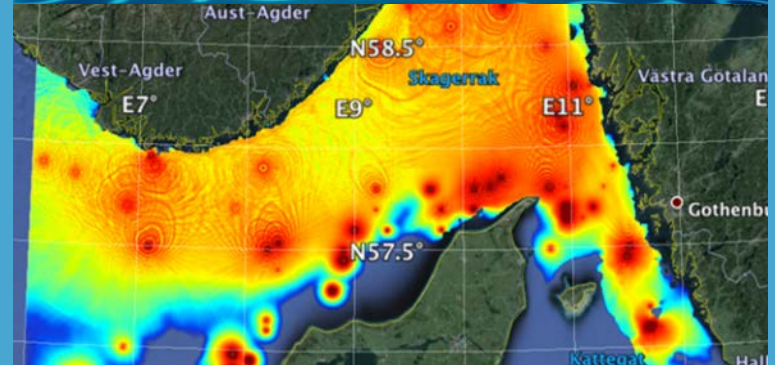
- Develop traceable measurement capabilities for calibration of hydrophones and autonomous sound recorders and systems low frequency region from 20 Hz to 1 kHz including the 63 Hz and 125 Hz third-octave bands cited by the EU Marine Strategy Framework Directive.
- Develop a coherent strategy for long-term operation of the developed measurement capabilities, provide a coherent approach to traceability for absolute acoustic measurements in the ocean, establish a European research capability

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



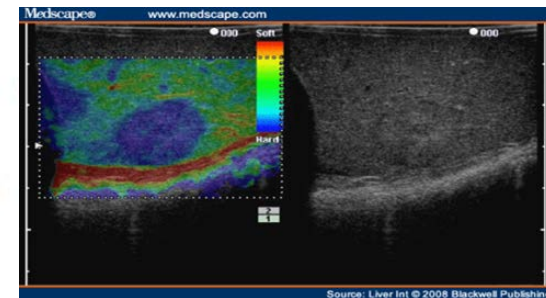
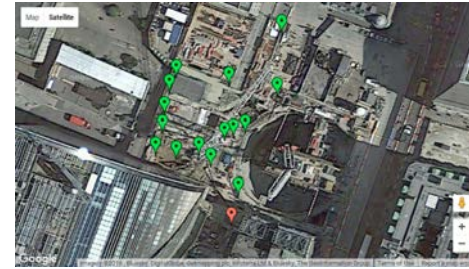
TC-AUV

Emerging metrology
challenges



AUV metrology challenges

- AUV sensor networks
- measurement paradigm moving towards use of sensor networks: metrology challenges include in-situ calibration, big data, data fusion...
- Extended frequency ranges
- air acoustics: infrasound and ultrasound (EARS II); medical ultrasound: high MHz scans; vibration: LF for seismic and tsunami detection; marine acoustics: low frequency monitoring
- 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 sensor calibration
- Increasingly the transducers used in practical sensing and measurement applications have digital outputs; Devices are often embedded into their surroundings and cannot be separated for calibration (no access to analogue signals)





**Acoustics, Ultrasound
and Vibration**

3

Thank you