



TC-AUV Highlights

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Acoustics, Ultrasound
and Vibration

Overview of activities

- Sub-committees: 3
 - SC-A, SC-U, SC-V
- Members: 26
- Comparisons:
 - 6 CCAUV
 - 4 EURAMET
 - 1 COOMET
- Active TC projects: 2
- CMC entries: 543



Delegates at the 2015 meeting of TC-AUV at GUM, Warsaw

A little game



1. STRING THEORY	62	
2. HIGGS BOSON	18	
3. INTER-PLANETARY PROBES	4	

What about acoustics?



- Babies and children have had hearing tests
- Increase in noise from new aircraft flight patterns
- Tinnitus having visited the dentist
- Unintelligible announcements in train stations
- Noise maps have become a factor in moving home
- Ultrasound physiotherapy
- Concern over safety of ultrasound pregnancy scans
- Noise hazards during recreational diving
- Will the next generation have reduced hearing because of personal stereos
- Occupational deafness
- Ultrasound to treat cancer
- Experience of 'throbbing' sensation in some buildings
- Links between noise and heart disease
- Wind turbines destroying countryside tranquility
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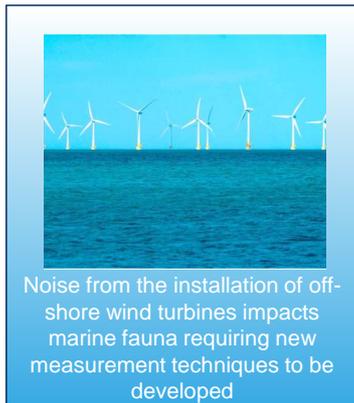
The moral of the story...



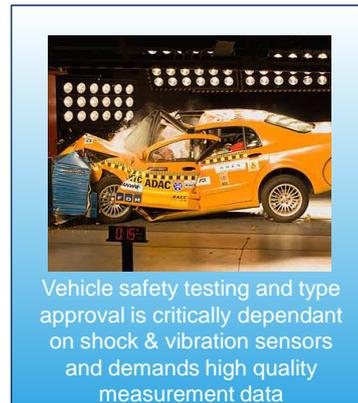
- High science is interesting...
- But mature sciences have at least the same, if not greater capacity to create impact and benefits
- Acoustics is easy for people to relate to and appreciate the benefits of innovation
- So TC-AUV can deliver significant and tangible *impact* through *innovation*



The new London Kings X Station, reports problems with ultrasound used in the voice alarm systems. Mitigation needs new measurement standards and methods



Noise from the installation of off-shore wind turbines impacts marine fauna requiring new measurement techniques to be developed



Vehicle safety testing and type approval is critically dependant on shock & vibration sensors and demands high quality measurement data

HLT-01 Universal ear simulator and non-audible sound (EARS) Introduction



Safety criteria and risk assessment methodology for non-audible sound (airborne ultrasound and infrasound) based on an evaluation of human perception thresholds using neuro-imaging techniques as indicators of perception

Develop a *universal* ear simulator capable of calibrating all types of transducer used in hearing assessment and applicable to all patient age groups, including newborns, infants and children for the first time.



Project Highlights



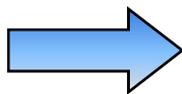
- The world's first primary standards for airborne ultrasound
 - New understanding that brain centres associated with auditory stimuli are also activated by infrasound
 - Formation of the UK working group on the Health Effects of Ultrasound in Air (HEFUA)
 - Production and professional manufacturer of the first ear simulator designed for application in neonatal hearing assessment
 - Stakeholder engagement through user trials within project and practical session at dissemination workshop
 - New work item proposals submitted to IEC and ISO working groups on the specification of ear simulators for neonates and children, the process for establishing reference thresholds and guidance for exposure to airborne ultrasound
 - Scientific outputs include 21 publications and 35 presentations at conferences and meetings
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Benefits



- NMIs have developed secondary calibration methods for airborne ultrasound and delivered services to industrial users, including a high profile supplier to the cell phone industry.
 - HEFUA is engaging with public health bodies and WHO groups to develop new guidance and policy for exposure to airborne ultrasound
 - The new universal ear simulator has attracted significant interest especially from medical equipment and hearing aid manufacturers wishing to exploit the its benefits of even the prototype device
 - Leading hearing professionals are excited by the prospect of improvements in the quality of the assessment services they offer
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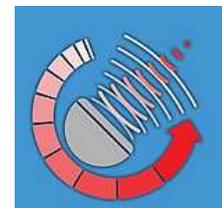
To reconcile the lack of equivalences from different measurement methods by establishing a new primary standard directly for sound power with a target uncertainty of 0.5 dB. Then, to develop a system for the dissemination of the unit watt for both tonal and broadband sources using appropriate transfer standards, thereby enabling improved qualification of complete measurement setups for the determination of sound power of real sources with the emphasis of reducing measurement uncertainty.



Major contribution to a quieter Europe

- JRP-partners: Development of a new landscape for sound power calibrations in Europe
- Standards developing organisations: New and better standards
- Testing laboratories: Traceability of test results
- Manufacturers of transfer sources: Innovation in the development of transfer sources
- Industrial users: Improved measurement uncertainty in sound power statements for products

To develop the concept of dose for therapeutic ultrasound applications, including definitions, validated measurement and modelling methods, and the metrology to underpin appropriate treatment planning and risk assessment. Through this work, to then lay the foundations for new international standard and best practices.



- Establish reference measurement methods and traceability
 - Developed exposure/dose definitions, reference measurement method & materials and stabilised calibration source.
- Improve modelling capabilities
 - Established acoustic holography protocol to determine input field parameters and implemented nonlinear Westervelt equation solver for soft-tissues with integrated thermal solver.
 - Developed a Kelvin-Voigt elastic wave model for the open-source k-Wave toolbox.
- Improved treatment planning
 - Investigated the effect of heat load on HeLa and cancer cell lines and mapped out the percentage of cells undergoing each of several distinct forms of cell death.
 - Implemented treatment planning software utilizing data from CT scans: tested on phantoms and animals.
- Dissemination
 - 28 scientific papers and 54 conference presentations
 - Contribution to 3 IEC standards (IEC62555, IEC60601-2-62, IEC/TS 62556).



- For manufacturers and regulators
 - easier to bring new modalities to market
 - help establish more homogenous global regulatory and purchasing requirements.
- For doctors and healthcare providers
 - increased range of reliable therapies available
 - greater information to guide equipment procurement and to underpin patient care
 - help reduce, or at least control, healthcare costs for relevant conditions.
- For patients
 - better disease management
 - and improved quality of life (including less invasive treatments, fewer side-effects, shorter recovery times.



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Thank you