Contents

Project participants at the kick-off meeting at PTB in Braunschweig

Welcome

It is a great pleasure to welcome you to the first newsletter of the project "Metrology for modern hearing assessment and protecting public health from emerging noise sources". We greatly appreciate the opportunity to make contact with potential users of the knowledge generated and disseminated by this project, and we will endeavor to provide regular updates on news and events of interest.

After successful completion of the first project, which became known as EARS, in summer 2015, many new ideas, problems, and questions are on the agenda of this follow-on project – EARS II. Once again, the work focuses on two different topics of hearing conservation. First, sound with frequency content in the infrasound and ultrasound ranges is still a matter of concern with respect to the mechanisms of their perception and the potential hazard to health and wellbeing. Second, the further development of devices and methods for test and calibration of audiometric equipment with particular focus on the assessment of neonates and children will be addressed.

The project is funded within the European Metrology Programme for Innovation and Research (EMPIR). It brings together various partners working in metrology from national metrology institutes, industry, and academia for a solution of problems of common interest and with global European significance.

I hope you will find valuable information in the newsletter. We are interested to keep in contact with you as stakeholders, users, or interested persons, and we are looking forward welcoming you in our project community.

Christian Koch
Coordinator

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News and facts

- EARS II project was launched at 1 May 2016. It will be active for 36 months.
- New project, same familiar web domain: The website of EARS II comes with a new look and up-to-date information. Visit us at www.ears-project.eu
- We highlight a call for papers in a Special Issue of JASA on airborne ultrasound.

EARS has a 'gap-year'

Due to the EMPIR Programme call cycles, there was approximately a 1-year gap between the end of the first EARS project and the start of EARS II. However, a number of initiatives continued to gather momentum during this period.

Royal Society publication

Professor Timothy Leighton authored an invited paper in the Proceedings of the Royal Society A (free download available from **http://tinyurl.com/hatv3xh**) entitled '*Are some people suffering as a result of increasing mass exposure of the public to ultrasound in air?*'. The paper has been downloaded some 11,000 in the 9 months since it was published in January 2016. In it Professor Leighton assesses whether the existing guidelines and regulation for airborne ultrasound exposure are built on a sufficient base of data, and whether they are appropriate for the increasing use of ultrasound in air. Radio stations, newspapers and blogs from around the world have since reported on the paper (**http://tinyurl.com/jd4vtkn**) and in March 2016, the International Commission on Non-Ionizing Radiation Protection met in Rome to discuss how this will influence its ongoing work (**http://tinyurl.com/zc65odd**).

HEFUA

The UK group Health Effects of Ultrasound in Air (HEFUA) had its second annual meeting in March 2016 to update members on preliminary measurements for ultrasound in air, funded by the Colt Foundation, and the progress of the EARII grant, and to scope out what is needed in future to investigate the field more thoroughly.

BSA Annual Conference

The British Society of Audiology held its annual conference in April 2016 in Coventry, UK. The conference included a special session on instrumentation and traceability for neonatal hearing screening, focussing on initiatives and outcomes from the EARS project. It is significant that this session was instigated by those responsible for the neonatal screening programme in the UK, and not by researchers directly involved in EARS. Dr Richard Barham presented an overview of ear simulator technology while Dr Thomas Fedtke discussed new ear simulators emerging from the EARS project and the associated work to establish reference threshold data. Other presentations (by Graham Frost and Prof. Adrian Davis) focussed on the historical landscape of standards and instrumentation and the further requirements for the new devices to come into mainstream practice.

Highlights from the work packages

EARS II launched

EARS II sees a new investment of €2 million from the EMPIR Programme, after a very successful campaign proposing the case for a follow-on project to EARS. Like its successor, the project proposal was top-ranked (with two other projects) in the EMPIR Health Call of 2015. The full title of this pan-European project is "Metrology for modern hearing assessment and protecting public health from emerging noise sources", but following the convention established by the first project, it has become known as EARS II. The project started in May 2016 with a meeting of all members of the consortium in PTB, Braunschweig, Germany.

The overall objective of this project is to develop measurement science solutions that bring improvements in two key areas; in the assessment of hearing and subsequent rehabilitation, especially in audiometry for children; and in understanding the risks to hearing conservation and public health posed by emerging noise sources with infrasound or ultrasound content, in both at the workplace and in the public environment.

The project will address these challenges by drawing together leading expertise in acoustics, audiology, ultrasonics, neuro-imaging and psychology. It has 12 partners from 6 EU countries, the consortium including national metrology institutes, academia, teaching hospitals and commercial organisations.

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Ear simulator development

The first tasks in the new project address some of the stakeholder opinions expressed at the dissemination workshop that closed the original project. These were that the specification for the neonatal ear simulator originated from essentially one, albeit large study; and that patient age may not be the best criterion for selecting the appropriate ear simulator on which to base the calibration. There were also concerns that number of proposed ear simulators may be cumbersome to deploy in practice.

Therefore studies are underway to find additional data on neonatal ear characteristics, and a significant new contribution from a group in Ohio, USA is under evaluation. A further study is investigating the options for using the ear canal volume as an alternative basis for selecting calibration values. Together these studies and a further user consultation will help finalise the specifications for the ear simulator family.

Contact:
Richard.Barham@acousticsensornetworks.co.uk

Development of airborne ultrasound measuring techniques

One of the aims of the project is the qualitative and quantitative characterisation of ultrasound noise in public and at workplaces. Unfortunately, there is hardly any commercial measurement equipment available that we need to fulfil this task. That's why several partners are preparing the necessary hardware and software for acquiring and analysing sound at the high and ultrasonic frequencies. This includes sound level measuring systems

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for laboratory and outdoor usage, setups for their calibration as well as a system for localising noise sources. Currently, work is in full swing and we're looking forward to test our new equipment at real world sites.

Contact: Christoph.Kling@ptb.de

Dissemination of work

One of the cornerstones of the EMPIR, is that research projects should create impact and benefits for its stakeholders. This section provides a summary of some initial dissemination activities.

The Stakeholder Advisory Group

One of the issues with a project that covers such diverse activities as neonatal hearing and occupational safety, is maintaining contact with an equally diverse set of stakeholders. For this reason, a Stakeholder Advisory Group has been formed to provide a hierarchy of liaison with stakeholders from the different sectors that the project aims to connect with. Membership of the group is made up of renowned experts who are well-positioned to provide this liaison. They include:

Prof. Adrian Davis – the instigator of the UK neonatal hearing screening programme

Prof. Katrin Neumann – advocate and advisor for global adoption of neonatal screening programmes

Dr Geoff Leventhall – world leading expert in infrasound

Prof. Detlef Krahé – German infrasound expert and leader of several high-level projects

The group will be chaired by Graham Frost, specialist in technical audiology and acoustics, who will liaise directly with the main project consortium to feed the group's vital inputs into the work plans.

New look website

Readers familiar with the original EARS project website will be pleased to know that the new project retains the same web address. However you will find a new logo for this second phase of the work, and of course, the latest content.

Visit us at www.ears-project.eu

EARS II at the ICA

From 4 to 9 September 2016 the International Congress of Acoustics, which is held only every three years, took place in Buenos Aires, Argentina. The conference is one of the major events in the field of acoustics. The project coordinator presented results from EARS I project together with an outlook to new ideas of EARS II to the conference and so the project was made known to a wide international community.

JASA - Special Issue

The World Health Organization, and the International Commission on Non-Ionizing Radiation Protection, are co-sponsoring a Special Issue of the *Journal of the Acoustical Society of America*, on the topic of 'Ultrasound in Air' (see http://tinyurl.com/h9lj39t). This was proposed and will be Guest-Edited by Professor Timothy Leighton FREng FRS, and is a strong vindication for the top level

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objectives of EARSII in the airborne ultrasound theme. The lower limit of ultrasound for this issue will be 17.8 kHz. The extensive list of topics included by the issue include: Measurement procedures for airborne ultrasound; Calibration procedures for airborne ultrasonic devices; Unintentional emission of airborne ultrasound by devices or procedures; Effects of ultrasound in air on humans; High frequency audiology; Guidelines/standards pertaining to the deployment, exposure or measurement of ultrasound in air. The deadline for manuscripts is 20 July 2017 (1700 Universal Time). For further information please contact T.G.Leighton@soton.ac.uk or see the above web page.

Business card of partners:

In this column of every Newsletter we will introduce one or two of the institutes from the consortium to you. In this issue we present the Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA), Germany, and the EAR Institute at University College London (UCL), UK.

The *Institute for Occupational Safety and Health*, IFA is an institute of DGUV, the umbrella organisation of the German statutory accident insurers for the industrial and the public sector.

DGUV is a legal entity established under private law with a public service mission. The DGUV-members provide insurance for 70 million persons in Germany against occupational accidents and diseases, commuting accidents and school accidents. Insurance covers all employees in industry, trade and in the public sector as well as pupils, students and volunteers.

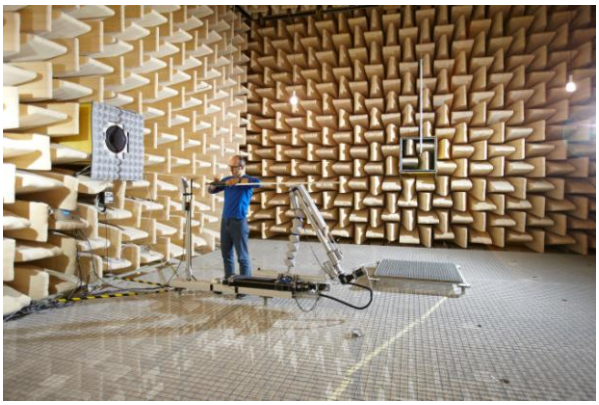
As such IFA gives support to these institutions in all scientific and technical issues relating to the prevention of occupational accidents and diseases. 240 persons are involved in research, consultancy and testing in the following fields of interest: hazardous chemicals, biological agents, physical factors such as noise, vibration and radiation, safety of machinery including usability, ergonomics, epidemiology and toxicology.

IFA cooperates closely with other research institutions and universities, both on a national and on an international level. As concerns issues of product safety, IFA is also in close contact with industry: It is a nationally and European notified test and certification body under the terms of the European Directives for Personal Protective Equipment and Machinery. Besides that, it helps manufacturers to develop and optimize safe products for the world market.

Participation in standardisation and regulation-setting bodies is also part of IFA's tasks. The majority of research issues stem from practice and deal with problems of occupational safety and health encountered at company-level. IFA's working results therefore have to be extremely field-oriented. At the same time, there is a close connection and exchange of information between research and other fields of activity relevant to prevention such as to further synergies and keep up-to-date in the state of the art of prevention. In addition to scientific research reports, IFA produces a variety of practical aids, among them several databases on hazardous substances. Therefore, the IFA is an ideal partner when it comes to

determination and rating of exposures regarding occupational health and safety.

All of its working results are available free of charge on the internet: www.dguv.de/ifa



Full anechoic chamber facility at IFA

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The *UCL Ear Institute* opened in 2005 to provide a close collaborative research environment for auditory researchers who were distributed all over University College London. It is the successor of the renowned Institute of Laryngology and Otology, founded in 1946, alongside the Royal National Throat, Nose and Ear Hospital.

Research at the Ear Institute is truly interdisciplinary. World-leading academics and clinicians, working in fields as diverse as human genetics, biophysics, computational neuroscience, cell biology and human cognition, come together to understand hearing and fight deafness; studies aimed at understanding the genetic bases of human forms of deafness inform clinical investigations designed to provide early warning to individuals and families most susceptible to age-related or noise-induced hearing loss; investigations into the development of the inner ear, and its potential for repair and regeneration, cross the boundaries of individual research labs and ensure that progress in one discipline informs research in another. Laboratories investigating important functions in hearing that arise at different brain centres share resources, facilities and personnel. This interdisciplinary approach enables individual laboratories to pool their expertise, solving problems that may be too big for any one laboratory to solve. In addition, collaborations with partners in other UCL departments, centres and institutes, and across the world, ensure that research at the Ear Institute remains at the cutting edge.

The EAR Institute brings together all auditory research activity at UCL

Ear Institute researchers, participated already in the preceding project (EARS I), when they deepened their existing knowledge in the area of low-frequency and infrasound perception. Their expertise in psychophysics and cochlear physiology, as well as having access to the institute's specialised facilities make them ideal contributors to the psychoacoustical and physiological experimentation required in the project work packages.

Visit the UCL Ear Institute at https://www.ucl.ac.uk/ear

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You can subscribe to this newsletter on our website.

Stop press…

In June 2016, the National Physical Laboratory (NPL) announced a full withdrawal from the field of sound-in-air research, and an intention to withdraw from this project. The Project Management Board was therefore faced with its first challenge in having to deal with the unprecedented situation of losing a major partner from the consortium. The situation was finally resolved by the introduction of a new organisation, Acoustic Sensor Networks, into the consortium. Acoustic Sensor Networks is a company formed by two of the original researchers from NPL, and will be sub-contracted by the project co-ordinating institute, PTB. This solution presents minimal disruption to delivery of the project and the outcomes and impact it expects to create. Therefore, apart from some organisational changes, it is business as usual for the EARS2 project.

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