Summary: "Future Sound Tech Solutions" – Meeting #06

Meeting # 06 in the working Group "Future Sound Tech Solutions" took place on March 16, 2026.

The meeting agenda was:

1. Webinars:
    a. Follow-up on proposals and ideas from meeting # 04 including additional comments and proposals.
    b. Proposals for possible speakers
    c. New themes?
2. Physical events during 2022
    a. Meetings? Workshops? Others?
3. Collaborative projects, update of proposals, indication of possible project consortia
4. Other ideas for Danish Sound Cluster activities
5. A.O.B.

Summary

Planned events for Danish Sound Cluster

1.	Product Test & Certification	2022, March 24th
2.	Challenges in Audio Post Production	2022, March 29th
3.	Edge Impulse for Consumer Audio Applications Workshop	2022, April 5th
4.	Sustainability Network, (network meeting)	2022, April 6th
5.	Noise and its effect on our health	2022, April 7th
6.	Robot Audition	2022, April 19th
7.	Bringing creativity into engineering processes	2022, April 26th
8.	½ day conference (Aarhus): The Danish Audio Hardware Symposium	2022, April 28th
9.	½ day conference (Copenhagen): Future Sound Forum	2022, May 4th

Ad 1a & 1b: Proposals for Webinars

#	Subject	Background
1a	AI/Machine learning (ML) Workshop (virtual/physical)	Two workshops from 'Edge Impulse' in planning: 1. Consumer products Planned for April 5th, 2022 2. Medical products (2-3 months later) The first event will be virtual (on-line), whereas event no. 2, on medical devices, most likely hearing aids, will be a physical event. For the virtual event, people need access through a computer and also need a mobile phone linked up. Already now, three weeks before the event, 29 people have signed up for the first event. For the second event, the physical event, the focus will be on hearing aids, but we can shape up the event based on feedback from the first event. For that event Edge impulse will bring hardware that people attending physically can use. Those who prefer virtual presence will still need to use a mobile phone like in the first event. Event No.2 has not yet been planned for the date but will most likely take place in June or early after the summer holiday.
2	**"Demant Discovery".** 4 start-ups to talk about their future plans. Event at "Lydens Hus"	Planned for March 17th 2022. Start up companies :***Alvenir, IDUN Audio, Auricle & Dive***.will meet with guests from Demant (Oticon). Aims to look for matchmaking between the startups and a large organization. This event is seen as a test on how we can run such events. **Comments:** In the meeting it was underlined that possibly in future events of similar nature, we should aim to have more large companies present in the same event, not just a single large company. If we are successful in running the event. The current plan is to copy the concept to an event in West Denmark.
3	Redress the great achievements of audio – and address the reality of unsolved audio challenges.	Very interesting theme. However, for now it is not yet mature. Nick Zacharov no longer available for support. Geoff Martin, B&O, that was seen a potential candidate has declined to participate. In general, the theme could most likely work well as a panel discussion in a conference but is difficult to implement as a webinar – particularly in a situation, where the key people behind the proposal are no longer available. We agreed to drop the theme.
4	Audio and 'privacy' Continued next page	At SoundDay 2021, the theme was taken up in the keynote presentation by Lars Thinggaard. The topic of "audio and privacy" will also be included in half-day conference, "Future Forum of Sound" that will take place on May 4th, 2022. Here Jonas Lindstrøm, Alexandra Institute and Sune Holm from Datalogic Institute will offer short presentations on the topic followed by a panel discussion, where also two other persons are planned to participate. Proposals for these other panelists are welcomed, especially candidates from a hearing aid company. The theme originally surfaced on the background that in e.g. AI applications a lot of user data are likely to be involved. How do we ensure that privacy issues related to such data are not violated? Also in the context of 'Alexia' and similar systems, how do we ensure that privacy related to such data is not violated? DTU informs that they have PhD students funded by e.g. Facebook, so they may be able to contribute (Jeremy to look for candidates)? Hearing aid companies are not at present concerned about violation of users' data, since hearings aids today are not feeding data into e.g. Google systems (are not an open gateway). The companies are more concerned about people listening in on data being transferred to the hearing aid.

#	Subject	Background
4	Audio and 'privacy' Contn'd	In general, there seems to be issues related to modern audio connections to e.g. televisions, where unknown data users/data collectors in essence are "invited into your living room", because you employ devices that listen in on what is happening in your private environment. In hearing aids, some provide an option for switching off the microphone, if you get paranoid about the issue (e.g. a small "yellow" button). But do we actually trust that the switch is active and preventing Google and others from listening in. For some users it is a mere question of trust – or lack of trust. And how come that sometimes, when we have disused issues at home in privacy, all of a sudden proposal for solutions appear on Google, even if you have never before searched the issue? For any device with a microphone and an IoT connection, is this an issue to be concerned with or not? Or are we just cognitively connected, which could explain the unexpected incident of Google adds appearing "just when we need such information"? Users have quite different perceptions. The big tech companies try to protect themselves with extensive and difficult to understand terms for use of their solutions that users must accept prior to usage. However, for most users, the complexity of the terms is challenging to understand.
5	Digital meetings and audio	The first sub-group meeting on setting up a position paper, ***'Guiding Star Note'*** has taken place. Clément Laroche, Tore Stegenborg Andersen and Birger discussed the background for ***"quality of sound in digital meetings".*** Several interesting points were raised. Issues related to the audio input units (direction sensitivity of microphone, type of microphone solution, etc.), and the surrounding environment were addressed. Similarly for the output devices. In addition, the transmission providers, here Microsoft Teams, Zoom, etc. have an important role in optimizing the sound quality for sound handled in their systems. For hardware suppliers, it is essential to meet the requirements of the transmission providers, e.g. through complying, i.e. obtain certification of their products in relation to the transmission solution, etc. Companies like Microsoft and Zoom have very elaborate requirements to meet to obtain certification. Issues related to fatigue, stress, etc. when participating in long hours of digital meetings are known to most people, but it is more difficult to find data supporting such claims. Some data may exist in relation to e.g. 'call-centers'. Other issues such as lack of 'lip-sync' synchronizations exists and here data from the broadcast industry may be useful. The subgroups will also include Torben Christiansen from EPOS, and the aim is to have a first version of the paper ready for comments at the ½ day conference "Future Sound Forum", on May 4th, 2022. It was commented that startup company 'Augmented hearing' seems to address the issues related to the issues in question. Concerning the issue of "fatigue" it was noted that during the COVID 19 period, the problems related to fatigue in relation to digital meeting is probably difficult to separate from other issues caused by the very different working conditions during this period.
6	Multisensory processing	Completed December 7th, 2022
7	Green footprint of audio streaming	Webinar: "Sustainable Transformation in Audio Companies" Completed: January 25, 2022 A networking meeting is planned for April 6th, 2022, at Interacoustics in Middelfart.

#	Subject	Background
8	"Emerging Acoustic Sensor Technologies and Applications"	Time: planned for late 2022 Difficulty in getting speakers to sign up. More than 10 persons have been contacted according to Shelley. Microphone technology and applications are certainly main focuses of the topic. Eddy Bøgh Brixen and people from 'Sonion' in Roskilde may be interesting to include. 'Knowles' is certainly another good potential candidate to include. Contact e.g. • Magnus Herner, MHER@sonion.com • Thomas Jensen, thomas.jensen@knowles.com Other people to talk to: • HBK (Claus Blaabjerg to check)? • G.R.A.S. (Niels Kjærgaard/others)? • Sergei Rotger Griful (Eriksholm) Others (e.g. Auricle-Pedro Costa)?.
9	'Personalization' of user needs	Theme is gradually coming into place Potential speakers: • Bert de Vries (GN Hearing), confirmed • Alessandro Pasta, senior data scientist at Oticon customer insights group at HQ, confirmed. The theme could do with one more speaker, Morten will check with WSA, but it is also possible to run the event with only two speakers.
10	Use of pre-simulated data	Neural networks can be trained using synthetic data to push the use in audio neural network applications. This is cheaper, more efficient and do not require e.g. the Google codec. For now, focus on low bandwidth codecs for AI applications. Train neural networks using synthetic data. Speakers: • Rasmus Kongsgaard Olsson, Jabra, confirmed. • Roman Serizel, Loria (F), contacted, not yet confirmed • Toon van Waterschoot, ESAT, Leuven, confirmed Others?
11	Perceptual audio evaluation one-o-one	Completed
12	'Sound Day 2021 keynote	Completed
13	Hearables	Danish Sound Cluster will do an event together with AES. "Will hearables destroy the hearing aid industry?". Several people are lined up for the topic.

#	Subject	Background
14a	Noise cancellation	Used in headsets, earbuds, etc. A challenge in application. Could be interesting to dive into the technology and challenges around noise cancellation. The technology in noise cancelation is rather straight forward, but the secret lies in the implementation (expert design). In addition there are physical constraints. Also, why do we need to use dynamic speakers, etc. In addition, e.g. FORCE (SensLab), is looking into the discomfort of using noise cancellations.
14b	Speech prediction	Active noise cancellation, ANC, can remove low frequency noise and passive noise cancellation can remove high frequency elements. However speech is in between, and ANC will never be able to suppress speech. Can this challenge be handled to some degree through employment of speech prediction to overcome this downside of in ANC? A difficult research topic. The two areas, noise cancellation and speech prediction could be handled in a combined webinar where these issues are highlighted
15	Feedback cancellation/suppression/control	Topic is related to hearing aids, stage performance issue (microphone control), speaker phones etc. Echo cancellation. No speakers proposed yet.
16	DSP event	Broad focus on DSP. WG not fully clear of status and actions taken, need to be clarified. Possible speaker: Roland Baduit (name misspelled?) professor in mathematics, Paris.

Ad 1c: Some ideas for future presentations

Subject	Background
Acoustics and signal processing	**Laurent Daudet**: Institut Langevin, Paris & . CTO, cofounder of LightOn. They use random optical media to accelerate ML computations physically. https://scholar.google.com/citations?user=PCIAcfUAAAAJ https://lighton.ai/team/
Energy harvesting	**Ryan L. Harne**: Energy harvesting (@ Penn State) https://scholar.google.com/citations?hl=en&user=IPCjPOoAAAAJ
Self-powered Audio Triboelectric Ultra-thin Rollable Nanogenerator (SATURN)	**Thad Starner or Gregory D. Abowd @Georgia Tech**: Cool prototype https://cacm.acm.org/magazines/2020/12/248790-saturn/fulltext

Ad 2: Physical Events

Half day physical events are planned for Copenhagen and Aarhus, Spring 2022

- ½ day conference (Aarhus):
  The Danish Audio Hardware Symposium 2022, April 28th
- ½ day conference (Copenhagen):
  Future Sound Forum 2022, May 4th

Ad 3: Collaborative projects

A new call for collaborative projects under DSC has been announced on March 10th, 2022, with deadline for application on April 6th, 2022.

Now is a good time to start building consortia for upcoming collaborative projects. Experience show that it takes time to form consortia. Often the knowledge institutions are initiators since they in contrast to companies can obtain funding from DSC and thus have the greater incentive. However, a consortium should focus on projects that will be essential for the participating private enterprises.

If seed funding from DSC is seen as important, time is now to get started.

It is recommended to contact the DSC secretariat early on, partly to obtain counselling on what is possible and what needs to be included in an application, partly to obtain assistance in finding partners for a consortium, if that is an issue for establishing a project application.

Next meeting

Tuesday May 17, 2022 14:00 to 15:00

Appendix 1: Participants in the meeting

Clément Laroche	GN Audio - Jabra	Senior Research Scientist
Jeremy Marozeau	DTU Hearing Systems	Associate professor
Jonas Raun Hansen	GN Hearing A/S	Manager, Electro Acoustics
Morten Kroman	WS Audiology	VP R&D Electronics
Tore Stegenborg Andersen	FORCE Technology	Senior Researcher
Birger Schneider	CHAMAJ Consult ApS	Director
Torben Vilsgaard	Danish Sound Cluster	Director
Shelley Uprichard	Danish Sound Cluster	Project Manager

Appendix 2: "Guiding star" note

Danish Sound Cluster
WG "Future Sound Tech Solutions"

"Guiding star" note:

"Sound quality in digital meetings"

"Guiding star" paper, i.e. reference note for focus areas within the sound area.

- Purpose: A 1-2 page paper to describe: 1) The background, 2) the situation today, 3) what needs to be done, 4) what it means for Danish companies, 5) expected future development in the market and 6) what it means for Danish companies and knowledge institutions. Topic is defined based on general interest in relation to DSC and SoundDenmark.
- Future use: The reference paper may find application, for example, in connection with fund application for projects as well as for general inspiration, e.g. in connection with creating interest in the area for companies, educational institutions, student recruitment, etc.
- Activity: A small Ad Hoc working group prepares the focus paper.

Current case: "Sound quality in digital meetings" is important. In an era, where video meetings have become common, it is essential to improve sound quality to a level where participants are not affected negatively as a result of joining in video meetings.

Many, who frequently participate in Zoom and Team's video meetings, experience fatigue and stress caused by poor sound quality. For several Danish companies, it is a core area of competence to ensure high sound quality with their products. It is known that to have a strong position in the market, a company's audio products must be better than that of competitors in the market:

Danish global players in the field include:

- Jabra (GN Audio)
- Epos (Demant)
- Bang & Olufsen

Marketing of "sound quality in digital meetings" as focus area on its own right for research is considered a poor approach to success. The subject does not have great opportunities to obtain support in Danish research councils, at EU project funding, etc. Competition from other R&D areas is fierce. However, if the subject can be coupled with stress, cognitive challenges, etc., one stands much stronger.

Many people do not understand why they often feel tired after video meetings. The fact is that sound quality is generally poor in video conferencing, and here much of the explanation of fatigue and stress must be found.

We want a perspective paper on the subject, not least including articulation of future impact.

For the present topic, a small ad hoc working group is proposed with the participation of:

- Clement Laroche, Jabra,
- Torben Christiansen, Epos
- Tore Stegenborg-Andersen, FORCE Technology
- Birger Schneider, CHAMAJ Consult

We envision that the perspective paper can be utilized well in connection with e.g. project applications, as it can serve as a common framework that can be referenced, when needs are to be identified.

Furthermore, we think that a similar approach can be used to put into perspective other significant areas under the DSC.

When proposal of the sub-group is presented, it will be discussed in the working group and possibly also with one or more of the other working groups. The finalized reference paper is published.

Niels Pontoppidan
Mads Græsbøll Christensen
Birger Schneider