

Open your ears...



STRUER – CITY OF SOUND – DENMARK
2017 AUGUST 30TH – SEPTEMBER 2ND
3RD AES INTERNATIONAL CONFERENCE ON

SOUND REINFORCEMENT OPEN AIR VENUES

Conference Programme

Revision PC 2017.08.24

Colour Coding

- Main programme times, refreshments, shuttle busses
- Social events
- Keynotes, Invited Papers
- Paper Sessions
- Panel Discussions
- Tutorials
- Workshops



Wednesday, August 30th, 2017

17-20: Registration open, pick up your conference pack, meet the committee.

APOLLON FOYER

17-20: Informal meet & greet, restaurant and bar open - purchase your own food and drinks from the menu.

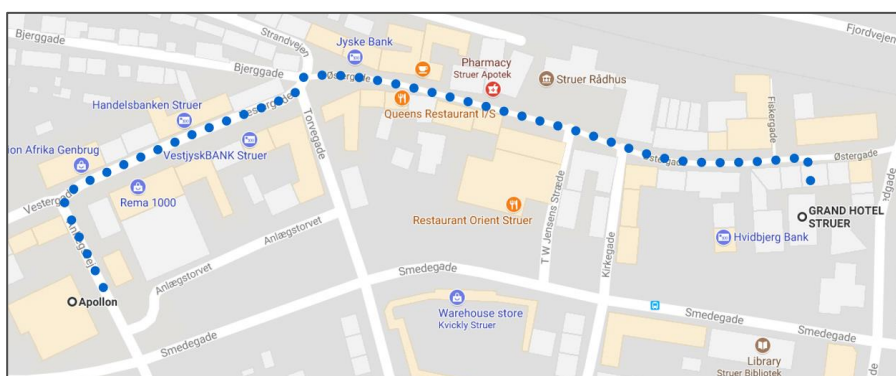
20-22: Social event "The Dark Tower" complimentary ATMOS film.

SAL 1

The Dark Tower is a new American science-fantasy-western-action-horror film set in modern-day New York city and scheduled for release mid-August 2017. It is a continuation of the Stephen King novels of the same name. The film will be presented in Dolby ATMOS and includes popcorn and a soft drink voucher.

22-23: Informal meet and greet continues in the bar.

23: Shuttle busses to hotels Humlum/Tambohus (North of Struer) and Royal/Schaumburg (South of Struer) depart from outside Apollon. Residents of Grand Hotel Struer should walk back to the hotel (6 minutes' walk, 450m, see map).



Thursday, August 31st, 2017

8: Shuttle buses from hotels to Apollon (pick-up at Tambohus and Schaumborg 8:00, Humlum and Royal approx. 8:10). Residents of Grand Hotel Struer should walk to Apollon (see previous map).

8-9: Registration open, pick up your conference pack, meet the committee, coffee, tea and water available.

APOLLON FOYER

9-9:15: Welcome

SAL 1

Conference chairs Eddy Brixen and Peter J. Chapman will open the conference and present the day's programme.

9:15-9:45: Keynote K1

SAL 1

Eddy Brixen will introduce the keynote by Niels Werner Adelman-Larsen.

ABSTRACT: Niels Werner Adelman-Larsen of Flex Acoustics will introduce the conference by reflecting on the signal chain from source to ear of an amplified music event and how room acoustics form part of our usual listening environment - or not in the case of outdoor events. "Imagine an outdoor rock concert. Visualize a flat field, a stage with a band and a crowd listening to the music coming mainly from the PA system. That's a rock concert without any room acoustics. Niels Werner will thus reflect upon if the reflection-free open air space is the ideal acoustic space for amplified music concerts or not?"

BIO: Niels Adelman-Larsen studied acoustics at the Technical University of Denmark and music and sound engineering at Berkeley College of Music. After a 15-year career as a professional musician he initiated research in acoustics for amplified music concerts. Based on the findings he wrote the book *Rock & Pop Venues – Acoustic & Architectural Design* and invented variable acoustics devices and the inflatable sound absorber.

9:45-11: Paper Session P1

SAL 1

Session chaired by Jan Voetmann.

BIO: Jan Voetmann is former senior technology specialist at DELTA - Danish Electronics, Light and Acoustics. In 2008, he founded his own company, Voetmann Acoustics, an independent advisory unit with special focus on room acoustics, audio, and hearing problems. Jan has over 40 years' experience as an acoustical consultant. He has also been co-originator of the Danish Tonmeister Education (1997) and Danish Sound Innovation in 2009.

9:45-10:10 - P1.1 Perception of Low Frequency Content of Amplified Music in Arenas and Open-air Music Festivals - Jonathan G. Burton, Damian T. Murphy and Jude S. Brereton - University of York, UK

ABSTRACT: The purpose of this study is to investigate whether audience perception at large arena shows and music festivals could be improved by the addition of Infra-sub. Infra-sub refers to low frequency audio content below 50Hz, and its presence might help provide a more involving and engaging audience experience at lower sound pressure levels. This paper investigates whether an increase in low frequency content (below 50Hz), both in terms of magnitude and frequency range, affects a listener's preferred listening level. The study was conducted in real-life situations at a number of European indoor arenas using a large format line array system with low frequency extension. It was shown that preferred listening levels were lower when low frequency content (Infra-sub) was increased. The implication of this result suggests that increasing Infra-sub content allows the environmental impact of large arena concerts and music festivals to be reduced whilst maintaining a positive listening experience. Although the study had some limitations in sample size and range of participants, it still underlines the beneficial social, environmental and health implications of the use of Infra-sub, stemming from an overall reduction in sound pressure level at arena concerts and open-air music festivals.

BIO: Jon Burton started life as a musician, but one keenly interested in the technical side of the profession. Engineering eventually overtook playing as touring work increased. Clients in the early days included the local band Radiohead. Since then Jon has toured with Suede, Pulp, The Lighthouse family, Stereophonics, Lulu, Bryan Ferry, Blue and for the last 14 years The Prodigy. Working both as a FOH engineer and a monitor engineer Jon has worked at the highest level for over 25 years. He engineers headline acts at international open air festivals for between 30 and 50 shows a year. Jon is also a partner in the Laundry Rooms studio complex in Sheffield which he built with fellow engineer Dave Hadley. A chance invite to talk for manufacturer Soundcraft, 20 years ago, led to an interest in education. Jon now regularly lectures at Universities and colleges in the UK and abroad. Jon completed an MSc in Music Technology from York University in 2017 and became an associate fellow of the Higher Education Academy. Jon is also part time writer for Sound on Sound magazine and contributes to the online education site Soul Sound.



10:10-10:35 - P1.2 Practical Considerations for Subwoofer Arrays and Clusters in Live Sound Reinforcement - Adam J. Hill - University of Derby, UK

ABSTRACT: The central theories behind low-frequency directionality with subwoofer clusters and arrays are well-known, but there are practical considerations that are essential to understand. This paper highlights key areas such as: the acoustic center, directionality of so-called omnidirectional sources, performance stage effects, and inter-unit decorrelation methods, primarily through the use of hemi-anechoic measurements with secondary analysis via electroacoustic simulations.

BIO: Adam Hill is currently a senior lecturer at the University of Derby where he runs the MSc Audio Engineering program. He received a Ph.D. from the University of Essex, an M.Sc. with Distinction in Acoustics and Music Technology from the University of Edinburgh, and a B.S.E. in Electrical Engineering from Miami University. His research generally focuses on analysis, modelling, and wide-area spatiotemporal control of low-frequency sound reproduction and reinforcement. Adam also works professionally as a live sound engineer for Gand Concert Sound and is co-chair of the AES Technical Committee on Acoustics and Sound Reinforcement.

10:35-11 - P1.3 Engineering Brief: 360 Degree Sound System Design & Adjustment at Teleton Theater, Santiago de Chile - Cristian Eduardo Becerra Benítez - INACAP University, Chile.

ABSTRACT: Teleton Theater at Santiago de Chile is a Venue rarely used for 360° Shows. This Engineering Brief describes the designing and tuning process of the Sound Reinforcement System for Andres De Leon 360° "20 years Concert".

BIO: Cristian Becerra graduated in Sound Technology from Vicente Perez Rosales University in Chile in 1998. In 2000, he began teaching at the same institution and in 2004 he attended its first Sound System Design and Optimization Seminar. Today, he is still teaching at INACAP University and has designed and optimized a lot of sound systems and several 360° systems at different venues in Chile through his own consultancy SABA Sonido, focused on live sound.

11-11:15: Refreshments - Danish pastry, coffee, tea and water available.

FOYER

11:15-12:30: Panel Discussion D1

SAL 1

Discussion introduced and chaired by Karsten Grunnet.

BIO: Karsten Grunnet is former Media Sales Director at Danmon Group Systems A/S, Denmark, now partially retired. He was active in specifying and installing sound systems with focus on room acoustics, audio, and hearing problems and has more than 40 years' experience as supplier to theatres, cinemas, concert halls, multi-purpose halls, studio control rooms etc. Karsten has been an AES member since 1973.

Are Advances in Sound Systems Improving Concert Experience Levels?

ABSTRACT: The panel are to discuss if technical improvements in sound systems such as in loudspeaker cabinets, amplification, DSP and computer prediction are increasing the audience experience levels at concerts in general – or is the performance from high quality system components often hampered by poor understanding of acoustics, component specifications, system design, rule-of-thumb assumptions or whatever seems to be the latest trend in the industry? Are audience sizes at outdoor venues 'out-sizing' current system understanding and capability for ideal performance for all ears?

INTRODUCTION: Jonathan G. Burton will introduce the discussion with examples from 25 years of touring with names such as The Prodigy, Radiohead, Suede and Brian Ferry.

PANEL: Jonathan G. Burton – York University, Scott Sugden - L-Acoustics, Jörgen Allen - Bose, Eddy Brixen - EBB Consult.

BIO: Jonathan G. Burton - see P1.1.

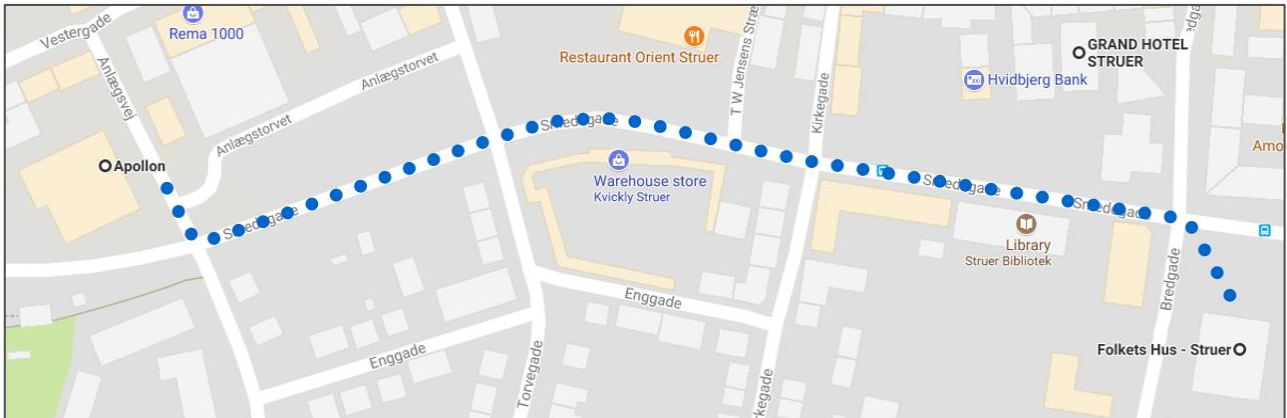
BIO: Scott Sugden is Head of Applications Touring, USA at L-ACOUSTICS. Scott is a recognized systems engineer, having previously toured with the Steve Miller Band and Van Halen. He was a mixing engineer on the first national tours of theatrical productions The Producers, Spamalot and 700 Sundays and has also designed the sound systems of top grossing music festivals Milwaukee's Summerfest, Country Thunder and Coachella as well as the permanent installation at the renowned Hollywood Bowl. He studied Physics at the University of Wisconsin Eau Claire.

BIO: Jörgen Allen began working for an audio rental company in mid-80's and he joined Bose in 1994 as a field engineer supporting dealers with sound system design and auralisation. The projects have mostly been large venues such as churches and stadiums. Since the launch of RoomMatch in 2012, Jörgen has also designed sound systems for live music.

BIO: Eddy B. Brixen received his education in electronic engineering from Danish Broadcasting Corporation, the Copenhagen Engineering College, and the Technical University of Denmark. Major activities include room acoustics and electroacoustic design. As a lecturer, he holds a position with the Danish National School of Performing Arts. Eddy joined the AES in 1981 and has been a consultant in the field of sound for over 40 years. He has contributed to many high-profile live events including the Eurovision Song Contest. Despite being a music lover, he occasionally treats the flugelhorn.

Note that we leave Apollon after the panel discussion so please take ALL your belongings with you!

12:30-12:40: Walk to Folkets Hus (6 minutes' walk, 450m, see map).



12:40-13:30: Lunch.

FOLKETS HUS FOYER

13:30-13:40: Find your tutorial – info.

INDOOR STAGE

Peter J. Chapman will introduce the afternoon tutorial sessions and explain how to navigate (see overview below).

	.1 (indoor stage)	.2 (upstairs room)	.3 (outdoors)
T1	Noise Prediction & Monitoring at Open-Air Events: Introduction - Dr. Elena Shabalina, d&b audiotechnik	Measurement: Then, Now, ... and Then? - Jakup Knudsen, MAVT	Comparing Subwoofer Solutions & Performance: L-R stacks, ground-array and flown - Peter J. Chapman, Harman
T2	Noise Prediction & Monitoring at Open-Air Events: Case Study & Validation - Daniel Belcher, Nick Malgieri, d&b audiotechnik	Understanding Acoustical Simulations - Mads Jensen, COMSOL	Mistakes in System Setup from a FOH Perspective - Jonathan G. Burton, York University, UK
T3	Noise Prediction & Monitoring at Open-Air Events: Measurement & Control - Kees Nervoort, Event Acoustics	Immersive Hyper-Realistic Sound Reinforcement: sound system design & real-time operation - Scott Sugden, L-Acoustics	A Loudness Function for Maintaining Spectral Balance at Changing Sound Pressure Levels - Sofus Birkedal Nielsen, Aalborg University, Denmark



13:40-14:40: Tutorial Session T1

T1.1 Noise Prediction & Monitoring at Open-Air Events: Introduction - Dr. Elena Shabalina, d&b audiotechnik.

INDOOR STAGE

ABSTRACT: In the past, the main focus of loudspeaker manufacturers and sound system designers was to provide the best possible sound quality for the listeners. With the number of these events increasing along with the number of the affected inhabitants and their complaints, the focus is shifting towards including predicting and minimising the noise in the neighbourhood in the planning of an open air event. NoizCalc is designed to close the gap between the environmental noise propagation models and a complex loudspeaker system models. The implementation of the Nord2000 and ISO 9613-2 propagation models were extended to include complex loudspeaker setups. This tutorial presents the motivation and the theoretical background of the NoizCalc prediction method, giving a detailed view on the propagation models and their combination with the precise sound reinforcement system model.

BIO: Elena Shabalina received her diploma in physics and acoustics from the Moscow State University in 2007 and joined the Institute of Technical Acoustics, RWTH Aachen University, Germany as a PhD student in 2008. After completing her PhD in 2012 she joined the R&D department at d&b audiotechnik. Here she moonlights on loud rock concerts where she combines elaborate mathematical theory with heavy metal to prove that even science has soul.

T1.2 Measurement: Then, Now, ... and Then? - Jakup Knudsen, MAVT.

UPSTAIRS ROOM

ABSTRACT: 'Then, Now...' How has development, acceptance and understanding changed from the time we performed single channel measurements, to today, where we can combine N microphones in one dataset and retrieve a mass of information. The use of measurement in live scenarios has now become the norm and in-fact, users have moved from scepticism of measurement to, in some cases, blindly trusting measurement data. Unfortunately, we often see that understanding has not kept up with the development in measurement techniques.

'... and then?' Our work today combines the teaching and use of measurement tools with an understanding of when one should put the data to the side and use your common sense. What is our strategy for ensuring consensus and understanding of measurement methods .. and what do we do when current methods are not sufficient?

BIO: Jakup has worked for many years as a system engineer on a variety of shows ranging from corporate events to concerts and festivals. He has worked with pretty much all of the major loudspeaker systems out there, from Meyer Sound to JBL, L-Acoustics, d&b and everything in-between. He's also been a touring mix engineer both in Denmark and internationally. Jakup teaches Smaart as an official instructor as well as classes in general sound system design & optimization. He also has extensive experience in designing sound systems for various applications, using EASE as well as in programming Soundweb London & Q-Sys. In his "free" time he does iOS programming as well.

T1.3 Comparing Subwoofer Solutions & Performance: L-R stacks, ground-array and flown - Peter J. Chapman, Harman.

OUTDOORS

ABSTRACT: A review of typical subwoofer solutions will be presented on an outdoor setup. Simulation results for the various options will be shown and the participants can compare these to the actual listening experience. Pros and cons of each subwoofer layout will be discussed in light of the acoustic performance including audience coverage, sound field uniformity, efficiency and SPL spill.

BIO: Peter J. Chapman was educated in Electroacoustics from the University of Salford in England in 1996. Since then he has developed active loudspeakers and sound systems for consumer, professional and automotive applications, most recently for Harman. For 20 years, he has also been a live sound engineer where he puts his understanding of acoustics and systems together with his passion for great sound. Peter has previously published technical papers on subjects such as thermal modelling of loudspeakers, tolerances in acoustic measurements and use of exotic dome materials in high-frequency drivers.

14:40-14:50: Change Session, refreshments - cake, fruit, coffee, tea and water available.

FOYER

14:50-15:50: Tutorial Session T2

T2.1 Noise Prediction & Monitoring at Open-Air Events: Case Study & Validation

- Daniel Belcher & Nick Malgieri, d&b audiotechnik.

INDOOR STAGE

ABSTRACT: The prediction of noise from open-air events in neighbouring residential areas is becoming more important. NoizCalc is a tool for calculating noise prognoses with sound reinforcement systems. The content of this tutorial is 1) A case study with a brief walkthrough of the modelling and calculating process, 2) Experiences with NoizCalc in the field, 3) Its validation by means of a comparison with measurements at open-air events and 4) an estimation of uncertainty for predictions.

BIO: Daniel Belcher studied physics at Stuttgart University. In 2007, he began working at Nubert, conceptually designing and developing passive and active HiFi loudspeaker systems and electronics. His second occupation as a noise consultant was at Müller-BBM in Switzerland, measuring and evaluating environmental noise. With this combined expertise, he started at d&b audiotechnik in 2016 and is advancing the field of sound reinforcement systems concerning noise pollution.

BIO: Nick Malgieri began his career in pro audio at the age of 14 when managing 7 monitor mixes in a 1000 capacity music venue in Northern California. 22 years later he has toured with members of the Grateful Dead and served as head of audio for the Monterey Jazz Festival and TED Talks. Nick has a well-rounded tenure in pro sound having also served as communications head for NASCAR, speaker re-coning for Skywalker Ranch, and technical director for venues at Stanford University where he also served as a lecturer. He now resides in Asheville, North Carolina where he provides Education and Applications Support for d&b audiotechnik and is the NoizCalc specialist for the Americas.

T2.2 Understanding Acoustical Simulations - Mads Jensen, COMSOL.

UPSTAIRS ROOM

ABSTRACT: This tutorial will give an introduction to modelling and simulating acoustics, starting from the loudspeaker itself and ending at the sound field generated, for example, at an open air venue. The basics of numerical modelling including lumped models, the finite element method (FEM), and ray tracing methods will be covered at an introductory level. Details on how the strengths of these different techniques can be combined will also be discussed. Examples will be shown in a live demo using the COMSOL Multiphysics software.

BIO: Mads Herring Jensen is a technical product manager for the acoustics module provided by COMSOL, who he joined in 2011. Before starting at COMSOL, he worked in the hearing aid industry for five years as an acoustic finite element expert. Mads has a Ph.D. in computational fluid dynamics from the Technical University of Denmark.

T2.3 Mistakes in System Setup from a FOH Perspective - Jonathan G. Burton, York University, UK..

OUTDOORS

ABSTRACT: Jon has been touring internationally for over 2 decades with high-profile artists. During this tutorial, he will share his opinion on system setup, especially some of the aspects where he regularly experiences shortcomings in setup or unfortunate configurations that either limit the opportunities for the FOH engineer, or compromise sound performance for some or all of the audience - for example, FOH mix position and width of the main stacks. For discussion, Jon will demonstrate some aspects on the outdoor sound system.

BIO: See P1.1.

15:50-16: Change Session, refreshments - cake, fruit, coffee, tea and water available.

FOYER

16-17: Tutorial Session T3

T3.1 Noise Prediction & Monitoring at Open-Air Events: Measurement & Control - Kees Nervoort, Event Acoustics.

INDOOR STAGE

ABSTRACT: Measuring the noise emission of multiple stage musical events by means of pattern recognition, how do we know which stage is causing what part of the noise that is present in the surroundings of the event and how can we adapt.

BIO: Kees Nervoort started his career working for 15 years as a live sound engineer while also getting his master degrees in music technology and acoustics. Kees currently works as an acoustic consultant and R&D manager for Dutch company Event Acoustics where he developed the MeTrao measurement system and designs sound system setups for live events, with special focus on noise spill. Kees lives in Amsterdam with his family.

T3.2 Immersive Hyper-Realistic Sound Reinforcement: sound system design and real-time operation

- Scott Sugden, L-Acoustics, USA

UPSTAIRS ROOM

ABSTRACT: Immersive hyper-realistic sound reinforcement refers to a new category of sound reinforcement that allows the audience to understand and distinguish between different voices or instruments and aligns the direction of the sound with its source as well as offering a wide panorama and enveloping the audience. This tutorial presents this novel workflow that combines implementation guidelines, an evaluation and certification tool for sound designs (Soundvision from L-Acoustics), an object based rendering unit (L-ISA processor), an object based user interface for live interaction (L-ISA controller) that has been recently seamlessly interfaced with DigiCo SD mixing console series. The approach will be outlined with recent references for pop and classical sound reinforcement for large audiences (5000 to 15000 people).

BIO: See D1.

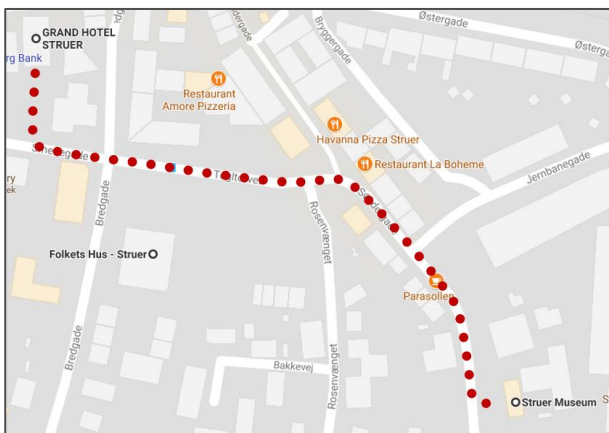


T3.3 A Loudness Function for Maintaining Spectral Balance at Changing Sound Pressure Levels - Sofus Birkedal Nielsen, OUTDOORS Aalborg University, Denmark.

ABSTRACT: Different music examples equalized and mixed at a specific Mixing Level e.g. 85 dBA will be played at different Listening Levels (75 – 105 dBA) to demonstrate how level will change our spectral perception (according to ISO226). A developed loudness compensation (SpecBal) will be demonstrated that can maintain the spectral balance at changing Listening Levels. Using dBA measurements challenges the sound quality with hidden 'free' bass boost.

BIO: Sofus Birkedal Nielsen is an Associate Professor at Aalborg University, Denmark since 1988. He teach and supervise engineer students at all levels in analogue electronics, digital signal processing implementation in fixed point DSP's, and Audio Engineering at the MSc. programme in Acoustics and Audio Technology. He does research in low frequency sound reproduction in rooms (CABS) and Audio Engineering and he has a big interest for analogue and digital HW design and DSP HW/SW implementation. He loves rhythmic music and attends many live concerts - often not because of the sound quality, which led to the development of a new spectral loudness compensation (SpecBal). Loves listening to music – not equipment.

17: Shuttle busses to hotels Humlum/Tambohus and Royal/Schaumburg. Pick-up on car park in front of Folkets Hus. Residents of Struer Grand Hotel should walk to the hotel (2 minutes' walk, 150m - see map).



17-19: Bus transport and free time at your hotel.

18:30: Shuttle busses to Struer Museum (pick-up at Tambohus and Schaumburg 18:30, Humlum and Royal approx. 18:40). Residents of Struer Grand Hotel should walk to Struer Museum (5 minutes' walk, 400m - see map).

19-23: Mayors Reception dinner & drinks, live jazz with The Martin Fabricius Trio. STRUER MUSEUM

This evenings' social event is held at Struer Museum. The museum includes exhibits describing the way of life, culture and developments in the local area from the 1500's to present day including a large exhibition of Bang & Olufsen products and a Sound Experimentarium. The whole museum is open for us to browse throughout the evening. The Mayor of Struer (and guitarist) Mads Jakobsen will open the evening at 19:30 and then a buffet dinner including local specialities together with beer, water and soft drinks will be served. After dinner there will be live jazz.

Martin Fabricius Trio was established in 2007 by Danish vibraphone player and film music composer Martin Fabricius. The music, which is written by Martin Fabricius with financial support from the Danish Art Council, has a distinct Nordic tone with strong melodies and has, by more than one critic, been described as image creating, beautiful music with healing powers. The trio recorded their first CD, When Sharks Bite, in 2008 which JazzNyt hailed as one of the best 10 Danish jazz CDs to come out that year. Since then the trio has performed all over the world attracting a growing audience of listeners both familiar and new to jazz, who appreciate the welcoming, friendly nature of the music. In 2014 came Out of the White which among other praise has received 5 stars from All About Jazz and has been one of the most played jazz albums on Danish National Radio. Out of the White was re-released by the German jazz label, Berthold Records, in March 2017. Photo: Bablu Virinder Singh.



23: Shuttle busses to hotels Humlum/Tambohus and Royal/Schaumburg. Pick-up in front of the museum. Residents of Struer Grand Hotel should walk to the hotel (5 minutes' walk, 400m - see previous map).

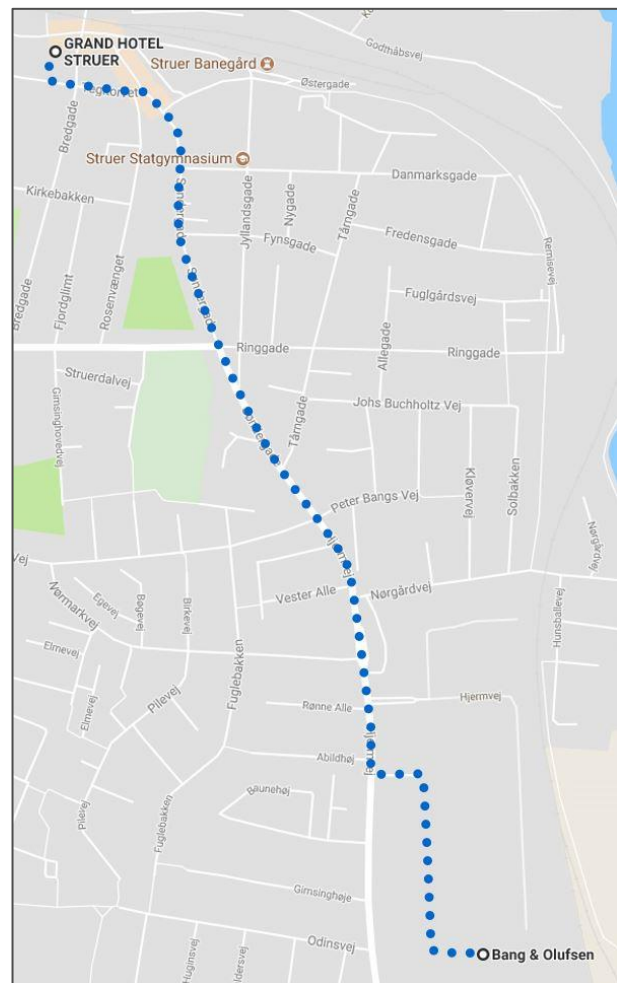
Friday, September 1st, 2017

8: Shuttle buses from hotels to Bang & Olufsen Headquarters (pick-up at Schaumburg and Tambohus 8:00, Humlum and Royal approx. 8:10, Grand Hotel Struer approx. 8:25). Residents at Grand Hotel can choose to walk the 20-25 minutes (2 km) to Bang & Olufsen Headquarters (see map).

8-9: Refreshments - coffee, tea and water available. FOYER

9-9:10: Welcome. AUDITORIUM

Conference chairs Eddy Brixen and Peter J. Chapman will give information about the day's programme.



9:10-9:55: Invited Paper I1

AUDITORIUM

Eddy Brixen will introduce the invited paper by David Scheirman.

Back to the Future, a Technology Project Review: Outdoor Sound Reinforcement of Symphony & Opera for Extremely Large Audiences.

ABSTRACT: 200,000 person audiences enjoyed classical music via a sound reinforcement system deployed in New York City parks. Sound from an acoustical shell was supplemented with battery-powered, digitally-delayed loudspeaker towers receiving wireless transmissions to cover asymmetrical sites. Technical and operational details of this futuristic open air sound system from 25 years ago, pioneering advanced technologies now taken for granted, are detailed.

BIO: David Scheirman is the Audio Engineering Society's President-Elect. He has worked with an electroacoustical measurement laboratory, a computer-controlled audio system developer, a networking technology R&D firm, as an installed system integrator, with major rental sound companies and a leading professional loudspeaker manufacturer, where he and colleagues developed advanced line source array loudspeakers with an integrated control, DSP and amplification platform to support them. He has studied complex product development, product management, and technology marketing strategy at M.I.T. (Cambridge, MA), CalTech (Pasadena, CA), and Stanford (Palo Alto, CA). As a sound reinforcement technician, mixer and sound designer, he worked on over 3,000 live shows across the globe. He is currently Director, Global Concert & Rental Business for Bose Professional.

RUN TO THE BEAT
powered by
BANG & OLUFSEN

Peter J. Chapman will introduce the day's workshops and explain the groups and how to navigate.

	.1	.2	.3
W1	State-of-the-Art Consumer Sound: Beolab 90 - Jakob Dyreby Martin, Bang & Olufsen	Microphone Choices & Techniques: Drums - Rune Slot, DPA	FOH Sound System Set-up & Optimization - Peter Jørgensen, Audio Consulting
W2	FOH Sound System Set-up & Optimization - Peter Jørgensen, Audio Consulting	State-of-the-Art Consumer Sound: Beolab 90 - Jakob Dyreby, Bang & Olufsen	Microphone Choices & Techniques: Drums - Rune Slot, DPA
W3	Microphone Choices & Techniques: Big Band - Rune Slot, DPA	FOH Sound System Set-up & Optimization - Peter Jørgensen, Audio Consulting	State-of-the-Art Consumer Sound: Beolab 90 - Jakob Dyreby, Bang & Olufsen

10:05-10:15: Walk to first workshop

10:15-11:25: Workshop Session W1

W1.1/W2.2/W3.3 State-of-the-Art Consumer Sound: BeoLab 90 - Geoff Martin, Bang & Olufsen.

HQ FOYER

ABSTRACT: Bang & Olufsen launched the Beolab 90 consumer loudspeaker in 2016. The loudspeaker weighs in at 137kg each with a moulded aluminium cabinet and includes intelligent DSP, 18 amplifier channels totalling over 8000W and 18 loudspeaker units. Audio input can be analogue, hi-res digital or wireless signals. The key technologies include directivity control (width and direction) and room compensation. Jakob will present the ideas behind the product, it's construction and demonstrate the audio performance to give an impression of where state-of-the-art consumer sound is today.

BIO: Jakob Dyreby has a Master of Science Degree in Acoustics and Signal processing from Aalborg University. Since 2006, Jakob has been employed at Bang & Olufsen as an Acoustic Engineer and later Specialist. He has been the acoustic engineer behind several products among others; BeoSound 8, Beolab 90, and BeoSound Shape.

W1.2/W2.3/W3.1 Microphone Choices & Techniques: Drums/Big Band - Rune Slot, DPA.

MAIN STAGE

ABSTRACT: In this workshop, Rune will touch upon many aspects relating to microphone techniques and choice of microphone including 1) The microphones' ability to handle high SPL, 2) Transient response & distortion of the diaphragm, 3) Frequency response on- and off-axis, 4) Advantage of linear microphones in a tight and multiple-microphone scenario and 5) Bleed & phase response. The workshop will use demonstrations with real instruments to illustrate a range of technical points.

BIO: Rune Slot is a hard-working, music loving, well-travelled freelance sound engineer with 20 years of experience in live sound and music studio work. FOH & MON engineer for Glenn Hughes, California Breed, Black Country Communion, D-A-D & Anne Linnet are some of the highlights of Rune's career. In 2010, after 10 years of music recording at different studio locations, Rune decided to build his own - The Dusty Goat Studio. Theatre and musical experience led to extensive touring as a sound designer for Betty Nansen Theatre on the Art Musical by Tom Waits and Robert Wilson, Woyzeck. Currently, Rune is part of the global sales team at DPA Microphones.

W1.3/W2.1/W3.2 FOH Sound System Set-up & Optimisation - Peter Jørgensen, Audio Consulting.

MAIN STAGE FOH

ABSTRACT: During this workshop, Peter will cover key parameters for deciding which size system is necessary for a particular event, the infrastructure in a modern PA system, typical errors in system setup and optimization and measurement of large scale PA systems.

BIO: Peter Jørgensen graduated from college in music and has been a drummer since the age of 6. After college, Peter started a high-end recording studio in the Danish city of Nyborg but stopped again some years later due to stiff competition in the industry. He then completed the comprehensive *Event Technician* education in Frederikshavn, where he specialized in sound system design and tuning. The last two and a half years he have been a freelance system and FOH engineer for medium to large scale festivals, theatre, television and touring.

11:25-11:35: Change Session, refreshments.

MAIN STAGE AUDIENCE AREA

11:35-12:45: Workshop Session W2

12:45-13:45: Lunch.

MAIN STAGE AUDIENCE AREA

13:45-14:55: Workshop Session W3

14:55-15:05: Change Session, refreshments.

MAIN STAGE AUDIENCE AREA

15:05-15:50: Invited Paper I2

AUDITORIUM

Eddy Brixen will introduce the invited paper by Jörgen Allen.



Progressive Directivity Array: Technology Overview and Performance Advantages for Sound Reinforcement Systems.

ABSTRACT: The concept and advantages of Progressive Directivity Array (PDA) was introduced at the ISEAT 2015 convention. The primary advantage of the PDA compared to conventional approaches such as line-array or point-source speakers is that the intended tonality can be achieved regardless of the room conditions (shape and material) with consistency throughout the target audience area not just for a single listening point. The study clearly indicates that precise coverage control to match the audience area with continuity of the sound source without gaps between modules are two crucial elements to achieve the primary objective. In this paper, adaptation of the PDA concept to the real product as a modular approach is described with performance of the product followed by application of the products to real world examples.

BIO: See D1.

15:50-16: Change Session, refreshments.

MAIN STAGE AUDIENCE AREA



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16-17: Katrine Windfeld Big Band concert

MAIN STAGE AUDIENCE AREA

Brilliant compositions, hard swinging ensemble parts, and stunning soloists is what quickly made KWBB the hottest new big band in Denmark. The band consists of 15 young Danish, Swedish, Norwegian, and Polish super talents, with the awarded composer, arranger, and pianist Kathrine Windfeld in front. In November 2016, they won a prestigious Danish Music Award 2016: "New Jazz Artist of The Year" with their debut album AIRCRAFT – which was nominated in further two categories - "Album Of The Year", and "Composer Of The Year". KWBB's next album will be released in spring 2017 on the renowned Scandinavian label STUNT. The vibrant, colourful charts draw inspiration from artists like Cannonball Adderley, Dave Holland, and Brandford Marsalis. Nevertheless, Kathrine Windfeld has definitely shaped her own musical voice with countless original pieces - often characterised by rhythmic twists, complex harmonies and a strong attitude. During two seasons, the band had a weekly gig at the exclusive jazz club The Standard in Copenhagen, and has been playing with prominent guests like Mike Stern, Gilad Hekselman, Nancy Harms etc. Kathrine Windfeld Big Band was selected for a showcase on JAZZAHEAD in Germany 2016 where they impressed several reviewers, all considering Kathrine Windfeld one of the most exciting and refreshing new Scandinavian jazz composers and arrangers in recent years. Note that the concert is open to the public.



17: Shuttle busses to Grand Hotel/Humlum/Tambohus and Royal/Schaumburg (pick-up on main Bang & Olufsen car park).

17-19: Bus transport and free time at your hotel.

18:30: Shuttle busses to The Hayloft (pick-up at Grand/Schaumburg 18:30, Royal and Humlum approx. 18:40, Tambohus approx. 18:55).

19-23: Social Event tapas buffet & drinks, The Nice Little Penguins live.

THE HAYLOFT

The Hayloft is a local concert venue pretty much "in the middle of nowhere" on the island of Thyholm and only a stones-throw from the waters of the Limfjord. The owner Bent Hargaard quit his teaching job after a family holiday to Toscana in 2005. Since then he has imported organic wines to Denmark. Above his shop, Bent has developed a converted barn into a concert venue - and it has been a great success with a long list of national and international artists visiting the intimate venue which has space for only 130 guests. Tonight we will enjoy a tapas buffet from the local butcher and free bar is included. After dinner, the Danish trio 'The Nice Little Penguins' will entertain us.

The Nice Little Penguins were formed in 1983. The Penguins are Bo Feierskov (bass, vocals) and brothers Michael Kolster (guitars, ukulele, vocals) and Carsten Kolster (drums). Through the years they have released 7 studio albums and played a huge number of live jobs. Their most famous song is "Flying" from the 1994 album of the same name. They have played at The Hayloft before and promise us a few anecdotes and an evening to remember.



23: Shuttle busses to hotels Tambohus/Humlum/Grand and Royal/Schaumborg.

Saturday, September 2nd, 2017

8: Shuttle buses from hotels to Apollon (pick-up at Tambohus and Schaumburg 8:00, Humlum and Royal approx. 8:10). Residents of Grand Hotel Struer should walk to Apollon.

8-9: Refreshments - coffee, tea and water available.

APOLLON FOYER

9-9:15: Welcome.

SAL 1

Eddy Brixen will introduce the day's programme.

9:15-10:30: Paper Session P2.

SAL 1

Session chaired by Morten Lydolf.

BIO: Morten gained his Ph.D. degree in Acoustics from Aalborg University in 2000. He has specialized in psychoacoustics, acoustic measurements, DSP and automotive acoustics. Morten has worked on international standardization within ISO on various subjects concerning the threshold of hearing, equal loudness contours and loudness scaling. He has designed automotive sound systems and solutions for the last 15 years at Bang & Olufsen and Harman.

9:15-9:40 - P2.1 An Adaptive, Data-Driven Sound Field Control Strategy for Outdoor Concerts - Franz M. Heuchel, Diego Caviedes Nozal, Jonas Brunskog, Efrén Fernández Grande and Finn T. Agerkvist - Technical University of Denmark, Copenhagen.

ABSTRACT: One challenge of outdoor concerts close to urban environments is to ensure adequate levels for the audience while avoiding disturbance of the surrounding residential areas. This paper outlines the initial concept of a sound field control system for tackling this issue. The idea is to create acoustic contrast between the audience area and the surrounding using methods from sound zoning. Control over large areas implies the need for precise information of transfer-functions between the loudspeakers and the control areas. The envisioned system uses a combination of measurements and Bayesian inference to update the parameters of a sound propagation model which estimates these transfer-functions. We present a simple case in which sound field control and propagation model work together.

BIO: Franz M. Heuchel graduated from the Technical University of Denmark (DTU) in 2016 with a M.Sc. in Engineering Acoustics and a Masters thesis on indoor low frequency sound field control. Since 2017 he is a PhD student at DTU in the Acoustic Technology group. His main areas of interests are the application of sound field control and sound zoning to outdoor problems. Diego Caviedes Nozal graduated from the Technical University of Denmark (DTU) in 2016 with a M.Sc. in Engineering Acoustics and a Master's thesis on the automatic localization of surfaces and characterization of its acoustic properties. Since 2017 he is a PhD student at DTU in the Acoustic Technology group. His main areas of interests are the application of Bayesian inference and machine learning techniques to acoustic phenomena.

9:40-10:05 - P2.2 Adjoint-Based Time Domain Sound Reinforcement - Mathias Lemke, Florian Straube, Frank Schultz, Jörn Sesterhenn, and Stefan Weinzierl - Technical University of Berlin, Germany.

ABSTRACT: Line Source Arrays (LSAs) are used for sound reinforcement aiming at the synthesis of homogeneous sound fields for the whole audio bandwidth. The deployed loudspeaker cabinets are rigged with different tilt angles and/or electronically controlled. The determination of the optimal geometric arrangement and electronic drive is an ill-posed inverse problem. In this contribution an adjoint-based approach is introduced. By defining a target sound field within an objective function the method allows the optimization of acoustic sources. It is based on the Euler equations and the corresponding adjoint which are solved by means of computational aeroacoustic (CAA) techniques. In this way, both optimal driving functions and optimal positions of sources for the synthesis of a desired sound field can be determined. The adjoint approach allows the consideration of a base flow, such as the influence of wind. We will present the fundamentals and features of the method together with two validation examples. It is shown, that the method is suitable to identify predetermined driving functions and that it provides reasonable driving functions when considering a base flow.

BIO: Mathias Lemke studied Physical Engineering at the Berlin Institute of Technology. He received his PhD degree in 2015 at the Institute of Fluid Dynamics and Technical Acoustics. Currently, he is working in the field of data assimilation and its application to acoustics as well as compressible and reactive flows.



10:05-10:30 - P2.3 Engineering Brief: Large Scale Open Air Sound Reinforcement in Extreme Atmospheric Conditions - Etienne Corteel, Scott Sugden, François Montignies - L-Acoustics, France.

ABSTRACT: Extreme atmospheric conditions have a profound effect on sound propagation. This paper presents two installations where this problem must be accounted for: the main stage of the Coachella Valley Music and Arts Festival and the Hollywood Bowl. The approach presented here combines an optimized sound system design combined with signal processing for partial compensation of remaining loss in selected areas.

BIO: Etienne Corteel is Director of Scientific Outreach at L-Acoustics. Etienne has authored more than 60 research publications in the field of 3D audio, perceptual evaluation, signal processing, loudspeaker radiation modelling and control. Etienne has been working at Studer Professional Audio, IRCAM, and Sonic Emotion as research scientist and R&D manager. He has obtained a PhD in Signal Processing and Acoustics from Pierre et Marie Curie university in Paris in 2004.

10:30-10:45: Refreshments - Danish pastry, coffee, tea and water available.

FOYER

10:45-12:00: Panel Discussion D2

SAL 1

Discussion chaired by Thomas Lund.

BIO: Thomas has been responsible for developments in true-peak level, loudness, sound exposure, reverb and spatialization. Out of a medical background, he is active in standardization under ITU, WHO and chairman of the European Commission council tasked with prevention of hearing loss. Thomas has written a number of AES papers and is Senior Technologist at Genelec.

Environmental Considerations & Neighbour Annoyance - Creating a Win-Win Situation

ABSTRACT: Today, live concert events are more popular and occur more often than ever before. In particular, outdoor festivals have seen an huge growth in interest over recent years. Furthermore, these events have multiple scenes and cater for thousands of people. SPL spill outside the venue is inevitable and environmental considerations and neighbour annoyance are important factors if a venue wants to be accepted and successful. In fact, indoor venues can also face challenges in urban areas. The panel are to discuss important factors in planning up to an event as well as modern methods for reducing neighbour annoyance and hopefully creating a win-win situation.

INTRODUCTION: Reducing neighbour annoyance around Hermans Theatre in Aarhus, Denmark by Lars Frederiksen of Alfa Audio.

PANEL: Lars Frederiksen - Alfa Audio, Bob McCarthy - Meyer Sound, Finn T. Agerkvist - Technical University of Denmark, Jan Voetmann - Voetmann Akustik.

BIO: Lars Frederiksen has more than 25 years of experience in the Danish and International pro audio industry. Since 2007, he has been managing director of Alfa Audio A/S who are distributor for top pro-audio brands such as d&b audiotechnik, SSL Sony and DPA. Before 2007, Lars has worked for d&b audiotechnik as application support engineer and has been a touring sound engineer.

BIO: Bob McCarthy's involvement in the field of sound system optimization began in 1984 with the development of Source Independent Measurement™ (SIM™) with John Meyer at Meyer Sound Laboratories. Since that time, he has been an active force in developing the tools and techniques of modern sound system optimization, including three generations of SIM, hundreds of tunings, training seminars and publications. His award-winning book, *Sound Systems: Design and Optimization*, considered the foremost text in the optimization field, has sold over 13,000 copies in three languages. His current position is Director of System Optimization at Meyer Sound.

BIO: Finn T. Agerkvist received the MSc in electrical engineering in 1991 and the PhD in 1994, both from the Technical University of Denmark. In 2002 he joined the Acoustic Technology group at DTU-Elektro, Technical University of Denmark, as associate professor and since 2013 he has been the head of the group. His research interest include signal processing, electro acoustics and nonlinear systems.

BIO: Jan Voetmann was former senior technology specialist at DELTA - Danish Electronics, Light and Acoustics. In 2008, he founded his own company Voetmann Acoustics, an independent advisory unit with special focus on room acoustics, audio, and hearing problems. His career has spanned more than 40 years as an acoustical consultant for theatres, cinemas, concert halls, multi-purpose halls, clubs, control rooms etc. Relevant assignments include the Danish National Gallery, Mogens Dahl Chamber Music Hall, Alfredo Kraus Concert Hall, Danish Radio and 200 THX-cinemas in Spain. Co-originator of the Danish Tonmeister Education (1997) and Danish Sound Innovation in 2009.

12:00-12:45: Keynote K2.

Eddy Brixen will introduce the keynote by Bob McCarthy.

ABSTRACT: Bob McCarthy from Meyer Sound has over 30 years industry experience. He runs system design workshops around the globe and is well known for his literature on the subject such as his book *Sound Systems: Design and Optimization* which is now in its third edition. He will talk to us about modern sound system design.

BIO: See D2.

12:45-13:00: Closing Remarks

SAL 1

Chair Eddy Brixen will close the conference.

13:00-14:00: Lunch.

RESTAURANT AREA

14:00: Shuttle busses to Humlum/Tambohus and Royal/Schaumburg.

Afternoon - optional Run To The Beat marathon event. Note that several roads are closed during the run.

STRUER

Evening - optional Run To The Beat after-party outdoor concert event. **Requires registration with the committee.**

MAIN STAGE

23: Shuttle busses to Grand/Humlum/Tambohus and Royal/Schaumburg. **By request upon after-party registration.**

Sunday, September 3rd, 2017

Morning - departure.

Please note that the programme may be subject to change.

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