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# AAC 2023

AACHEN ACOUSTICS COLLOQUIUM

November 27th - 29th, 2023



# PROGRAM

**DEVELOPMENT AND RESEARCH  
IN AUTOMOTIVE ACOUSTICS**

[www.aachen-acoustics-colloquium.com](http://www.aachen-acoustics-colloquium.com)

# FOREWORD

## 14TH AACHEN ACOUSTICS COLLOQUIUM



Parkhotel Quellenhof Aachen, Germany

Are you looking for new ideas and methods to improve the acoustics and vibrations of vehicles and drives? The Aachen Acoustics Colloquium is the perfect opportunity for experts from both industry and research to exchange knowledge and ideas within the field of acoustics and vibrations of vehicles. With 20 technical presentations and 2 plenary speeches, you can stay up-to-date in this ever-evolving field. Attend the Aachen Acoustics Colloquium to get the competitive edge that you need and to get familiar with the latest innovations and insights around acoustics and vibrations of vehicles and drives.

Aachen is one of the most important centers for development and research in automotive acoustics. This year, the Aachen Acoustics Colloquium takes place for the 14th time under the aegis of Prof. S. Pischinger, FEV Group, Prof. L. Eckstein, fka GmbH, Prof. K. Genuit, HEAD acoustics GmbH, and Prof. M. Vorländer, Institute for Hearing Technology and Acoustics of RWTH Aachen University.

### Organizers

FEV Group, fka GmbH, HEAD acoustics GmbH, Institute for Hearing Technology and Acoustics of RWTH Aachen University





# ORGANIZATIONAL AND LOCATIONS OF INTEREST

## REGISTRATION

Please register for the Aachen Acoustics Colloquium at:  
[www.aachen-acoustics-colloquium.com](http://www.aachen-acoustics-colloquium.com)

## HOTEL RESERVATION

Please book your hotel room via aachen tourist service by using the following link:  
[www.aachen-acoustics-colloquium.com/accommodation](http://www.aachen-acoustics-colloquium.com/accommodation)

## LOCATIONS OF INTEREST

**1** Parkhotel Quellenhof  
Monheimsallee 52  
52062 Aachen

**2** Rathaus Aachen  
Markt  
52062 Aachen

## PAYMENT

The registration fee of € 940 (plus 19 % VAT) also includes a welcome reception as well as a banquet dinner.

Registration fee for university staff is € 470 (plus 19 % VAT).

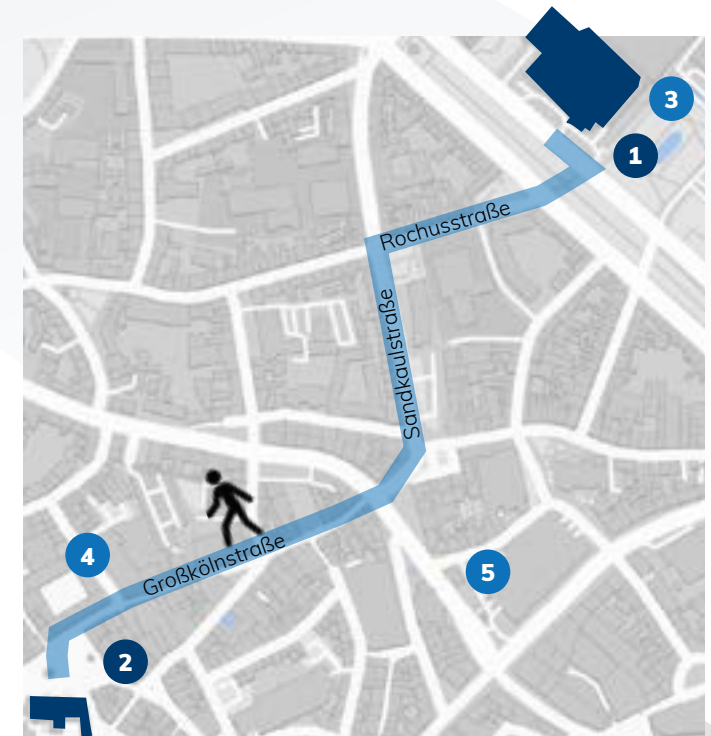
## PARKING INFORMATION

This year again, participants of the Aachen Acoustics Colloquium can park free of charge in the APAG car parks (exception: car park Carolus Thermen No. 13). **The Quellenhof car park is not an APAG car park!**

You will receive a 3-day parking ticket at our information desk on request. The congress park ticket enables unlimited access to the car parks during the period of 27. - 29.11.2023.

## CAR PARKS

- 3** Parkhaus Eurogress  
Monheimsallee 40  
52062 Aachen
- 4** APAG Parkhaus Rathaus  
Mostardstraße 5  
52062 Aachen
- 5** APAG Parkhaus Couvenstraße  
Couvenstraße 6  
52062 Aachen



# PLENARY SPEAKER

## 14TH AACHEN ACOUSTICS COLLOQUIUM



Tobias Hillers  
Dr. Ing. h.c. F. Porsche AG

### **Driven by Dreams: Crafting the Porsche Electric Sport Sound, Honoring 75 Years of Sound Heritage**

Porsche celebrates its 75th anniversary, reflecting on the challenge of developing a unique sound for fully electric vehicles. Exploring the rich heritage of Porsche's iconic sounds, we examine their historical significance and emotional connection. Amidst this backdrop, we unveil the task of crafting a distinctive sound for electric Porsches, navigating complexities and challenges. Blending tradition and innovation, the sound design process meticulously evokes emotions and defines the vehicle's character. Let us celebrate 75 years of historical sound heritage, experiencing the passion and technical brilliance that brings this dream to life and gaining insights into the future of automotive sound.



Prof. Jesko Verhey  
Otto-von-Guericke  
University Magdeburg

### **Vehicle Interior Noise in the Light of Auditory Sensations**

The quality of the cabin noise is an important criterion when buying a vehicle. But which perceptual aspects determine this perceived sound quality? These perceptual aspects can be quantified by asking for auditory sensations. For example, the cabin noise of vehicles of electric drives is usually perceived less loud than that of a vehicle with an internal combustion engine, resulting in a higher perception of comfort. On the other hand, electric drives may produce a higher perceived magnitude of tonal content, which can reduce the pleasantness. If tonal components have very low-frequencies, they elicit yet other sensations. This talk will focus on several sensations and their possible role in perceived sound quality of vehicle interior noise and how this may be affected by the hearing abilities of the potential buyers.

# SCIENTIFIC COMMITTEE

## 14TH AACHEN ACOUSTICS COLLOQUIUM



Prof. Uwe Baake  
Vice President Product  
Engineering  
Mercedes-Benz Trucks  
Daimler AG



Dr. Michael Fischer  
Chief Expert and Head  
Center of Competence NVH  
Robert Bosch GmbH



Dr. Christian Schuster  
Manager Vehicle NVH  
Ford-Werke GmbH



Dr. Per-Olof Stureson  
Consultant, Cum Scientia  
Engineering, Sweden  
Researcher  
KTH Royal Institute of  
Technology, Sweden



Prof. Otto von Estorff  
Head of the Institute of  
Modelling and Computation  
Technische Universität  
Hamburg



Thomas Weidlich  
Head of Acoustics / Structural  
durability and fatigue  
AUDI AG

# PROGRAM

## 27<sup>TH</sup> & 28<sup>TH</sup> NOVEMBER

November 27<sup>TH</sup>

### 19:00 Welcome Reception for Colloquium Attendees

The welcome reception will take place at the exhibition, Parkhotel Quellenhof Aachen, with drinks and food. The reception is free of charge for our participants.

### MEETING VENUE

Parkhotel Quellenhof Aachen  
Monheimsallee 52  
52062 Aachen, Germany  
Phone: +49 241 91320  
E-Mail: [info@parkhotel-quellenhof.de](mailto:info@parkhotel-quellenhof.de)  
Internet: [www.parkhotel-quellenhof.de](http://www.parkhotel-quellenhof.de)

### EXHIBITORS

Take a look at this year's exhibitors:  
[www.aachen-acoustics-colloquium.com/exhibition](http://www.aachen-acoustics-colloquium.com/exhibition)

November 28<sup>TH</sup>

### 08:30 Welcome and Opening

Prof. Klaus Genuit/  
Prof. Michael Vorländer

### ACTIVE SOUND DESIGN AND ACTIVE COMPONENTS I

Session Chair:  
Prof. Michael Vorländer  
Institute for Hearing Technology and Acoustics (IHTA),  
RWTH Aachen University

### 08:45 Driven by Dreams: Crafting the Porsche Electric Sport Sound, Honoring 75 Years of Sound Heritage

Tobias Hillers  
Dr. Ing. h.c. F. Porsche AG

### 09:30 Validation of Active Sound Design Models using Driving Simulator and Test Drive Evaluation

Stefan Hank  
HEAD acoustics GmbH

### 10:00 QuietComfort Road Noise Control: Helping Carmakers Design Better Cars

Michael Wirtz  
Bose Automotive GmbH

### 10:30 Coffee Break & Snacks

### VEHICLE AND DRIVE TRAIN ACOUSTICS

Session Chair:  
Prof. Jan-Welm Biermann  
fka GmbH

### 11:00 Structure-borne Road Noise Target Allocation to Tire-Wheel Subsystem in Autonomous Vehicles

Daniel Baker  
Zoox, Inc.

### 11:30 The Sound of Silence – New challenges for BEV development

Christoph Steffens  
FEV Europe GmbH

### 12:00 Influence of the Manufacturing Scatter on the Excitation Behavior in Series Production of an E-Motive Cylindrical Gear Stage

Laurenz Roth  
Laboratory of Machine Tools and Production Engineering (WZL),  
RWTH Aachen University

### 12:30 Lunch



# PROGRAM

28<sup>TH</sup> NOVEMBER

## NUMERICAL METHODS AND MEASUREMENT TECHNOLOGY

Session Chair:  
Dr. Matthias Wegerhoff  
HEAD acoustics GmbH

**13:45** Numerical Frontloading of an Acoustical End of Line Test Station for a Rearview Camera System  
Dr. Sören Keuchel  
Novicos GmbH

**14:15** An Industrial Validation of Automated Modal Analysis using Machine Learning  
Markus Brandstetter  
Siemens Digital Industries Software

**14:45** Coffee Break

## ACOUSTICS OF ELECTRIC DRIVES

Session Chair:  
Dr. Christoph Steffens  
FEV Europe GmbH

**15:15** NVH improvement of e-motors through optimization of the control settings  
Tongfang Fu  
Chair of Thermodynamics of Mobile Energy Conversion Systems,  
RWTH Aachen University

**15:45** Investigation of the motor-freewheel's impact on the structural dynamics of an e-bike drive unit using flexible multi-body simulation  
Kevin Steinbach  
Bosch eBike Systems

**16:15** Coffee Break & Snacks

## ACOUSTIC MATERIALS

Session Chair:  
Dr. Gottfried Behler  
Institute for Hearing Technology and Acoustics (IHTA),  
RWTH Aachen University

**16:45** Acoustic Metamaterial: Space Saved Broadband Sound Absorption System by using Coupled Quarter-Wavelength and Membrane Resonator  
Shunji Suzuki  
Honda R&D Co., Ltd.

**17:15** Application Concepts and Potentials of Vibroacoustic Metamaterials for NVH Comfort  
Armin Weber  
Institute for Automotive Engineering (ika),  
RWTH Aachen University

**17:45** FE-Based Inverse Approach to Determine Complex Acoustic Material Parameters in Alpha Cabins  
Mark Müller-Giebeler  
Institute for Hearing Technology and Acoustics (IHTA),  
RWTH Aachen University

**19:30** Champagne Reception

**20:00** Opening by Prof. Stefan Pischinger  
The banquet will take place at the historical city hall of Aachen and is free of charge for attendees.  
The fee for accompanying persons is € 50.





# PROGRAM

29<sup>TH</sup> NOVEMBER

## SOUND QUALITY, TROUBLE-SHOOTING, SOUND DESIGN

Session Chair:  
Prof. Klaus Genuit  
HEAD acoustics GmbH

### 08:30 Influence of Tonality on the Annoyance of Tire Exterior Noise

Etienne Parizet  
Laboratoire Vibrations Acoustique, INSA-Lyon

### 09:00 Large Scale End-User Jury Test on Artificial Enriched Interior Driving Sounds of Electric Vehicles

Rob Opdam  
Bosch Engineering GmbH

### 09:30 Vehicle Interior Noise in the Light of Auditory Sensations

Prof. Jesko L. Verhey  
University Magdeburg

### 10:15 Coffee Break & Snacks

## EXTERIOR SOUND - THE BaLSaM PROJECT

Session Chair:  
Prof. Lutz Eckstein  
fka GmbH



### 10:45 Holistic Approach for Aurally Accurate Road Traffic Noise Reduction by Adaption of Traffic Routes and Infrastructure Planning

Carolin Schliephake  
Institute for Automotive Engineering (ika),  
RWTH Aachen University  
Chalotorn Möhlmann  
Institute for Hearing Technology and Acoustics (IHTA),  
RWTH Aachen University

### 11:15 Urban noise protection measures from the perspective of urban designers– case study of the “Gräselberg - Auf den Eichen” master plan

Moritz Lippold  
REICHER HAASE  
ASSOZIIERTE GmbH

### 11:45 Optimizing the Estimation of Vehicle Sound Radiation Characteristics by Combining Numerical Models and Microphone Array Measurements

Thiago Henrique  
Gomes Lobato  
HEAD acoustics GmbH

### 12:15 Lunch

# PROGRAM

29TH NOVEMBER

## ACTIVE SOUND DESIGN AND ACTIVE COMPONENTS II

Session Chair:  
Prof. Stefan Pischinger  
FEV Europe GmbH

## 13:45 An Audio Architecture for the Software-Defined Vehicles

Somasundaram Alagappan  
BlackBerry QNX

## 14:15 Dissecting Advanced Driving Sounds for EVs

Jasper de Kruiff  
Impulse Audio Lab

## 14:45 Low-Latency MIMO Loudspeaker-Room Compensation for Real-Time Driving Sound Enhancement in Electric Vehicles

Marius Lambacher  
Müller-BBM Active Sound Technology GmbH

## 15:15 Advancing Active Sound Design Systems for AVAS and Emotionalization: A Holistic Approach to Enhance Active Sound Design Systems

Lukas Lübbert  
University of Applied Sciences and Arts Dortmund

## 15:45 Final Remarks

Prof. Lutz Eckstein/  
Prof. Stefan Pischinger



## CONTACT

Aachen Acoustics Colloquium GbR

E-Mail: [info@aachen-acoustics-colloquium.com](mailto:info@aachen-acoustics-colloquium.com)

Internet: [www.aachen-acoustics-colloquium.com](http://www.aachen-acoustics-colloquium.com)

### General questions / Attendees

Sara Portz  
fka GmbH

Phone: +49 241 8861-205

E-Mail: [portz@aachen-acoustics-colloquium.com](mailto:portz@aachen-acoustics-colloquium.com)

### Exhibitors

Dr. Marco Günther  
tme, RWTH Aachen University

Phone: +49 241 80-48080

E-Mail: [guenther@aachen-acoustics-colloquium.com](mailto:guenther@aachen-acoustics-colloquium.com)

### Authors

Dr. Gottfried Behler  
IHTA, RWTH Aachen University

Phone: +49 241 80-97987

E-mail: [behler@aachen-acoustics-colloquium.com](mailto:behler@aachen-acoustics-colloquium.com)