

# INFORMATION

## » 12<sup>TH</sup> FKFS-CONFERENCE

Progress in Vehicle Aerodynamics and Thermal Management

The FKFS-Conference is an ideal location to get latest information about new car developments, new or improved testing techniques and new or improved simulation procedures. It is an ideal forum to meet leading experts from industry, universities and other institutions, to exchange ideas and discuss new ones. Furthermore, demonstrations will show the state-of-the-art in measurement technology applied live in FKFS Wind Tunnels and Laboratories.

## » DATE

1 October 2019 | 8:00 – 22:00

2 October 2019 | 9:00 – 16:15

## » LOCATION

Haus der Wirtschaft | Willi-Bleicher-Straße 19 | 70174 Stuttgart | Germany

## » ORGANIZED BY

FKFS – Research Institute of Automotive Engineering and Vehicle Engines Stuttgart

### Scientific Management:

Dr.-Ing. Timo Kuthada

Dr.-Ing. Jorg-Dieter Vagt

Prof. Dr.-Ing. Andreas Wagner

Prof. Dr.-Ing. Jochen Wiedemann

## » LECTURES

Bertha-Benz-Saal and Mannheim Room (1<sup>st</sup> floor)

## » TECHNICAL EXHIBITS

Suppliers of engineering services, measurement equipment and components present their latest developments in the Meidinger-Saal.

1 October 2019 | 8:00 – 16:15

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## » EVENT WEBSITE



[www.fkfs-veranstaltungen.de/fkfs-conference](http://www.fkfs-veranstaltungen.de/fkfs-conference)

## » REGISTRATION



[www.fkfs-conference.de/registration](http://www.fkfs-conference.de/registration)

## » REGISTRATION FEE

» Access to all lectures on both days

» Conference documentation

» Lunch, cold drinks and coffee at break times

» Access to the formal evening reception on 1 October 2019 (excluded Students)

### Participants

» Conference 1050 € + 19 % VAT

### Students

» Student 119 € incl. VAT

For students of the **University of Stuttgart** a limited number of free tickets are available. Please send a copy of your student card to [info@fkfs-conference.de](mailto:info@fkfs-conference.de).

**Sign up now:** [www.fkfs-conference.de/registration](http://www.fkfs-conference.de/registration)

## » REGISTRATION

The registration desk is located in the foyer of Meidinger-Saal on the 1<sup>st</sup> floor.

Opening times:

1 October 2019 | 8:00 – 15:30

2 October 2019 | 8:30 – 13:00

## » HOTEL

Stuttgart-Marketing GmbH | Rotenbühlplatz 25 | 70178 Stuttgart

Phone +49 711 2228-100 (Mon – Fri | 9:00 – 17:00)

Fax +49 711 2228-270, [hotels@stuttgart-tourist.de](mailto:hotels@stuttgart-tourist.de)

[www.stuttgart-tourist.de/fkfs2019](http://www.stuttgart-tourist.de/fkfs2019)

**Reservation-Code: FKFS**

## » CONTACT

General Question about the FKFS-Conference and the Exhibition:

### FKFS

Phone: +49 711 685 65601

[aerodynamics-conference@fkfs.de](mailto:aerodynamics-conference@fkfs.de)

Questions about Registration and Invoice:

### EMENDO Event + Congress

Tel.: +49 711 4605376-8

[info@fkfs-conference.de](mailto:info@fkfs-conference.de)

# WELCOME

The increase in regulations with respect to environmental and safety standards will increase the complexity of vehicles as well as the costs for their development. Furthermore, car buyers in all countries are looking for unique features. Thus, the number of derivatives of different vehicles based on a single platform raises and will increase even more in the future. Hence, differentiations of consumer-facing features will likely require more research and development.

Never before the automotive industry has experienced such a pressure triggered by today's demand for electrification. Manufacturers have to evaluate new practices and technologies since the vehicles are changing from mechanical devices to more electric and electronic ones. Comfort is only one aspect that is increasingly influenced by aerodynamics and thermal management. The demand for reduced wind noise and soiling, reduction of unsteady phenomena, cooling of mechanical as well as electric components and energy usage in general requires enhanced aero- and thermodynamics. To resolve this requirement, computational methods are complementing experimental testing in order to get shorter development times.

To give room for more presentations, for a first time the FKFS-Conference is divided into two parallel sessions: Aerodynamics/Aeroacoustics and Thermal Management.

Joining this conference gives the ideal opportunity to meet the speakers/experts from industry, universities or other institutions and to exchange ideas about latest topics.

A unique feature of the conference is provided by complementing demonstrations showing measurement technologies and testing procedures applied live in the FKFS Wind Tunnels and Laboratories.



Forschungsinstitut für Kraftfahrwesen und Fahrzeugmotoren Stuttgart

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Forschungsinstitut für  
Kraftfahrwesen und  
Fahrzeugmotoren  
Stuttgart

# 12<sup>TH</sup> FKFS CONFERENCE

PROGRESS IN **VEHICLE  
AERODYNAMICS AND  
THERMAL MANAGEMENT**

1 – 2  
**OCTOBER 2019**  
STUTT GART

As at: 12 September 2019

## PROGRAM TUESDAY, 1 OCTOBER 2019

### PLENARY SESSION | BERTHA-BENZ-SAAL

**9:00 Welcome**  
*Andreas Wagner, FKFS/IVK, Universität Stuttgart*

**9:15 KEYNOTE 1998-2019: Progress Made and Lessons Learned**  
*Jochen Wiedemann, FKFS*

9:50 Coffee Break

### UNSTEADY AND WHEEL AERODYNAMICS | BERTHA-BENZ-SAAL

**Chairperson:** *Alexander Wäschle, Daimler AG*

**10:15 Simulation of Unsteady Flow Effects in Car Aerodynamics**  
*Martin Maihöfer, Alexander Wäschle, Erich Jehle-Graf, Daimler AG*

**10:45 Characterization of the Transient Airflow Around a Vehicle on Public Highways**

*Christoph Jessing, IVK, Universität Stuttgart; Felix Wittmeier, Jochen Wiedemann, FKFS; Henning Wilhelmi, Andreas Dillmann, Deutsches Zentrum für Luft- und Raumfahrt (DLR)*

**11:15 Improved Methodology for Realistic Representation of Rotating Wheels in CFD Applications**

*Markus Gray, Hyundai Motor Europe Technical Center GmbH; Hak-Lim Kim, Euijae Lee, Myeongwoo Park, Hyundai Motor Company NamYang South*

11:45 Lunch

### WIND TUNNEL TECHNOLOGY | BERTHA-BENZ-SAAL

**Chairperson:** *Jochen Wiedemann, FKFS*

**13:00 New Wind Tunnel Center of CAERI in Chongqing**  
*Yong Wang, Zhu Xijia, CAERI; Stefan Becker, WBI – Wallner und Brand Ingenieurgesellschaft mbH*

**13:30 New Large Microphone-Array at FKFS Wind Tunnel**  
*Matthias Riegel, Reinhard Blumrich, FKFS; Nicholas Oettle, Harriet Vickers, Jaguar Land Rover Ltd.; Olivier Minck, MicrodB; Bart Verrecas, Siemens Industry Software NV*

**14:00 New Environmental Test Center at Ford**  
*Michael Steup, Ford-Werke GmbH*

14:30 Coffee Break

### COOLING AIR FLOW | BERTHA-BENZ-SAAL

**Chairperson:** *Timo Kuthada, FKFS*

**15:00 Unsteady Cooling Air Flow Measurements on the Racetrack and Conclusion for the Aerodynamic and Thermal Development of Sports Cars**  
*Tilman Moser, Gustavo Estrada, Mercedes-AMG GmbH*

**15:30 Introduction of an Idealized Pickup Truck and SUV Model**  
*Sudesh Woodiga, Kevin Howard, Paul Norman, Burkhard Hupertz, Karel Chalupa, Neil Lewington, Robert Carstairs, Ford Motor Company*

**16:00 Introduction to Demonstrations**  
*Timo Kuthada, FKFS*

16:20 Transfer to FKFS

### THERMAL MANAGEMENT OF ELECTRIC VEHICLES | MANNHEIM ROOM

**Chairperson:** *Heike Schönerstedt, Daimler AG*

**Life-Time Thermal Analysis of Electronic Components in Passenger Cars**  
*Adrian Bernhard, Jochen Wiedemann, FKFS; Heinrich Reister, Thomas Binner, Daimler AG; Nils Widdecke, IVK, Universität Stuttgart*

**UNICARagil: Challenges in Thermal Management for Autonomous Vehicle Concepts**

*Daniel Gehringer, Dan Keilhoff, IVK, Universität Stuttgart; Timo Kuthada, Jochen Wiedemann, FKFS*

**Thermal Analysis of the Rotor Design in Permanent Magnet Synchronous Machines**

*Moritz Künzler, Robert Lehmann, Daimler AG; Uwe Schäfer, Technische Universität Berlin*

### BRAKE COOLING | MANNHEIM ROOM

**Chairperson:** *Andreas Wagner, FKFS/IVK, Universität Stuttgart*

**A CFD Method to Simulate Brake Liquid and Disc Temperature Monolithically**  
*Saim Yigit, Marcel Streitenberger, Karl-Michael Hahn, Samuel David Lago Places, Charles Ribes, Janko Wuchatsch, Frank Werner, Opel Automobile GmbH*

**Simulation of Brake System Cooling for Real World Track Driving**

*Edward Tate, Young-Chang Cho, DS Simulia*

**Replicating Brake Cooling Tests by Using Coupled CAE Simulations**

*Alexey Vdovin, Chalmers University; Gaël Le Gigan, Volvo Car Corporation*

### DEMONSTRATIONS | FKFS

**17:00 Demonstrations**

» Full Scale Aeroacoustic Wind Tunnel: Aeroacoustic Testing by means of a large Microphone Array System

» Model Scale Wind Tunnel: Quantitative Flow Visualization with Streamwise ProCap

» Thermal Wind Tunnel: Transient Cooling Air Flow Measurements

» Handling Roadway System: The New Driving Dynamics Test Bench @IVK/FKFS

» Anechoic Chamber: Nearfield Sound Source Localization for low Frequencies

» Formula Student Team University of Stuttgart: Aerodynamics

The **Demonstrations** and the Evening Event are located at FKFS, Pfaffenwaldring 12, 70569 Stuttgart. A bus transfer is available.

**19:00 BUFFETT DINNER / ECARA AWARD CEREMONY**

22:00 End

## PROGRAM WEDNESDAY, 2 OCTOBER 2019

### PLENARY SESSION | BERTHA-BENZ-SAAL

**9:00 Warm-up**  
*Jochen Wiedemann, FKFS*

**9:10 KEYNOTE Current and Future Challenges in Thermal Management of Electric Vehicles**

*Dirk Neumeister, MAHLE International GmbH*

9:40 Coffee Break

### AEROACOUSTICS | BERTHA-BENZ-SAAL

**Chairperson:** *Teddy Woll, Daimler AG*

**10:00 Computational AeroAcoustics at Mercedes-Benz**  
*Alexander Schell, Rebecca Busch, Christopher Edelmann, Mark Eiselt, Martin Maihöfer, Hironori Tokuno, Daimler AG*

**10:30 Beamforming and Deformation Measurements in the Porsche Wind Tunnel**

*Jörg Ocker, Dr. Ing. h.c. F. Porsche AG*

**11:00 Automotive Aeroacoustic Sound Quality**  
*Ben West, Bentley Motors Limited; Paul Kendrick, University of Salford*

11:30 Lunch

### AERODYNAMICS OF NEW VEHICLES | BERTHA-BENZ-SAAL

**Chairperson:** *Atsushi Ogawa, Honda R&D Co.*

**13:00 The New Audi e-tron**  
*Jan Czarnota, Gerhard Wickern, Christopher Collin, AUDI AG*

**13:30 Analysis of the flow topology and loss mechanisms in the wheelhouse area**  
*Jelena Hurlbrink, Volkswagen AG*

**14:00 Life is a Race: The Mercedes-AMG GT 4-Door Coupe with intelligent Aerodynamics**  
*Gustavo Estrada, Mercedes-AMG GmbH*

14:30 Coffee Break

### AERODYNAMICS AND THERMAL MANAGEMENT OF THE NEW PORSCHE TAYCAN | BERTHA-BENZ-SAAL

**Chairperson:** *Ralf Hässler, Dr. Ing. h.c. F. Porsche AG*

**15:00 Aerodynamics electrified, Porsche Taycan Turbo**  
*Michael Hinterbuchinger, Dr. Ing. h.c. F. Porsche AG*

**15:30 The Thermal Management of the new Porsche Taycan – Key to Performance, Efficiency and Everyday Usability**  
*Marcel Dannowski, Fabian Zeyher, Dr. Ing. h.c. F. Porsche AG*

**16:00 Farewell**  
*Andreas Wagner, FKFS/IVK, Universität Stuttgart*

### UNDERHOOD THERMAL MANAGEMENT | MANNHEIM ROOM

**Chairperson:** *Burkhard Hupertz, Ford GmbH*

**Aspects of Fan Modeling for Underhood Thermal Management CFD**  
*Michael Kornhaas, Klaus Räddecke, Ingo Futterer, Frank Werner, Groupe PSA: Opel Vauxhall; Charles Ribes, Olivier Ferney, Groupe PSA: Peugeot Citroen DS*

**Development of Fan Model for Underhood Thermal Management with High Accuracy and Low Calculation Power**

*Kunihiko Yoshitake, Yuichi Fukuchi, Kazutaka Yokota, Honda R&D Co.*

**Development of Simplified Condenser Model Considering the Effect of Phase Change**

*Yuichi Fukuchi, Kunihiko Yoshitake, Kazutaka Yokota, Honda R&D Co.*

### THERMAL MANAGEMENT ON BEV/PHEV | MANNHEIM ROOM

**Chairperson:** *Dirk Neumeister, MAHLE International GmbH*

**Advanced Interdisciplinary Thermal Development Process for EVs at Magna Steyr**

*Inés Cuenca Jaén, Klaus Kovac, Michael Kalunder, Eckhart Seelenbacher, Magna Steyr Fahrzeugtechnik AG & Co. AG*

**Innovative Aerodynamic and Thermal Safety Developments of the i8 Roadster**

*A. Stefan Eibl, Angelina Heft, Reiner Tost, Thomas Schütz, BMW Group*

**Aerothermal Investigations for the Development of a Fully Electric City Truck**

*Sebastian Saegeler, Zijia Bai, Antoine Devesa, Marius Hellmold, MAN Truck & Bus AG*