

# 7. mobileM Online Colloquium

October 27 - 28, 2020

Online Colloquium



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The challenge to drastically reduce worldwide greenhouse gas emissions despite growing energy demand requires decisive changes in energy supply, conversion and storage technologies. For the transport sector the electrification of the drivetrain combined with increasing electrical power generation from renewable sources is a promising approach to decrease the dependency on shortening crude oil and gas resources.

### 7. mobileM Online Colloquium

The 7. mobileM Colloquium takes place online this year. It is a discussion panel for young researchers and professionals covering the areas of electric energy storage, electric drive systems, system simulation and control, topology and thermal management as well as range extender modules.

### Research Training Group mobileM

mobileM (Integrated Energy Supply Modules for Roadbound E-Mobility) is a Research Training Group of RWTH Aachen University funded by Deutsche Forschungsgemeinschaft (DFG). It explores the physical foundations of electric propulsion, electro-chemical energy storage for mobile propulsion and its combination with novel fuel and fuel cell operated range extender units.



## Presentation Program

Tuesday, October 27, 2020

### Welcome and Opening

**10:30** Opening Address  
Prof. Stefan Pischinger, VKA of RWTH Aachen University

### Simulation & Control

Session Chair: Prof. Dirk Abel, irt of RWTH Aachen University

**10:45** Cyber-Physical Mobility Lab – An Open Source Platform for Networked and Autonomous Vehicles  
Dr. Bassam Alrifaae, Embedded Software of RWTH Aachen University

**11:15** Towards an Efficient and Degradation-conscious Control Strategy in Fuel Cell Hybrid Vehicles  
Thuc Anh Nguyen, irt of RWTH Aachen University

**11:45** UNICARagil - Disruptive Modular Architecture for Agile, Automated Vehicle Concepts  
Prof. Lutz Eckstein, ika of RWTH Aachen University

**12:15** UNICARagil Dynamics Module  
Timm Martens, ika of RWTH Aachen University

**12:45** Lunch Break

### Poster Session

Session Chair: Prof. Rik W. De Doncker, ISEA-LEA of RWTH Aachen University

**13:15** Poster Presentations

**14:15** Poster Session

## Electric Drive System

Design of Coupled Inductor for Two-Phase Synchronous Boost Converters in Automotive Applications

Georg Götz, ISEA of RWTH Aachen University

Measurement Considerations for Applications with Wide-Bandgap Power Semiconductors

Vivien Grau, ISEA of RWTH Aachen University

The ISEA Double Pulse Test Bench – Switching Loss Characterization of Wide Bandgap Semiconductor Devices

Severin Klever, ISEA of RWTH Aachen University

Fast Short-Circuit Detection for SiC-MOSFETs

Michael Laumen, ISEA of RWTH Aachen University

Highly Integrated Switching Cell Design based on Copper Diamond Heat Spreader, 3D Printed Heat Sink and HTCC Logic Board

Alexander Sewergin, ISEA of RWTH Aachen University

Enhancing Lifetime of Power Electronic Modules via Thermal Buffers

Alexander Stippich, ISEA of RWTH Aachen University

Control Methods of Switched Reluctance Machines - Hysteresis Current Control vs. Direct Instantaneous Torque Control

Anne von Hoegen, ISEA of RWTH Aachen University

Modeling and Simulation of Drive Train Acoustics

Markus Jaeger, IEM of RWTH Aachen University

Preliminary Investigations on Designing High-Speed Electrical Machines for Fuel Cell Compressors

Maximilian Lauerburg, IEM of RWTH Aachen University

Investigation of the Influence of Electrical-Sheet Welding Process on the Powertrain Loss Development of Traction Drives

David Ukwungwu, IEM of RWTH Aachen University

## Electric Energy Storage

Calendaric Aging of 18650 Lithium-Ion Cells with Si/C Anode

Fabian Frie, ISEA of RWTH Aachen University

In situ TEM Analyses of Materials for Lithium-Ion Batteries

Simon Jakobi, IAC of RWTH Aachen University

Pressure and Mechanical Degradation in Lithium-Ion Batteries

Ilhame Kihal, ISEA of RWTH Aachen University

Prelithiation of Silicon/Graphene Composite Based Anodes for Advanced Lithium-Sulfur Batteries by Stabilized Lithium Metal Powder (SLMP®)

Thomas Meyer, LET of Universität Duisburg-Essen

## Range Extender

An Adaptive PMP Based Model Predictive Energy Management for Fuel Cell Hybrid Train

Kai Deng, IEM of RWTH Aachen University

Towards the CFD Analysis of Free Piston Engines

Aranya Dan, ITV of RWTH Aachen University

Accurate Flame Speed Modeling to Improve Burn Rate Prediction of SI-Engines for Current and Future Fuels

Raik Hesse, ITV of RWTH Aachen University

Multiphysics Modelling and Simulation of an Ammonia-Cracker

Florian Nigbur, LET of Universität Duisburg-Essen

Methods to Ensure Real-time Capability in Numerical Fuel Cell Simulations

Daniel Raff, LET of Universität Duisburg-Essen

FEM-based Investigation of the Mechanical Degradation of LT-PEM Fuel Cell Membranes

Markus Kohn, VKA of RWTH Aachen University

Study of Liquid Water Distribution and Movement within Fuel Cells

Yingxu Liu, VKA of RWTH Aachen University

Water Management in Fuel Cell Systems

Sören Tinz, VKA of RWTH Aachen University

## Thermal Management

Thermal Comfort Library for Automotive Application

Damian Backes, ika of RWTH Aachen University

A User-Centered Approach to Automotive Air Conditioning

Thomas Hirn, ika of RWTH Aachen University

Thermal Management Design for Electric Drivetrain Components

Christoph Massonet, ika of RWTH Aachen University

Simulation of Light Scattering at Moving Droplets for the Development of a Novel Phase Doppler Profile Sensor

Martin Niehoff, WSA of RWTH Aachen University

Influence of Shear Rates on the Effective Heat Transfer of Nanofluids in View of the Particle Rotation

Qiya Shu, WSA of RWTH Aachen University

## Control & System Simulation

Virtual Coupling of Test Benches – Simulation of Physical Components within a Distributed Network of Embedded Systems

Timm Fahrbach, VKA of RWTH Aachen University

Model-Based Predictive Control of Fuel-Cell-Battery-Systems on Multiple Time-Scales

Verena Neisen, irt of RWTH Aachen University

Robust Parametrization of a Model Predictive Controller Using Bayesian Optimization

David Stenger, irt of RWTH Aachen University

## Presentation Program

Tuesday, October 27, 2020

### Topology & Thermal Management

Session Chair: Prof. Reinhold Kneer, WSA of RWTH Aachen University

- 15:30** Optimization of Operating Strategies in Thermal Management of Electric Vehicles  
Prof. Stefan Pischinger, VKA of RWTH Aachen University
- 16:00** Physically-motivated Figure of Merit (FOM) Assessing the Cooling Performance of Fluids Suitable for the Direct Cooling of Electrical Components  
Claas Ehrenpreis, WSA of RWTH Aachen University
- 16:30** The Porsche Taycan – New Ways of Thermal Management for the Electromobility of Tomorrow  
Marcel Dannowski & Fabian Zeyher, Dr. Ing. h.c. F. Porsche AG
- 17:00** Connected Energy and Thermal Management in Battery Electric Vehicles  
Patrick Manns, VKA of RWTH Aachen University

## Presentation Program

Wednesday, October 28, 2020

### Electric Drive System

Session Chair: Prof. Lutz Eckstein, ika of RWTH Aachen University

- 08:30** Flexible Electric Motor Series for Mobile Applications  
Bernhard Burkhart, Engiro GmbH
- 09:00** Holistic Assessment of Electric Machine Technologies in Automotive Applications  
Jonas Hensen, ika of RWTH Aachen University
- 09:30** Manufacturing Tolerances and their Impacts on Electrical Machines  
Prof. Kay Hameyer, IEM of RWTH Aachen University
- 10:00** A High Bandwidth Active SiC Gate Driver for Dynamic Adjustment of Electromagnetic Emissions in Electric Vehicles  
Jochen Henn, ISEA-LEA of RWTH Aachen University
- 10:30** Coffee Break

### Electric Energy Storage

Session Chair: Prof. Ulrich Simon, IAC of RWTH Aachen University

- 11:00** Modern Battery Management System in Electrified Vehicles  
Dr. Wladislaw Waag, BMW Group
- 11:30** Towards an OK K-O<sub>2</sub> Battery  
Jannis Küpper, IAC of RWTH Aachen University



# Presentation Program

Wednesday, October 28, 2020



- 12:00 Systematic Analysis of the Potential of Different Cell and Material Concepts for Higher Gravimetric Energy Densities  
Prof. Dirk Uwe Sauer, ISEA-ESS of RWTH Aachen University
- 12:30 System Identification using Multisine Excitation Signals and Undersampling  
Alexander Blömeke, ISEA-EES of RWTH Aachen University
- 13:00 Lunch Break

## Range Extender

Session Chair: Prof. Heinz Pitsch, ITV of RWTH Aachen University

- 13:45 Aquarius Linear Engine – Development of a Simple and Lightweight Engine Concept for Generator Application  
Henning Hoff, AVL Schrick GmbH
- 14:15 Improved Mass Transfer Models of Diffusion Media for PEM Fuel Cells  
Stephan Martin, LET of Universität Duisburg-Essen
- 14:45 Fuel Cell Stacks: Increasing Numbers Require Production-oriented Design  
Prof. Angelika Heinzl, LET of Universität Duisburg-Essen
- 15:15 Investigation of the Early Flame Kernel Development in Spark-ignition Engines  
Hongchao Chu, ITV of RWTH Aachen University
- 15:45 Concluding Remarks  
Prof. Stefan Pischinger, VKA of RWTH Aachen University