Power Electronics and Electrical Drives | RWTH AACHEN UNIVERSITY

PhD presentations at ISEA

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Friday, August 20, 2021
09:00 a.m. [Time zone Berlin]
Florian Ringbeck, M. Sc.
“Optimized Charging of Lithium-Ion Batteries with Physico-Chemical Models“

Wednesday, August 25, 2021
2:00 p.m. [Time zone Berlin]
Philipp Joebges, M. Sc.
“Distributed Real-Time Simulation of Modular Bidirectional DC-DC Converters for Control-Hardware-in-the-Loop“

Abstracts

Florian Ringbeck

“Optimized Charging of Lithium-Ion Batteries with Physico-Chemical Models“

For the usability of lithium-ion batteries in many applications, their fast charging capability plays an important role. However, a too high charging current can permanently damage the battery and pose a safety risk. Therefore, charging patterns with an optimal current are required for many applications and require continuous monitoring and analysis of the battery’s internal condition. Physico-chemical battery models allow deep insights into lithium-ion batteries’ internal states and processes. However, due to the complexity of such models, the numerous model parameters, and the high computing demand, they are typically not used today in onboard applications. The task of this thesis is to overcome these problems. It includes modelling work, parameter estimation from lab experiments, control algorithms for advanced charging schemes, experimental validation and clear dedication towards a solution that can be implemented in onboard management systems.

Philipp Joebges

“Distributed Real-Time Simulation of Modular Bidirectional DC-DC Converters for Control-Hardware-in-the-Loop”

Modern power-electronic converters provide a key technology for the sustainable integration of generators, consumers, and storage systems, as well as for the intelligent distribution of electrical energy. Such converters must operate reliably under all conditions within the entire system.
The requirements that are imposed on these converters can be ensured using control-hardware-in-the-loop (CHiL) as a methodology, enabled by real-time simulation models and high-performance simulation hardware.
In this thesis, a distributed real-time-capable modeling method is developed by the example of modular high-power dc-dc converters. A distributed CHiL setup is used to validate the proposed control of a modular dc-dc converter.
Finally, the results of the real-time modeling and the performance of the developed control are discussed based on measurement results of two high-power converter setups.