



## PE:Region Newsletter - June 2017

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### Upcoming Events 2017



Danish-German PE:Region seminar:

28 June 2017, 12.00 - 15.30

Fachhochschule Kiel

**Application of new materials in power electronics, and demonstrator development for intelligent grid integration, high speed drives, and battery charging**

[For further information and registration](#)

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Presentation by [Prof. Robert D. Lorenz](#)

23 June 2017 - 13.00

CAU - Kaiserstr. 2, Kiel - "The Aquarium"

**Disruptive Paradigm Changes for Electrical Machines and Electrical Drives**

**Abstract**

Electric machine design paradigms have been dramatically changed by the need to meet demands for minimizing losses and smooth torque control during driving cycles with widely vary loads and speeds. Simultaneously, new drive control paradigms systematically out-perform industry standard field oriented control (FOC) and simultaneously solve several classical problems with FOC. In addition, the internet of things is opening expansive opportunities for motor drives. This presentation with focus on these disruptive changes in the paradigms for electric machines and electrical drives explores the opportunities for innovation that these technologies provide.

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## Staff News



**Konstantin Kostov**

As of 1 June, Konstantin Kostov has been employed as an Associate Professor at MCI, SDU Electrical Engineering, joining the PE-Region project. He received his MSc, Lic.Sc., and D.Sc. (Tech.) degrees in electrical engineering from Helsinki University of Technology (HUT), Finland, in 2003, 2006, and 2009, respectively.

Konstantin's main activity in the PE-Region project will be in the fields of fast motor drive technology. He has an extensive experience in SiC and GaN technology. His research interests include design, modelling, and control of power electronic converters, EMC in power electronics, and the packaging of high-power semiconductor devices. He comes from a position as a Senior Scientist at Acreo Swedish ICT, in Kista, Sweden.



**Vadzim Adashkevich**

Recently, Vadzim Adashkevich has been employed as an Engineer at MCI, SDU Electrical Engineering, joining the PE:Region project. His primary objective will be failure analysis of wide-bandgap semiconductor devices using the Zeiss Orion Helium Ion Microscope of MCI.

In 2010, Vadzim obtained a MSc in Automation Engineering with a major in Automation of Technological Processes and Production at Belarusian State Technological University, Minsk, Belarus.

Vadzim's working career started with a position as an electronic engineer, providing the full lifetime circle support for Draeger and Radiometer medical equipment. Subsequently, he was employed as a Software Quality Assurance Engineer, performing testing of web-/server-based applications and project management.

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## Demonstrator Status

### Energy efficient, reliable, and compact high-speed drive

High-speed electrical machines are used for example in blowers, compressors, separators, ect. Due to the high speed, it is possible to save the expenses and maintenance of a gearbox. This way the drivetrain can be designed more compact while having less noise emission.



*Fig. 1: Demonstrator #2 Laboratory setup at the Chair of Power Electronics, CAU Kiel*

For the demonstrator, two different three-level topologies, NPC and T-Type, were developed and tested

with different state-of-the-art control schemes. The behavior of a high-speed machine was emulated under consideration of the dynamic performance and the stability boundaries. Parameters mismatch occurs due to converter non-linearities, deadtimes, and saturation, hence, providing robust control is a key challenge. Three different control schemes are analyzed. The Discrete-Time PI Current Controller is providing good robustness, while the dynamic performance may not be sufficient for some applications. Second, the Deadbeat Control offers very fast dynamic performance, but is weak under parameter mismatch. The novel application of the Dahlin controller for high-speed machines offers a trade-off between performance and stability.

The laboratory is equipped with a 22kW Siemens PMSM, connected to a DC load machine. The switching frequency and deadtime are equivalent to higher power drives and used to emulate the medium power high-speed machine. A DSpace MicroLabBox is used to control the system.

Parts of this work will be presented at the upcoming [ELECTRIMACS 2017](#) in Toulouse, France.

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## Conference Participation



### [IEEE CPE-POWERENG2017](#)

April 2017, Cadiz, Spain

Kasper Paasch presented a paper entitled "Hybrid Magnetics", authored by Wai Keung Mo and Kasper Paasch. The paper is a result of the joint activities between the PE-Region project and the PET-PhD project.

### [IEEE 26th International Symposium on Industrial Electronics \(ISIE\)](#)

June 2017, Edinburgh, Scotland

Wai Keung Mo presented a paper entitled "Hybrid Magnetic Design", authored by Wai Keung Mo and Kasper Paasch.

### [European Power Electronics Conference \(EPE\)](#)

September 2017, Warsaw, Poland

Two papers are in preparation.

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