APETT Symposium 2018

Advanced Power Electronics Technologies and Tools

Thursday, October 4, 2018

Aalborg Congress and Culture Center

Hall West and Hall East

Europa Plads 4, 9000 Aalborg, Denmark

PROGRAMME FOR THE SYMPOSIUM

13:30 – 13:40	**Welcome and a short introduction to APETT – Prof. Frede Blaabjerg, Aalborg University, Denmark**
13:40 – 14:00	**Emerging technologies in Power Electronics to reach lower volume, Prof. Morten Nymann, Southern Denmark University, Denmark and Prof. Stig Munk-Nielsen, Aalborg University, Denmark**
14:00 – 14:20	**How to accelerate accelerated test by physics of failure, Prof. Francesco Iannuzzo and Senior Engineer Søren Jørgensen, Grundfos A/S, Denmark**
14:20 – 14:40	**DFR2-tool – the next generation of design for reliability tool, Prof. Huai Wang, Aalborg University**
14:40 – 14.50	**Next generation of adjustable speed drives, Andreas Aupke, Danfoss Drives A/S, Denmark**
14.50 – 15.00	**TBD**
15:00 – 15:30	**Long distance IGBT monitoring, Bjørn Rannestad, KK Wind Solutions A/S**
15:30 - 17:30	**Poster session with different activities in APETT**
17:30	**End of day**

Registration no later than October 1: click *here*

We look forward to seeing you in Aalborg,

Frede Blaabjerg
fbl@et.aau.dk

ABOUT APETT

http://www.apett.et.aau.dk

APETT - Advanced Power Electronic Technology and Tools

An Innovation Fund Denmark project

Energy efficient systems and solutions require more use of power electronics in which Danish industries and universities have a stronghold. However, the technologies and competencies built up during the last three decades are challenged from two aspects. Firstly, new fast switching technologies, which promise radical size, efficiency and performance improvements, but require new competencies, designs, test methods and workflows. Secondly, more stringent reliability requirements to reduce the Cost-of-Energy demand new tools for designing reliability and robustness into power electronic products in the early development phase under constrained cost and time.

Thirdly Existing solutions based on current technologies and tools are copied rapidly. To maintain our stronghold, we need simulation driven development methods and reliability-oriented tools to master the complexity of the new technologies, exploit the promised improvement opportunities and reduce time to market. Cooperation between universities and companies is vital both to acquire and develop the new technologies and to develop new adequate workflows, utilizing the benefits of a "digital twin" of the physical product as described in "Industry 4.0". Ability to sense physical world key states from field use and transmitting them to "digital twin" enabling real time scenario scoping of lower level performance conditions: energy utilization, power density and stress levels. This enables higher-level decisions: failure predictions and health diagnoses, influencing product service programs and design phase. Value creation through converting vast data streams by smart algorithms into intuitive human friendly decision tools, secondly a design platform based on actual product field performance enabling more cost efficient designs.

The majority of the products and solutions in scope of this project are applied into critical infrastructure and in a huge variety of industrial and commercial applications globally, they target attractive markets and it is hence crucial that we maintain the competitive edge during the technology transition.

The project aims to prepare for a paradigm shift in power electronics that will boost the spread of smart electrical energy systems and secure competitiveness and growth of the power electronics industry in the next decade.

New competences and work methods shall further significantly improve reliability-oriented design and testing, prototyping/development time of power electronics products for energy systems. The outcomes will advance the power electronics technologies and new multi-disciplinary design tool development to overcome the abovementioned three aspects of great challenges. It has the three specific goals below:

- *A factor of 3 volume and weight improvement of kW converters used in variable speed drives and power supplies*
- *Reduce the power electronics products reliability testing time by 20%, and the maintenance cost and return rates by 50%.*
- *Develop a Design for Reliability and Robustness Tool (DfR2 Tool) platform for industry product design or field operation lifetime extension; contribute to the reduction of LCoE of renewables and LCC of energy utilizations.*

The collaborators are Aalborg University, South Denmark University, Grundfos, Danfoss, Vestas Wind Systems, Danfysik, Horsodan, KK Wind Solutions and CityU from Hong Kong

POSTER SESSION

M.Sc. student Steffen Buhrkal-Donau	*Comparative study of wire bond degradation under power and mechanical accelerated tests*
Ph.D. student He Du	*Investigation on 1.0 kV/22 A SiC MOSFETs under Repetitive Short-Circuit Tests*
Ph.D. student Keting Hu	*Reliable Operation of IGBT Power Electronic Converters: Prediction or Failure Tolerance – What to Choose*
Ph.D. student Yingzhou Peng	*A Condition Monitoring Method for Three Phase Inverter Based on System-Level Signals*
Ph.D. student Saeed Peyghami	*Effect of Mission Profile on the Reliability of Power Electronic based Power Systems*
Ph.D. student Zhan Shen	*Design and Reliability of Magnetic Components of Power Electronic Converters*
Ph.D. student Zhijian Yin	*Thermal characterization of a capacitor bank*
Ph.D. student Haoran Wang	*A Lumped Thermal Model for Capacitor Banks*
Ph.D. student Zhongxu Wang	*Thermal model characterization of multi-chip modules*
Ph.D. student Yi Zhang	*Simplified Thermal Modeling for IGBT Modules with Periodic Power Loss Profiles in Modular Multilevel Converters*