

FGLA Colloquium

“Failure Mechanisms and Reliability of Electrical Drive Trains – Power Electronics, Batteries, Drives”

23 September, 2020

via ZOOM [registration: <mailto:veranstaltungen@isea.rwth-aachen.de>]

Program

- 10:00 – 11:00 a.m. **Frede Blaabjerg**
Design for reliability in Power Electronic Systems
- 11:00 – 12:00 a.m. **Egbert Figgemeier**
*Current Status of Life Time Expectations and Next Generation
Lithium Ion Batteries*

Abstracts & Bio

Frede Blaabjerg

Design for reliability in Power Electronic Systems

In recent years, the automotive and aerospace industries have brought stringent reliability constraints on power electronic converters because of safety requirements. Today customers of many power electronic products expect up to 20 years of lifetime – in some areas even 30 years - and they also want to have a “failure free period” and all with focus on the financials. The renewable energy sectors are also following the same trend, and more and more efforts are being devoted to improving power electronic converters to account for reliability with cost-effective and sustainable solutions. This presentation will introduce the recent progress in the reliability aspect study of power electronic converters for power electronic applications. It will cover some of the following contents: the motivations for highly reliable electrical energy; the reliability requirements of typical systems and its implication on the power electronic converters; failure mechanisms and lifetime models of key power electronic components (e.g., power semiconductor switches, capacitors, and fans); long-term mission profiles in the applications and component level stress analysis; reliability analysis methods, tools, and improvement strategies of power electronic converters in their application.

Frede Blaabjerg was with ABB-Scandia, Randers, Denmark, from 1987 to 1988. From 1988 to 1992, he got the PhD degree in Electrical Engineering at Aalborg University in 1995. He became an Assistant Professor in 1992, an Associate Professor in 1996, and a Full Professor of power electronics and drives in 1998. From 2017 he became a Villum Investigator. He is honoris causa at University Politehnica Timisoara (UPT), Romania and Tallinn Technical University (TTU) in Estonia.

His current research interests include power electronics and its applications such as in wind turbines, PV systems, reliability, harmonics and adjustable speed drives. He has published more than 600 journal papers in the fields of power electronics and its applications. He is the co-author of four monographs and editor of ten books in power electronics and its applications and has received numerous awards. In 2019-2020 he serves a President of IEEE Power Electronics Society. He is Vice-President of the Danish Academy of Technical Sciences too.

Egbert Figgemeier

Current Status of Life Time Expectations and Next Generation Lithium Ion Batteries

Lithium ion batteries appear to be a key enabling technology for the electrification of traffic and has made rapid progress since its introduction in end user applications. Starting with lifetime expectations for consumer electronics products of about 3 years and less than 1000 charge/discharge cycles, much improvement has been realized for making it a valid technology for cars with a required lifetime of more than 10 years and several thousand charge/discharge cycles. The presentation will give an overview of the current status of lithium ion technology with a focus on lifetime and degradation mechanisms. Moreover, the perspectives and recent scientific advancements will be summarized.

Prof Figgemeier studied chemistry and did his PhD at the University of Paderborn. This was followed by academic research at the Universities of Dublin, Basel and Uppsala. In 2007 he joined Bayer Technology Services heading the materials and corrosion lab as well as the development of materials for battery applications. From 2012 on, he worked as application development engineer for battery materials at 3M Deutschland responsible for technical support of customers in Germany and Europe. Since 2016 he is group leader at the Helmholtz Institute Münster (section Aachen) and he holds the chair for "Ageing and Reliability of Batteries" at the RWTH Aachen University.