PhD - Public Defence

Title: Multiphysics Modeling and Reliability of Magnetic Components for Power Electronic Applications

Location: Pontoppidanstræde 101, room 1.001

Time: Friday April 17th at 13.00

PhD defendant: Zhan Shen

Supervisor: Professor Huai Wang

Moderator: Associate Professor Pooya Davari

Opponents: Associate Professor Sanjay Kumar Chaudhary, Dept. of Energy Technology, Aalborg University (Chairman)
Professor William Gerard Hurley, National University of Ireland, Ireland
Associate Professor Qiang Li, Virginia Polytechnic Institute and State University, United States

The defence will be in English - all are welcome
Abstract:

In emerging and future applications, power electronic magnetics may need to be designed to their electro-thermal limits to reduce the size and cost. To do it confidently, more precise models are necessary. The degradation of magnetic components is also a concern that could alter the operation points of the power electronic converters. In recent decades, there is a lot of research on modeling. However, how to model power electronic magnetic components precisely considering reliability is still an open question.

To address this issue, this project proposes a number of models urgently demanded in the multiphysics field, and explores the degradation and reliability of power electronics magnetic components. The impedance and power loss modeling are firstly studied in both electric and magnetic fields. Then the thermal modeling is investigated. Finally, a thermal Accelerated Lifetime Testing (ALT) of planar transformers is performed. The degradation mechanism is analyzed, and the lifetime model of planar transformers is proposed at the first time to the best knowledge.