

Organisational Information

Sign up at: www.ecpe.org/events

Registration Deadline:

2 February 2023

Participation Fee:

- € 670,- * for industry
- € 520,- * for universities/institutes
- € 180,- * for students/PhD student
(limited spaces; copy of students ID required)
- * plus VAT

- The participation fee includes dinner, lunches, coffee/soft drinks and digital proceedings. The reduced (PhD) students fee includes all except for dinner (can be booked for an extra fee of € 50,-*).
- Digital proceedings will be provided by download link latest one day before start of the event. A printed handout is available on request (€ 50,-*).
- Upon receipt of registration confirmation via email you are signed-up for the event. The invoice will be sent via email.
- 25 % discount for participants from ECPE member companies.
- 10% discount on university/institute fee for participants from ECPE competence centres.
- Further information (hotel list and maps) will be provided after registration and can be found on the ECPE web page.
- Cancellation policy: Full amount will be refunded in case of cancellation upon to 2 weeks prior to the event. After this date 50 % of the fee is non-refundable (replacement is possible).

24/01/23

Organisational Information

Organiser	ECPE e.V. 90443 Nuremberg, Germany www.ecpe.org
Technical Chair	Prof. Dr. Ger Hurley, University of Galway (IRE) Prof. Dr. Ziwei Ouyang, Technical University of Denmark (DK)
Technical Contact	Dr. Chris Gould, ECPE e.V. +49 911 81 02 88 – 21 chris.gould@ecpe.org
Organisation	Ingrid Bollens, ECPE e.V. +49 911 81 02 88 – 10 Ingrid.bollens@ecpe.org
Venue	SuperGrid Institute 23 rue Cyprian 69100 Villeurbanne (Lyon) France



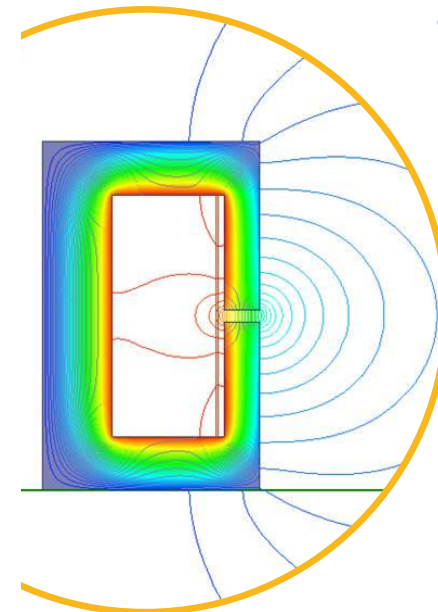
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Source graph front page: Ger Hurley, University of Galway



ECPE Tutorial

Passives in Power Electronics: Magnetic Component Design and Simulation

9 - 10 February 2023
Villeurbanne/Lyon
France



Passives in Power Electronics: Magnetic Component Design and Simulation

9 - 10 February 2023
Villeurbanne/Lyon, France

Today, high efficiency and high power density converters are fundamental to the continued profitable growth of the telecommunications, automotive, aerospace and data processing industries. High-frequency operation can lead to a reduction in magnetics size and an increase in power density. The tutorial begins with the fundamentals of magnetic component design for inductors and transformers. Inductor design methodology includes multiple coil inductors such as the flyback converter. This is followed by transformer design, optimized for core and winding loss by proper selection of the maximum operating flux density based on the core loss properties. The winding is further optimized for high frequency loss with non-sinusoidal currents. Fringing, interleaving and litz wire are also covered. Practical designs include forward, push-pull and LLC resonant converters.

The 2nd day of the tutorial starts with the discussion of planar magnetics. Planar magnetics fabrication processes have several advantages over conventional magnetics: low profile, automated assembly and predictable parasitics amongst other. They also lend themselves to integrated magnetic solutions. Planar magnetic components are particularly suited to wireless power transfer because of their low profile. A simulation approach and the numeric models will be presented in order to allow an easy application of the tutorial contents to power magnetic component designs.

A sound understanding of different material properties is crucial for a proper choice of magnetic cores. The tutorial concludes with an in-depth overview and classification of industrially available permeable materials with a focus on high frequency applications.

The Tutorial is chaired by:

Prof. Dr. Ger Hurley, University of Galway (IRE)
Prof. Dr. Ziwei Ouyang, Techn. Univ. of Denmark (DK)
Dr. Jesus Acero, University of Zaragoza (ES)
Dr. Maeve Duffy, University of Galway (IRE)
Prof. Dr. Werner Wölflé (DE)

All presentations and discussions will be in English.

Programme

Thursday, 9 February 2023

- 09:30 Registration & Welcome Coffee
- 10:00 **Welcome, Opening**
Chris Gould, ECPE e.V.
Hubert de la Grandière, SuperGrid Institute
- 10:20 **Magnetics Design**
Ger Hurley/Werner Wölflé
- Review of fundamentals
- Inductor design
- Transformer design

12:30 Lunch Lab tour at SuperGrid Institute

- 14:00 **Practical Applications in Power Supply Design**
Werner Wölflé
- Inductor design: forward converter, flyback converter
- Transformer design: pushpull and LLC resonant converter

16:00 Coffee Break

- 16:30 **High Frequency Considerations**
Ger Hurley
- High frequency calculations for winding losses and core losses
- Fringing
- Interleaving
- Litz wire

17:30 Open questions from the 1st day

18:00 End of 1st Day

- 19:30 Dinner "Le Bouchon de Filles"
20, rue Sergent-Blandan/la place Sathonay
69001 Lyon, France | [Le Bouchon des Filles](#)

Programme

Friday, 10 February 2023

- 09:00 Start of 2nd Day
- 09:00 **High Frequency Materials for Advanced Magnetics**
Maeve Duffy
- Review of fundamentals
- Inductor design
- Transformer design

10:30 Coffee Break

- 11:00 **High Frequency Planar Magnetics for Power Conversion**
Ziwei Ouyang
- Overview of planar magnetics
- High frequency eddy current effects: Interleaved windings, parallel windings
- High frequency leakage inductances
- Winding capacitances
- Magnetics integration

12:30 Lunch

- 14:00 **Modelling and Simulation of Magnetic Components**
Jesus Acero
- Modelling of inductors and transformers by means of electrical impedances
- Finite element simulation: assumptions, limitations and practical approaches
- Analytical-finite element mixed modelling
- Introduction to efficiency optimization
Experimental verification, modelling and simulation of magnetic components

16:00 Final Discussion

16:00 End of Tutorial