

# Thomas Guillod

## Curriculum Vitae

1989  
Swiss citizen

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### Work Experience

- 04.2021 – current **Researcher**, Thayer School of Engineering, Dartmouth College, USA,  
Modeling techniques for high-performance ferrite materials
- 08.2020 – 04.2021 **Independent Engineering Consulting**, Zurich, Switzerland,  
Magnetic component design, converter optimization, dielectric barrier discharges
- 11.2018 – 07.2020 **Postdoctoral Researcher**, ETH Zurich, Switzerland, Power Electronic Systems Lab.  
Medium-voltage converters, high-frequency magnetics, machine learning
- 09.2013 – 11.2018 **Research & Teaching Assistant**, ETH Zurich, Switzerland, Power Electronic Systems Lab.  
Design and construction of medium voltage DC-DC converters, teaching
- 04.2014 – 07.2013 **Research Assistant**, ETH Zurich, Switzerland, High Voltage Lab.  
Study of high voltage corona discharges with mixed AC/DC voltages
- 09.2011 – 12.2011 **Internship**, Bombardier Transport, Zürich, Switzerland  
Simulation of traction chain of high-speed trains (transformer and converter)
- 08.2008 – 09.2009 **Teacher Substitute**, CIFOM-ET, Le Locle, Switzerland  
Mathematic and physics teaching at a technical high school

### Education

- 09.2013 – 11.2018 **Doctorate**, ETH Zurich, Switzerland, Power Electronic Systems Lab.  
Modeling and Design of Medium-Voltage Medium-Frequency Transformers
- 02.2011 – 03.2013 **Master of Science**, ETH Zurich, Switzerland, Electrical Engineering and Inf. Tech.  
Focus on numerical methods, field theory, and high voltage technology  
Overall grade point average: 5.8 out of 6.0 (with distinction)
- 09.2012 – 03.2013 **Master Thesis**, ETH Zurich, Switzerland, High Voltage Lab. (with Swissgrid)  
Simulation of AC/DC Hybrids Overhead Lines
- 09.2007 – 02.2011 **Bachelor of Science**, ETH Zurich, Switzerland, Electrical Engineering and Inf. Tech.  
Major: Energy and Power Electronics  
Overall grade point average: 5.5 out of 6.0 (very good)

### Languages

- French Native speaker  
English Fluent (C1) – Master and Ph.D studies in English, many publications in English  
German Fluent (C1) – Bachelor studies in German, Intensivkurs Deutsch als Fremdsprache

### Computer Skills

- Skills Numerical simulations, multi-objective optimization, magnetics, converter design, high-frequency measurements, high-voltage testing, machine learning
- Computer Linux, Windows, Word, Excel, Powerpoint, Illustrator, LaTeX
- Scientific tools COMSOL, Ansys, Altium Designer, Inventor, Simulink, SPICE, PLECS
- Programming Python, Keras, TensorFlow, MATLAB, Qt, C, Java, DSP, Bash
- Open-source Creation and maintenance of scientific open-source tools

## Peer-Reviewed Scientific Journal Papers

- [JESTPE 2021] P. Czyz, **T. Guillod**, F. Krismer, J. Huber and J. W. Kolar, "Design and Experimental Analysis of 166 kW Medium-Voltage Medium-Frequency Air-Core Transformer for 1:1-DCX Applications", IEEE J. Emerg. Sel. Topics Power Electron., 2021
- [TPEL 2021] P. Papamanolis, **T. Guillod**, F. Krismer, and J. W. Kolar, "Transient Calorimetric Measurement of Ferrite Core Losses up to 50MHz", IEEE Trans. Power Electron., 2021
- [OJPEL 2020] P. Papamanolis, **T. Guillod**, F. Krismer, and J. W. Kolar, "Minimum Loss Operation and Optimal Design of High-Frequency Inductors for Defined Core and Litz Wire", IEEE Open Access Journal of Power Electronics, 2020
- [OJPEL 2020] **T. Guillod**, P. Papamanolis, and J. W. Kolar, "Artificial Neural Network (ANN) Based Fast and Accurate Inductor Modeling and Design", IEEE Open Access Journal of Power Electronics, 2020
- [CPSS 2020] **T. Guillod** and J. W. Kolar, "Medium-Frequency Transformer Scaling Laws: Derivation, Verification, and Critical Analysis", IEEE CPSS Trans. on Power Electron. and App., 2020
- [MDPI 2019] R. Färber, **T. Guillod**, F. Krismer, J. W. Kolar, and C. M. Franck, "Endurance of Polymeric Insulation Foil Exposed to DC-Biased Medium-Frequency Rectangular Pulse Voltage Stress", MDPI Energies, 2019
- [JESTPE 2019] **T. Guillod**, R. Färber, F. Krismer, C. M. Franck, and J. W. Kolar, "Dielectric Losses in Dry-Type Insulation of Medium-Voltage Power Electronic Converters", IEEE J. Emerg. Sel. Topics Power Electron., 2019
- [TPEL 2019] **T. Guillod**, D. Rothmund, and J. W. Kolar, "Active Magnetizing Current Splitting ZVS Modulation of a 7kV/400V DC Transformer", IEEE Trans. Power Electron., 2019
- [JESTPE 2019] D. Rothmund, **T. Guillod**, D. Bortis, and J. W. Kolar, "99% Efficient 10kV SiC-Based 7kV/400V DC-Transformer for Future Data Centers", IEEE J. Emerg. Sel. Topics Power Electron., 2019.
- [JESTPE 2019] D. Rothmund, **T. Guillod**, D. Bortis, and J. W. Kolar, "99.1% Efficient 10kV SiC-Based Medium Voltage ZVS Bidirectional Single-Phase PFC AC/DC Stage", IEEE J. Emerg. Sel. Topics Power Electron., 2019.
- [ELEN 2018] **T. Guillod**, F. Krismer, and J. W. Kolar, "Magnetic Equivalent Circuit of MF Transformers: Modeling and Parameter Uncertainties", Springer / Electrical Engineering, 2018
- [ELEN 2017] R. Bosshard, **T. Guillod**, and J. W. Kolar, "Electromagnetic Field Patterns and Energy Flux of Efficiency Optimal Inductive Power Transfer Systems", Springer / Electrical Engineering, 2017
- [JESTPE 2017] **T. Guillod**, F. Krismer, and J. W. Kolar, "Protection of MV Converters in the Grid: The Case of MV/LV Solid-State Transformers", IEEE J. Emerg. Sel. Topics Power Electron., 2017
- [TPWRD 2014] **T. Guillod**, M. Pfeiffer, and C. M. Franck, "Improved Coupled Ion-Flow Field Calculation Method for AC/DC Hybrid Overhead Power Lines", IEEE Trans. Power Del., 2014
- [JPIER 2013] **T. Guillod**, F. Kehl, and C. Hafner, "FEM-based Method for the Simulation of Dielectric Waveguide Grating Biosensors", Progress in Electromagnetics Research, 2013
- [TPS 2013] D. Gerber, **T. Guillod**, J. Biela, and R. Leutwyler, "Gate Unit with Improved Short Circuit Detection and Turn-Off Capability for 4.5kV Press-Pack IGBTs Operated at 4kA Pulse Current", IEEE Trans. Plasma Sci., 2013

## Awards & Grants

- SNSF 2021 Swiss National Science Foundation Mobility Fellowship
- IEEE JESTPE 2020 IEEE JESTPE Transactions First Prize Award
- IEEE ECCE 2018 Best Paper Award
- IEEE ECCE 2016 Travel Grant Award
- IEEE IECON 2015 Best Presentation Recognition
- IEEE IECON 2015 Travel Grant Award
- IEEE ECCE 2014 Best Overall Oral Presentation
- IEEE ECCE 2014 Best Overall Student Paper
- ETG 2013 ETG-Innovationspreis Finalist (electrosuisse)

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## Peer-reviewed International Conference Proceedings

- [CIPS 2020] M. Kasper, L. Peluso, G. Deboy, G. Knabben, **T. Guillod**, and J. W. Kolar, "Ultra-high Power Density Server Supplies Employing GaN Power Semiconductors and PCB-Integrated Magnetics", IEEE CIPS, Germany, 2020
- [APEC 2020] P. Papamanolis, **T. Guillod**, F. Krismer, and J. W. Kolar, "Transient Calorimetric Measurement of Ferrite Core Losses", IEEE APEC, USA, 2020
- [ECCE Asia 2019] P. Czyz, P. Papamanolis, **T. Guillod**, F. Krismer, and J. W. Kolar, "New 40kV/300kVA Quasi-2-Level Operated 5-Level Flying Capacitor SiC "Super-Switch" IPM", IEEE ECCE Asia, South Korea, 2018
- [ECCE Asia 2018] P. Czyz, **T. Guillod**, F. Krismer, and J. W. Kolar, "Exploration of the Design and Performance Space of a High Frequency 166kW/10kV SiC Solid-State Air-Core Transformer", IEEE ECCE Asia, Japan, 2018
- [COMPEL 2017] **T. Guillod**, J. Huber, F. Krismer, and J. W. Kolar, "Litz Wire Losses: Effects of Twisting Imperfections", IEEE COMPEL, USA, 2017
- [APEC 2017] **T. Guillod**, F. Krismer, and J. W. Kolar, "Electrical Shielding of MV/MF Transformers Subjected to High dv/dt PWM Voltages", IEEE APEC, USA, 2017
- [ECCE USA 2016] **T. Guillod**, R. Färber, F. Krismer, C. M. Franck, and J. W. Kolar, "Computation and Analysis of Dielectric Losses in MV Power Electronic Converter Insulation", IEEE ECCE, USA, 2016
- [IECON 2015] **T. Guillod**, F. Krismer, R. Färber, C. M. Franck, and J. W. Kolar, "Protection of MV/LV Solid-State Transformers in the Distribution Grid", IEEE IECON, Japan, 2015
- [APEC 2015] D. Rothmund, G. Ortiz, **T. Guillod**, and J. W. Kolar, "10kV SiC-Based Isolated DC-DC Converter for Medium-Voltage-Connected SSTs", IEEE APEC, USA, 2015
- [ECCE USA 2014] **T. Guillod**, J. Huber, G. Ortiz, A. De, C. M. Franck, and J. W. Kolar, "Characterization of the Voltage and Electric Field Stresses in Multi-Cell Solid-State Transformers", IEEE ECCE, USA, 2014
- [CIPS 2012] **T. Guillod**, D. Gerber, J. Biela, and A. Müsing, "Design of a PCB Rogowski Coil Based on the PEEC Method", IEEE CIPS, Germany, 2012
- [PPC 2011] D. Gerber, **T. Guillod**, and J. Biela, "IGBT Gate-Drive with PCB Rogowski Coil for Improved Short Circuit Detection and Current Turn-Off Capability", IEEE PPC, USA, 2011

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## Open-Source Softwares

- since 2019 AI-mag – Inductor design with artificial neural networks and the finite element method.  
MATLAB/Python, <https://ai-mag.github.io>
- since 2019 Toolbox for multi-objective optimization with genetic algorithm  
MATLAB, [https://github.com/ethz-pes/multi\\_objective\\_optimization\\_matlab](https://github.com/ethz-pes/multi_objective_optimization_matlab)
- since 2016 Computation of litz wire losses with homogenized parameters  
MATLAB, [https://github.com/ethz-pes/litz\\_wire\\_homogenization\\_comsol\\_matlab](https://github.com/ethz-pes/litz_wire_homogenization_comsol_matlab)
- since 2016 Toolbox for 2D magnetic simulation with the mirroring method  
MATLAB, [https://github.com/ethz-pes/mirroring\\_method\\_matlab](https://github.com/ethz-pes/mirroring_method_matlab)
- since 2015 Library for importing and handling 2D and 3D FEM meshes  
MATLAB, [https://github.com/otvam/fem\\_mesh\\_matlab](https://github.com/otvam/fem_mesh_matlab)

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## Further Scientific Contributions

- [Talk 2021] J. W. Kolar, J. Huber, and **T. Guillod**, “Fundamentals and Application Oriented Evaluation of Solid State Transformer Concepts”, PSMA Webinar, Roadmap Presentation, 2021
- [Talk 2020] P. Czyz, **T. Guillod**, F. Krismer, and J.W. Kolar, “Experimental Analysis of a 166kW Medium Voltage/Frequency Air Core Transformer for 1:1 DCX Applications”, IEEC ECCE, USA, 2020
- [Talk 2020] **T. Guillod** and J. W. Kolar, “From Brute Force Grid Search to Artificial Intelligence: Which Algorithms for Magnetics Optimization?”, APEC PSMA Industry Session, USA, 2020
- [Invention 2020] P. Czyz, P. Papamanolis, V. Lazarevic, **T. Guillod**, F. Krismer, and J.W. Kolar, “Voltage Source Converter Configured to Transition Between at Least Two Voltage Levels”, Swedish patent application, 2020
- [Workshop 2020] P. Papamanolis, **T. Guillod**, F. Krismer, and J. W. Kolar, “Minimum Loss Operation of High Frequency Inductors”, ECPE Magnetic Components Workshop, France, 2020
- [Article 2019] D. Rothmund, **T. Guillod**, D. Bortis, and J. W. Kolar, “Use Electrical Energy More Efficiently with New Solid-State Transformers”, Swiss National Science Foundation NRP 70/71, 2019
- [Talk 2019] **T. Guillod** and J. W. Kolar, “Handling Design Space Diversity of Power Electronics Multi-Objective Optimization”, IEEE Design Automation for Power Electronics, Italy, 2019
- [Talk 2019] **T. Guillod**, D. Rothmund, and J. W. Kolar, “10kV SiC MOSFETs for Solid-State Transformers: Opportunities and Challenges”, X-Power Electronics Conference, China, 2019
- [Workshop 2019] **T. Guillod** and J. W. Kolar, “Dielectric Losses in the Insulation of Dry-Type Medium-Frequency Transformers”, ECPE Solid-State Transformer Workshop, Switzerland, 2019
- [Ph.D 2018] **T. Guillod**, “Modeling and Design of Medium-Frequency Transformers for Future Medium-Voltage Power Electronics Interfaces”, Ph.D. Thesis, ETH Zurich, 2018
- [Talk 2018] D. Rothmund, **T. Guillod**, D. Bortis, and J. W. Kolar, “Design and Experimental Analysis of a 10kV SiC MOSFET Based 50kHz Soft-Switching Single-Phase 3.8kV AC/400V DC Solid-State Transformer”, IEEC ECCE, USA, 2018
- [Workshop 2017] **T. Guillod**, F. Krismer, and J. W. Kolar, “Dielectric Losses: MV/MF Converter Insulation”, SCCER FURIES Technical Workshop, Switzerland, 2017
- [Talk 2016] **T. Guillod** and J. W. Kolar, “Medium-Frequency Transformers for Smart Grid Applications: Challenges and Opportunities”, SCCER-FURIES Annual Conference, Switzerland, 2016
- [Poster 2015] **T. Guillod**, R. Färber, C. M. Franck, and J. W. Kolar, “Effects of Mixed-Frequency Voltage Stress on Dry-Type Insulation Systems”, SCCER-FURIES Annual Conference, Switzerland, 2015
- [Article 2013] M. Pfeiffer, **T. Guillod**, M. Weber, and C. Franck, “Erhöhung der Übertragungskapazität durch Hybride AC/DC-Freileitungen, Potenzial und Machbarkeit in der Schweiz”, Bulletin SEV/AES Electrosuisse, 2013
- [Poster 2013] **T. Guillod**, “Simulation von AC/DC hybriden Freileitungen”, ETG-Innovationspreis, 2013
- [Master 2013] **T. Guillod**, “Simulation of AC/DC Hybrid Overhead Lines”, Master Thesis, ETH Zurich, 2013
- [Talk 2012] F. Kehl and **T. Guillod**, “Combined FEM and Analytical Method for the Simulation and Optimization of Planar Dielectric Waveguide Grating Biosensors”, Workshop on Numerical Methods for Optical Nano Structures, Switzerland, 2012