

# Thomas Guillod / CV

Location: NH, USA  
Citizenship: Switzerland  
Birth year: 1989

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## Work Experience

- 04.2021 - current** **Researcher**, Thayer School of Engineering, Dartmouth College, NH, USA  
*Modeling techniques for high-performance ferrite materials*
- 07.2020 - 06.2021** **Independent Engineering Consultant**, Zurich, Switzerland  
*Magnetic component design, converter optimization, dielectric barrier discharges*
- 11.2018 - 07.2020** **Postdoctoral Researcher**, ETH Zurich, Switzerland, PES Lab.  
*Medium-voltage and/or high-frequency magnetics, machine learning, thesis supervision*
- 09.2013 - 11.2018** **Research & Teaching Assistant**, ETH Zurich, Switzerland, PES Lab.  
*Design and construction of medium voltage DC-DC converters, teaching*
- 04.2013 - 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** **Intern**, Bombardier Transport, Propulsion and Controls, Zurich, Switzerland  
*Simulation of traction chain of high-speed trains (transformer and converter)*
- 08.2008 - 09.2009** **Teacher Substitute**, CIFOM-ET, Le Locle, Switzerland  
*Mathematics 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 Hybrid 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 PhD studies in English, many publications in English
- German** Fluent (C1) - Bachelor studies in German, Intensivkurs Deutsch als Fremdsprache

## Skills

- Science** Numerical simulations, multi-objective optimization, magnetics, converter design, high-frequency measurements, high-voltage testing, machine learning
- Computer** Linux, Windows, Word, Excel, Powerpoint, Illustrator, LaTeX, 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]** **T. Guillod**, P. Czyz, and J. W. Kolar, "Geometrical Optimization of Medium-Frequency Air-Core Transformers for DCX Applications", IEEE J. Emerg. Sel. Topics Power Electron., 2021
- [JESTPE 2021]** P. Czyz, **T. Guillod**, D. Zhang, F. Krismer, R. Färber, J. Huber, C. M. Franck, and J. W. Kolar, "Analysis of the Performance Limits of 166 kW / 7 kV Air-Core and Magnetic-Core Medium-Voltage Medium-Frequency Transformers for 1:1-DCX Applications", IEEE J. Emerg. Sel. Topics Power Electron., 2021
- [MDPI 2021]** P. Czyz, P. Papamanolis, F. Trunas Bruguera, **T. Guillod**, F. Krismer, V. Lazarevic, J. Huber, and J. W. Kolar, "Load-Independent Voltage Balancing of Multi-Level Flying Capacitor Converters in Quasi-2-Level Operation", MDPI Electronics, 2021
- [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 2020]** 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

## Peer-reviewed International Conference Proceedings

- [APEC 2023]** T. Guillod, J. Lee, H. Li, S. Wang, M. Chen, C. R. Sullivan, "Calculation of Ferrite Core Losses with Arbitrary Waveforms Using the Composite Waveform Hypothesis", IEEE APEC, USA, 2023
- [APEC 2023]** H. Li, D. Serrano, S. Wang, T. Guillod, M. Luo, M. Chen, "Predicting the B-H Loops of Power Magnetics with Transformer-Based Encoder-Projector-Decoder Neural Network Architecture", IEEE APEC, USA, 2023
- [APEC 2023]** S. Wang, D. Serrano, H. Li, A. Lin, T. Guillod, M. Luo, C. R. Sullivan, M. Chen, "A Simplified DC-Bias Injection Method with Mirror Transformer for Magnetic Material Characterization", IEEE APEC, USA, 2023
- [COMPEL 2022]** D. Serrano, H. Li, T. Guillod, S. Wang, M. Luo, C. R. Sullivan, M. Chen, "Neural Network as Datasheet: Modeling B-H Loops of Power Magnetics with Sequence-to-Sequence LSTM Encoder-Decoder Architecture", IEEE COMPEL, Israel, 2022
- [APEC 2022]** H. Li, D. Serrano, T. Guillod, E. Dogariu, A. B. Nadler, S. Wang, M. Luo, V. Bansal, Y. Chen, C. R. Sullivan, M. Chen, "MagNet: an Open-Source Database for Data-Driven Magnetic Core Loss Modeling", IEEE APEC, USA, 2022
- [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

## Further Scientific Contributions

- [Workshop 2022]** **T. Guillod** and C. R. Sullivan, "Data-Driven Core-Loss Modeling", ECPE Magnetic Components Workshop, France, 2022
- [Workshop 2022]** C. R. Sullivan and **T. Guillod**, "Magnetic Core Geometry Influences on Component Performance", PSMA Workshop, High Frequency Power Magnetics, USA, 2022
- [Workshop 2021]** **T. Guillod** and J. W. Kolar, "ANN Powered Models for Magnetic Components", ECPE Online Workshop, Steps towards Design Automation & Artificial Intelligence in Power Electronics, 2021
- [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
- [PhD 2018]** **T. Guillod**, "Modeling and Design of Medium-Frequency Transformers for Future Medium-Voltage Power Electronics Interfaces", PhD 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

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## Awards & Grants

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

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## Open-Source Tools

<b>2016 - 2021</b>	Toolbox for power magnetics: model and optimization. MATLAB, <a href="https://github.com/otvam/magnetic_components_toolbox_matlab">github.com/otvam/magnetic_components_toolbox_matlab</a>
<b>2019 - 2020</b>	AI-mag - Inductor design with artificial neural networks and the finite element method. Python/MATLAB/COMSOL, <a href="https://ai-mag.github.io">ai-mag.github.io</a>
<b>2019 - 2020</b>	Toolbox for multi-objective optimization with genetic algorithm MATLAB, <a href="https://github.com/ethz-pes/multi_objective_optimization_matlab">github.com/ethz-pes/multi_objective_optimization_matlab</a>
<b>2016 - 2020</b>	Computation of Litz wire losses with homogenized parameters MATLAB/COMSOL, <a href="https://github.com/ethz-pes/litz_wire_homogenization_comsol_matlab">github.com/ethz-pes/litz_wire_homogenization_comsol_matlab</a>
<b>2016 - 2020</b>	Computation of Litz wire losses with FEM and Bessel functions MATLAB, <a href="https://github.com/ethz-pes/litz_wire_losses_fem_matlab">github.com/ethz-pes/litz_wire_losses_fem_matlab</a>
<b>2016 - 2020</b>	Toolbox for 2D magnetic simulation with the mirroring method MATLAB, <a href="https://github.com/ethz-pes/mirroring_method_matlab">github.com/ethz-pes/mirroring_method_matlab</a>
<b>2015 - 2020</b>	Library for importing and handling 2D and 3D FEM meshes MATLAB, <a href="https://github.com/otvam/fem_mesh_matlab">github.com/otvam/fem_mesh_matlab</a>