

Thomas Guillod / CV

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

guillod@otvam.ch
linkedin.com/in/tguillod
github.com/otvam

Work Experience

- 04.2021 - current** **Researcher**, Thayer School of Engineering, Dartmouth College, NH, USA
Modeling techniques for high-performance ferrite materials and HF inductors
- 07.2020 - 06.2021** **Independent Engineering Consultant**, otvam consulting, 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 co-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
Development of traction chains 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 analysis, multi-objective optimization, electromagnetism, converter design, field simulations, high-frequency measurements, high-voltage testing, machine learning
- Computer** Linux, Windows, Word, Excel, Powerpoint, Airtable, Illustrator, LaTeX, COMSOL, Ansys EM, Altium, KiCad, Inventor, Simulink, SPICE, PLECS
- Programming** Python, PyTorch, Pandas, HPC, MATLAB, SQL, Qt, C, DSP, Bash
- Open-source** Development and maintenance of scientific open-source tools

Peer-Reviewed Scientific Journal Papers

- [TPEL 2024] S. Wang, H. Li, D. Serrano, **T. Guillod**, J. Li, C. R. Sullivan, M. Chen, "A Simplified Dc-Bias Injection Method for Characterizing Power Magnetics using a Voltage Mirror Transformer", IEEE Trans. Power Electron., 2024
- [TPEL 2023] D. Serrano, H. Li, S. Wang, **T. Guillod**, M. Luo, V. Bansal, N. K. Jha, Y. Chen, C. R. Sullivan, M. Chen, "Why MagNet: Quantifying the Complexity of Modeling Power Magnetic Material Characteristics", IEEE Trans. Power Electron., 2023
- [TPEL 2023] H. Li, D. Serrano, **T. Guillod**, S. Wang, E. Dogariu, A. Nadler, M. Luo, V. Bansal, N. K. Jha, Y. Chen, C. R. Sullivan, M. Chen, "How MagNet: Machine Learning Framework for Modeling Power Magnetic Material Characteristics", IEEE Trans. Power Electron., 2023
- [JESTPE 2021] **T. Guillod**, P. Czyz, 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, 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, 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, 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, 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, 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, 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**, 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, 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, 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, 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, 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, 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, J. W. Kolar, "Magnetic Equivalent Circuit of MF Transformers: Modeling and Parameter Uncertainties", Springer / Electrical Engineering, 2018
- [ELEN 2017] R. Bosshard, **T. Guillod**, 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, 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, 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, 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 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 2024] T. **Guillod**, W. V. R. Roberts, C. R. Sullivan, "Characterization and Impact of Large-Signal Dielectric Properties in MnZn Ferrites", IEEE APEC, USA, 2024
- [APEC 2024] E. Deleu, H. Li, J. Li, W. Lee, T. **Guillod**, C. R. Sullivan, S. Wang, M. Chen, "Multi-Material Power Magnetics Modeling with a Modular and Scalable Machine Learning Framework", IEEE APEC, USA, 2024
- [ICEMS 2023] T. Ohno, S. Miric, T. **Guillod**, F. Krismer, J. Huber, J. W. Kolar, "New Triple-Output Quad-Active-Bridge DC/DC Converter Employing a Four-Leg Inverter Input Stage", IEEE ICEMS, China, 2023
- [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**, 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, 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, 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, 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, J. W. Kolar, "Litz Wire Losses: Effects of Twisting Imperfections", IEEE COMPEL, USA, 2017
- [APEC 2017] T. **Guillod**, F. Krismer, 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, 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, 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**, 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, 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, A. Müsing, "Design of a PCB Rogowski Coil Based on the PEEC Method", IEEE CIPS, Germany, 2012
- [PPC 2011] D. Gerber, T. **Guillod**, 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 2024] C. R. Sullivan, **T. Guillod**, "Thermal, Scaling and Dielectric Issues in Magnetics Design", PSMA Workshop, High Frequency Power Magnetics, USA, 2024
- [Talk 2023] **T. Guillod**, "Using (Simple) Neural Networks to boost Power Magnetics Models", Mag & Mad Conference, Spain, 2023
- [Talk 2023] **T. Guillod**, "MagNet Challenge Webinar: Equation-based Baseline Models", IEEE PELS MagNet Challenge Webinar, 2023
- [Workshop 2022] **T. Guillod**, C. R. Sullivan, "Data-Driven Core-Loss Modeling", ECPE Magnetic Components Workshop, France, 2022
- [Workshop 2022] C. R. Sullivan, **T. Guillod**, "Magnetic Core Geometry Influences on Component Performance", PSMA Workshop, High Frequency Power Magnetics, USA, 2022
- [Workshop 2021] **T. Guillod**, 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, **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, 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**, 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, 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, J. W. Kolar, "Minimum Loss Operation of High Frequency Inductors", ECPE Magnetic Components Workshop, France, 2020
- [Article 2019] D. Rothmund, **T. Guillod**, D. Bortis, 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**, 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, J. W. Kolar, "10kV SiC MOSFETs for Solid-State Transformers: Opportunities and Challenges", X-Power Electronics Conference, China, 2019
- [Workshop 2019] **T. Guillod**, 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, 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, J. W. Kolar, "Dielectric Losses: MV/MF Converter Insulation", SCCER FURIES Technical Workshop, Switzerland, 2017
- [Talk 2016] **T. Guillod**, 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, 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, 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, **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

Awards & Grants

| | |
|--------------------|--|
| IEEE TPEL 2023 | IEEE TPEL Transactions First Prize Award |
| IUCRC PMIC 2023 | Power Management Integration Center / NSF IUCRC / Accepted Project |
| SNSF PostDoc 2021 | Swiss National Science Foundation Mobility Fellowship |
| IEEE JESTPE 2021 | IEEE JESTPE Transactions Second Prize Award |
| 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 |
| Electrosuisse 2013 | ETG-Innovationspreis Finalist (Electrosuisse) |

Open-Source Software

| | |
|-------------|---|
| 2023 - 2024 | PyPEEC - FFT/GPU accelerated 3D quasi-magnetostatic PEEC solver. Python, pypeec.otvam.ch |
| 2016 - 2021 | Toolbox for power magnetics: model and optimization. MATLAB, github.com/otvam/magnetic_components_toolbox_matlab |
| 2019 - 2020 | AI-mag - Inductor design with artificial neural networks and the finite element method. Python/MATLAB/COMSOL, ai-mag.github.io |
| 2019 - 2020 | Toolbox for multi-objective optimization with genetic algorithm MATLAB, github.com/ethz-pes/multi_objective_optimization_matlab |
| 2016 - 2020 | Computation of Litz wire losses with homogenized parameters MATLAB/COMSOL, github.com/ethz-pes/litz_wire_homogenization_comsol_matlab |
| 2016 - 2020 | Computation of Litz wire losses with FEM and Bessel functions MATLAB, github.com/ethz-pes/litz_wire_losses_fem_matlab |
| 2016 - 2020 | Toolbox for 2D magnetic simulation with the mirroring method MATLAB, github.com/ethz-pes/mirroring_method_matlab |
| 2015 - 2020 | Library for importing and handling 2D and 3D FEM meshes MATLAB, github.com/otvam/fem_mesh_matlab |