Mattia Iurich

Power Electronics Engineer

👤 Profile

Passionate power electronics engineer, specializing in EVs and clean energy systems. Committed to driving sustainable solutions and optimizing power conversion technologies. Demonstrated dedication, enthusiasm, and an unwavering drive to contribute to the clean energy revolution.

💼 Employment History

Ph.D. student at University of Udine, Udine (Italy)

November 2020 — October 2023

Ph.D student in Power Electronics, Machines and Drives - research topic "*Power electronics converters and technologies for modern e-mobility applications*".

Projects

- Inverter Dead-Time distortion modeling and compensation: analytical modeling, development of compensation strategy, PLECS simulation, FW implementation and testing
- Integrated High-Frequency SiC Based Modular Multi Three-Phase PMSM Drive for Automotive Range Extender, modeling and control of multi three-phase machine: modeling of multi-three-phase machine, design of control strategy, simulation and FW control implementation.
- Modeling and Control of Dual Active Bridge for HV-to-HV conversion considering all phase-shifts: modeling of triple-phase shift (TPS) modulation, design of model-predictive finite-control set (MP-FCS) based on TPS modulation, simulation of proposed control, FW implementation and validation.
- Multi-objective optimization and design of HV DC-DC converter for Solid Oxide Fuel-Cell applications @CPES
  - Topology comparison and selection
  - Magnetics design and FEA simulation (Ansys Maxxwell 2D/3D) for performance validation in comparison w/ analytical models.
  - Power-loop design optimization via FEA (Ansys/Q3D) for SiC paralleling thanks to loop-inductance minimization.
  - PCB design of power board w/ Altium Designer (i.e. SiC auxiliaries and mechanical interconnects).
  - PCB design of motherboard (i.e. gate drivers, signal conditioning and relative DSP interconnects) for controlling the power-board.

Student Intern at Center for Power Electronics Systems (CPES), Blacksburg, Virginia (USA)

August 2022 — June 2023

- Multi-objective optimization and design of DC-DC converter for Solid Oxide Fuel-Cells for energy storage and distribution systems
- Different topologies comparison and Pareto-front evaluation
- Power stage design: semiconductor devices configuration design, gate driving design, current/voltage sense, layout
- Passives components design (inductors and DC-link cap)

Details

Udine, Italy, +39 3489636044

mattiaiurich@hotmail.it

Date / Place of birth

13-10-1992 / Battipaglia (SA), Italy

Skills

Matlab

PLECS

Simplis/Simetrix

LTSpice

Circuit Design

Hardware Lab Experience

Code Composer Studio

Ansys

Altium Designer

Python

Git

- TODO Test and validation

Firmware engineer at Metasystem S.p.A., Reggio Emilia (Italy)
September 2019 — October 2020

Ob-board Charger (OBC) firmware design for EV and PHEV

- Modeling and control design for commonly used topologies in OBCs and HV-to-LV DC-DC (i.e. totem pole PFC, LLC, Phase-Shift DC-DC, etc)
- Testing and validation of software modules in simulated environment (PLECS, CANoe)
- Designed and optimized firmware to ensure robust communication protocols between micro-controller and peripheral devices

Intern at Infineon Technologies, Villach (Austria)
June 2018 — September 2018

- Simulation and characterization of High-Speed Serial Interface transceiver for automotive micro-controller (AURIX)
- measurements and characterization on HSSI test-chip
- simulation of package parasitic impact on transceiver-IC performances

🎓 Education

Bachelor and Master of Science, University of Udine, Udine (Italy)
September 2012 — March 2019

📖 Literature

Iurich, M., Calligaro, S., Petrella, R., "Accurate and Computationally-Optimized Small-Signal Model Identification of LLC Resonant Converter Based on Machine Learning Techniques" *2022 IEEE Energy Conversion Congress and Exposition, ECCE 2022*

Breda, R., Biason, M., Calligaro, S., Iurich, M., Mazzer, S., Petrella, R."Optimized Distributed Digital Control and Communication Architecture for Flying Capacitor Modular Multilevel Converter Based PMSM Drives" *2022 IEEE Energy Conversion Congress and Exposition (ECCE)*

Fiaz, M.F., Calligaro, S., Iurich, M., Petrella, R. "Analytical Modeling and Control of Dual Active Bridge Converter Considering All Phase-Shifts" *Energies, 2022*

N. Bianchi, S. Calligaro, G. Maldini, M. Marson, M. Iurich and R. Petrella, "Integrated High-Frequency SiC Based Modular Multi Three-Phase PMSM Drive for Automotive Range Extender," *2021 IEEE Energy Conversion Congress and Exposition (ECCE)*

M. Biason, R. Breda, M. Iurich, S. Mazzer and R. Petrella, "Adaptive High-Frequency Injection and Control Loops Design for Flying-Capacitor Passive Cross-Connected Modular Multilevel Converter Based Drive Systems," *2021 IEEE Energy Conversion Congress and Exposition (ECCE)*

M. Biason, S. Calligaro, M. Iurich, R. Petrella and A. Shahdadi, "Advances on Analysis, Modeling and Accurate Self-Commissioning Compensation of Inverter Dead-Time Distortion Based on a Physical Model," *2021 IEEE Energy Conversion Congress and Exposition (ECCE)*