

Mattia Simonazzi

Curriculum Vitae



Short Bio

Mattia Simonazzi was born in Guastalla (RE) on 18th February 1995. He obtained the bachelor's and master's degree in Electrical Engineering from the University of Bologna in 2017 and 2019, respectively. In March 2023 he pursued the PhD in Biomedical, Electrical, and System Engineering at the University of Bologna and currently holds the role of research fellow at the same institute. The research activity has mainly focused on wireless power transfer for high power systems, electromagnetics and electromagnetic compatibility. The research activity led to various publications in international journals and contributions to international conferences, for which Mattia Simonazzi is also a reviewer. Since 2019, Mattia Simonazzi has been a teaching assistant for courses of electrotechnics, electromagnetic compatibility and electromagnetics at the University of Bologna.

Research Experience

Nov 2022 - Oct 2023 **Research Fellow**, *Alma Mater Studiorum – University of Bologna*

- Research Project: “*Electromagnetic Compatibility Issues in Automotive WPT Systems*”
- Supervisor: Prof. Leonardo Sandrolini
- Description: The project aimed to investigate the problems of electromagnetic compatibility in wireless power transfer (WPT) systems, representing the limits to their large-scale diffusion, in particular concerning high-power WPT systems, i.e. in automotive applications. Conducted and radiated disturbances are studied both through numerical models and experimental measurements on scale prototypes. Artificial materials for the of shielding low-frequency magnetic fields are also being studied, which are specifically suitable for shielding automotive WPT apparatuses.

Education

Mar 2022 **PhD in Biomedical, Electrical and System Engineering**, *Alma Mater Studiorum – University of Bologna*

- Curriculum: Electrical Engineering
- Final score: Excellent, cum laude
- Thesis Title: “*Analysis and Design Considerations of Resonator Arrays of Inductive Power Transfer Systems*”
- Supervisor: Prof. Leonardo Sandrolini

Jan 2022 **PhD School “Ferdinando Gasparini”**, *University of Naples*
Scuola Nazionale dei Dottorandi di Elettrotecnica “Ferdinando Gasparini”.

Oct 2019 **Master's Degree in Electrical Engineering**, *Alma Mater Studiorum – University of Bologna*

- Final score: 110/110 cum laude
- Thesis Title: “*Misalignment effects and electromechanical characterization of an IPT resonator array system*”
- Supervisor: Prof. Leonardo Sandrolini

Jul 2017 **Bachelor's Degree in Electrical Engineering**, *Alma Mater Studiorum – University of Bologna*

- Final score: 109/110
- Thesis Title: “*Numerical Analysis of a Salient Pole Synchronous Alternator*”
- Supervisor: Prof. Marco Breschi

Teaching Activity

Sep 2019 - Current **Bachelor's and Master's Degree Thesis Co-supervisor**, *Alma Mater Studiorum – University of Bologna*

Sep 2019 - Current **Teaching Assistant**, *Alma Mater Studiorum – University of Bologna*
Teaching assistant of Elettrotecnica T (A-K) for the Bachelor degree in Industrial Engineering.

Jan 2022 - Feb 2022 **High School Teacher**, “*Bertrand Russell*” Institute
High school teacher of physics and mathematics at the “Bertrand Russell” institute in Guastalla (RE), Italy.

Sep 2019 - Sep 2021 **Teaching Assistant**, *Alma Mater Studiorum – University of Bologna*
Teaching assistant of Electromagnetic Compatibility and Laboratory Techniques T for the Bachelor's degrees in Electrical Engineering and Automation Engineering.

Feb 2020 - Feb 2021 **Teaching Assistant**, *Alma Mater Studiorum – University of Bologna*
Teaching assistant of Compatibilità Elettromagnetica Industriale M for the Master's degree in Electrical Engineering.

Feb 2021 - Feb 2023 **Teaching Assistant**, *Alma Mater Studiorum – University of Bologna*
Teaching assistant of Electromagnetic Compatibility M for the Master's degree in Electrical Engineering.

Feb 2022 - Feb 2023 **Teaching Assistant**, *Alma Mater Studiorum – University of Bologna*
Teaching assistant of Elettrodinamica Quasi Stazionaria e Non Stazionaria M (Modulo2) for the Master's degree in Electrical Engineering.

Licences and Certifications

Nov 2020 Esame di Stato - Abilitazione all'Esercizio della Professione di Ingegnere Industriale, Section A, *Alma Mater Studiorum – University of Bologna*

Italian Professional Practice Exam

Jul 2019 - Jul 2021 B2 English Certification, *IELTS*

Language Proficiency

- ITALIAN: Mother Tongue
- ENGLISH: B2 certificated by IELTS in 2019 – good knowledge of technical vocabulary
- FRENCH: A2

Computer skills

- Ansys Maxwell and HFSS (Finite Element Method based software)
- MatLab - MatLab Simulink
- Programming language Python – Artificial Intelligence (AI) basic algorithms
- Programming language LabVIEW
- AutoCAD
- SolidWorks (Basic)
- Programming language C (Basic)
- Microsoft Office

Scientific Publications

Scopus:  Orcid:  Google Scholar: 

PhD Thesis Simonazzi M., Analysis and Design Considerations of Resonator Arrays for Inductive Power Transfer, *PhD Thesis*, 2023.

- Journal Papers
- Lucca G.; Sandrolini L.; Popoli A.; Simonazzi M.; Cristofolini A., Assessment of AC Corrosion Probability in Buried Pipelines with a FEM-Assisted Stochastic Approach, *Applied Sciences*, June 2023, 13, 7669, <https://doi.org/10.3390/app13137669>.
 - Simonazzi M.; Sandrolini L.; Mariscotti A., Resonator Arrays for Linear Position Sensors, *Journal of Low Power Electronics and Applications*, June 2023, 13, 41, <https://doi.org/10.3390/jlpea13020041>.
 - Sandrolini L.; Simonazzi M.; Barmada S., Fontana N., Two-port Network Compact Representation of Resonator Arrays for Wireless Power Transfer with Variable Receiver Position, *International Journal of Circuit Theory and Applications*, May. 2023, 1-14, <https://doi.org/10.1002/cta.3510>.
 - Barmada S.; Fontana N.; Sandrolini L.; Simonazzi M., Optimal Terminations of 2D Meta-Surfaces for Uniform Magnetic Field Applications, in *IEEE Transactions on Magnetics*, vol. 59, no. 5, pp. 1-4, May 2023, <https://doi.org/10.1109/TMAG.2022.3231354>.
 - Campanini, A., Simonazzi, M., Sandrolini, L. et al. Fast dynamic control for a boost DC/DC converter in hybrid-electric powertrain with PEM fuel cell and battery pack, *Electrical Engineering*, Feb. 2023, <https://doi.org/10.1007/s00202-023-01761-2>.
 - Mariscotti, A.; Sandrolini, L.; Simonazzi, M., Supraharmonic Emissions from DC Grid Connected Wireless Power Transfer Converters, *Energies*, July 2022, 15, 5229, <https://doi.org/10.3390/en15145229>.
 - Simonazzi M.; Sandrolini L.; Mariscotti A., Receiver–Coil Location Detection in a Dynamic Wireless Power Transfer System for Electric Vehicle Charging, *Sensors*, Mar. 2022, 22, 2317, <https://doi.org/10.3390/s22062317>.
 - Simonazzi M.; Reggiani U.; Sandrolini L., Standing Wave Pattern and Distribution of Currents in Resonator Arrays for Wireless Power Transfer, *Energies*, Jan. 2022, 15, 652, <https://doi.org/10.3390/en15020652>.
 - Cristofolini A.; Popoli A.; Sandrolini L.; Pierotti G.; Simonazzi M., Laplace Transform for Finite Element Analysis of Electromagnetic Interferences in Underground Metallic Structures, *Applied Sciences*, Jan. 2022, 12, 872, <https://doi.org/10.3390/app12020872>.
 - Simonazzi M.; Campanini A.; Sandrolini L.; Rossi C., Design procedure based on maximum efficiency for wireless power transfer battery chargers with lightweight vehicle assembly, *Energies*, Dec. 2021, 15, 70, <https://doi.org/10.3390/en15010070>.

- L. Sandrolini, M. Simonazzi, A. Mariscotti and G. Pasini, “Simple Energy-Based Method for Estimating the Equivalent Circuit Parameters of Electrolytic Capacitors,” 2023 International Symposium on Electromagnetic Compatibility – EMC Europe, Krakow, Poland, 2023, pp. 1-6, <https://doi.org/10.1109/EMCEurope57790.2023.10274166>.
- S. Bhagat, A. Mariscotti, M. Simonazzi and L. Sandrolini, “Variability of Conducted Emissions of EV Chargers due to Mutual Effects on a DC Grid,” 2023 International Symposium on Electromagnetic Compatibility – EMC Europe, Krakow, Poland, 2023, pp. 1-6, <https://doi.org/10.1109/EMCEurope57790.2023.10274375>.
- A. Campanini, M. Simonazzi, F. Peirano and C. Rossi, “Rule-Based Energy Supervisory in Racing Hybrid-Electric Powertrain for Minimizing the Racetrack Time,” IEEE EUROCON 2023 - 20th International Conference on Smart Technologies, Torino, Italy, July 6-8, 2023, pp. 659-664, <https://doi.org/10.1109/EUROCON56442.2023.10199049>.
- M. Bosi, M. Simonazzi, L. Peretto and L. Sandrolini, “Conducted Emission and Power Line Filter Design of a Three-phase Grid-connected Battery Charger for Automotive Application,” 2023 IEEE International Workshop on Metrology for Automotive (MetroAutomotive), Modena, Italy, 2023, pp. 67-71, <https://doi.org/10.1109/MetroAutomotive57488.2023.10219093>.
- M. Simonazzi, L. Sandrolini and A. Campanini, “Input Current of H-bridge Inverters with Asymmetric Switch Parameters for Wireless Power Transfer Applications,” 2023 IEEE 17th International Conference on Compatibility, Power Electronics and Power Engineering (CPE-POWERENG), Tallinn, Estonia, 2023, pp. 1-5, <https://doi.org/10.1109/CPE-POWERENG58103.2023.10227468>.
- M. Simonazzi, L. Sandrolini, S. Barmada and N. Fontana, “Optimal Metamaterial Configuration for Magnetic Field Shielding in Wireless Power Transfer Systems,” 2023 IEEE Wireless Power Technology Conference and Expo (WPTCE), San Diego, CA, USA, 2023, pp. 1-5, <https://doi.org/10.1109/WPTCE56855.2023.10216186>.
- S. Barmada, N. Fontana, L. Sandrolini and M. Simonazzi, “Surface Current Analysis in a 2D Metamaterial,” 2022 International Applied Computational Electromagnetics Society Symposium (ACES-China), Xuzhou, China, Dec. 9-12, 2022, pp. 1-2, <https://doi.org/10.1109/ACES-China56081.2022.10064997>.
- Simonazzi M.; Sandrolini L.; Iotti M.; Mariscotti A.; “Deep-Learning Based Transient Identification in Switched-Mode Power Supplies Conducted Emissions”, 2022 International Symposium on Electromagnetic Compatibility – EMC Europe, Gothenburg, Sweden, Sep. 5-8, 2022, pp. 410-414, <https://doi.org/10.1109/EMCEurope51680.2022.9900994>.
- Simonazzi M.; Sandrolini L.; Campanini A.; Alberto J.; Mariscotti A., “Center-Fed Resonator Array for Increased Misalignment Tolerance in Automotive Wireless Power Transfer”, 2022 IEEE 21st Mediterranean Electrotechnical Conference (MELECON), Palermo, Italy, June 14-16, 2022, pp. 775 – 779, <https://doi.org/10.1109/MELECON53508.2022.9842937>.
- Campanini A.; Simonazzi M.; Bosi M.; Rossi C., “Design and Comparison Between PSFB and LLC 400/48V DC/DC Stage for On-Board Battery Charger During Total and Partial CC-CV Charging Cycles”, 2022 IEEE 21st Mediterranean Electrotechnical Conference (MELECON), Palermo, Italy, June 14-16, 2022, pp. 1102 – 1106, <https://doi.org/10.1109/MELECON53508.2022.9842914>.
- Simonazzi M.; Sandrolini L., “Conducted Emission Analysis of a Near-Field Wireless Power Transfer System”, in: Proc. 2021 IEEE 15th International Conference on Compatibility, Power Electronics and Power Engineering, CPE-POWERENG 2021, Florence, Italy, June 14-16, 2021, pp. 1 – 6, <https://doi.org/10.1109/CPE-POWERENG50821.2021.9501177>.
- Simonazzi M.; Campanini A.; Sandrolini L.; Rossi C., “Single Stage Wireless Power Transfer Battery Charger for Electric Vehicles”, 2021 IEEE 15th International Conference on Compatibility, Power Electronics and Power Engineering (CPE-POWERENG), Florence, Italy, July 14-16, 2021, pp. 1 – 6, <https://doi.org/10.1109/CPE-POWERENG50821.2021.9501183>.

- Simonazzi M.; Sandrolini L.; Reggiani U., “Magnetic near Field Investigation and Shielding Effectiveness Evaluation of an Inductive Power Transfer System with a Resonator Array”, 2020 International Symposium on Electromagnetic Compatibility - EMC EUROPE, EMC EUROPE 2020, Rome, Italy - Virtual, Sep. 23-25, 2020, pp. 1 - 5, <https://doi.org/10.1109/EMCEUROPE48519.2020.9245788>.
- Simonazzi M.; Sandrolini L.; Zarri L.; Reggiani U.; Alberto J., “Model of Misalignment Tolerant Inductive Power Transfer System for EV Charging”, IEEE ISIE 2020 29th IEEE International Symposium on Industrial Electronics, Delft, The Netherlands – Virtual, June 17-19, 2020, pp. 1617 – 1622, <https://doi.org/10.1109/ISIE45063.2020.9152242>.

Technical Reports ○ Sandrolini, L.; Simonazzi, M. 2021. Modellazione Elettromagnetica di Tamponature con Accumulo Elettrico Integrato. Report RdS/PTR2021/135 Ricerca di Sistema Elettrico, Accordo di Programma Ministero dello Sviluppo Economico (Ministero della Transizione Ecologica) - ENEA, Piano Triennale di Realizzazione 2019-2021.

External Collaborations

- Dec 2020 - Current **Department of Energy and System Engineering (DESTEC), *University of Pisa***
 Since December 2020, a collaboration has been ongoing with Prof. Sami Barmada and Prof. Nunzia Fontana of the DESTEC department of the University of Pisa. The main objective of the activity is to deepen the study of magnetic metamaterials operating at low frequencies. Simulation and experimental verifications of metamaterial prototypes were jointly conducted. The research activity is testified by various publications in journals and contributions to international conferences.
- Sep 2020 - Current **Department of Naval, Electrical, Electronic and Telecommunications Engineering (DITEN), *University of Genoa***
 Starting from 2020, research activity is underway with Dr. Andrea Mariscotti of the University of Genoa in the field of electromagnetic compatibility (EMC) and wireless power transfer (WPT) systems. In particular, the analysis (both experimental and numerical) is aimed at modelling the emissions conducted by switching converters, with particular attention to converters for WPT applications. Resonator arrays have also been studied as systems such as position sensors, both for stand-alone applications and as combined systems for wireless power transmission. The research activity has led to the publication of several articles and contributions in international conferences.
- Feb 2022 - Dec 2022 **Department of DC systems, Energy conversion & Storage, *TU Delft***
 The international collaboration has been carried out in place of the research period abroad, which was cancelled due to the COVID-19 pandemic. The research was focused on the analysis of electromagnetic interference (EMC) in the power supply of WPT systems for automotive applications, being the main limit to the large-scale diffusion of this technology. Furthermore, a specific circuit model has been developed for the representation of planar windings with magnetic core typically used in high-power WPT systems.

Projects

- Sep 2019 - Dec 2021 **Ricerca di Sistema Elettrico, *ENEA***
 The activity named “Electromagnetic modelling of infills with integrated electrical storage”, coordinated by Prof. Leonardo Sandrolini as part of the project “Ricerca di Sistema Elettrico” managed by the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), was carried out. It aimed at evaluating the shielding effectiveness (SE) of special bricks with integrated electrochemical accumulators through *ad hoc*-developed electromagnetic models and experimental measurements on prototypes.

Jul 2020 - Jul 2021 **3D Electromagnetic Simulation of Diagnostic Instrumentation for Accelerated Particle Beams**, *ENEA - Frascati*

As part of a research project on particle accelerators for oncology therapies coordinated by the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), a study on diagnostic instruments for accelerated particle beams has been carried out. In particular, different configurations of beam particle monitors (BPMs) were analysed using 3D electromagnetic simulations in order to optimise their geometry and position within the accelerator.

Editorial Activities

Reviewer for the international scientific journals:

- IEEE Transaction on Power Electronics
- IEEE Transaction on Magnetics
- MDPI Energies
- MDPI Applied Sciences
- IET Power Electronics

The undersigned authorises the use and processing of personal data pursuant to Italian Legislative Decree no. 196 dated 30 June 2003.

Bologna, 2nd November 2023

Mattia Simonazzi

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