

Alex Pacini

Curriculum Vitae

Villach, 9500, AT
alexpacini.gitlab.io
alexpacini90@gmail.com



“The noblest pleasure is the joy of understanding.”

Leonardo da Vinci

Biography

Alex Pacini, Ph.D., is currently employed in Infineon Austria, working as Power System Application Engineer in the Optimized Power Transfer, Innovation Lab group.

Sustainability, freedom, and open-knowledge enthusiast, he is a lifelong learner and enjoys challenges requiring an interdisciplinary approach to problem-solving, along with creativity, intuition, and critical thinking. He can independently handle complex and diverse projects from feasibility study to end product. He enjoys collaboration, sharing of ideas and knowledge, and has a strong desire to drive future discoveries. Eager to improve, especially from his own mistakes, he is the first to criticize and question his own work and to demand correctness.

His core interests are in Power Electronics, as Inductive Power Transfer, Resonant Power Converters and Power System Design using WBG, in Electromagnetic Theory, and in RF/Microwave Circuit and System Design.

He is an IEEE Member (#92465702) and a reviewer for the “IEEE Transactions on Microwave Theory and Techniques”, “IEEE Transactions on Industrial Electronics”, “IEEE Transactions on Power Electronics”, “IEEE Access” and for the “International Journal of Microwave and Wireless Technologies”.

Education

2015 – 2019 **PhD in Electronics, Telecommunications, and Information Technologies Engineering**, *Alma Mater Studiorum - University of Bologna*, Cesena & Bologna, graduated in April 2019 with *Excellent, summa cum laude*

Thesis **Design of Novel Systems for Position Independent Energy and Data Transfer.**

DOI: 10.6092/unibo/amsdottorato/8930.

During the PhD I developed a theoretical and experimental framework for the modelling, analysis and design of a complete position independent energy and data transfer system for industrial applications. It provides a constant output dc voltage, without any feedback, while enabling passive rx localisation. The link operates at 6.78MHz and is based on geometrically optimized coils, GaN Class EF inverters connected in *virtual series* and on a SiC Class E rectifier. It delivers over 100W with a dc-dc efficiency of 83%. A data link with over 100Mb/s of bandwidth and high resilience to interference is integrated to provide a complete data and power transfer solution.

Additionally, I developed solutions for omnidirectional powering of miniaturized and loosely coupled (< 1%) medical implants.

Other responsibilities included co-supervising final year master students, writing project deliverables and teaching assistance.

Awards *Design of a Position and Load Independent dc-to-dc Wireless Power Transfer System for Moving Applications*

- COST IC1301 Meeting 2017 Poster Session Winner, Porto, PT
- CPS 2017 Poster Session Winner, Cambridge, UK

Wireless Networks: From Energy Harvesting to Information Processing

- CTTC 2015 Summer School Student Design Competition Winner, Barcelona, Spain

2012 – 2015 **MS in Electrical and Telecommunication Engineering for Sustainable Development, Alma Mater Studiorum - University of Bologna, Cesena**, graduated in June 2015 with *110/110, summa cum laude*

Thesis **Approccio Teorico e Numerico per la Selezione di Topologie d'Antenna Miniaturizzate su Substrati Magneto-Dielettrici.**

The thesis theoretically demonstrates the design rules to select the best magneto-dielectric material for a certain antenna topology, which provides the best compromise between miniaturization, bandwidth and radiation efficiency.

Awards *Wearable miniaturized magneto-dielectric antennas for Body Area Network and Wireless Power Transmission applications*

- MTT-S Undergraduate/Pre-graduate Scholarship for Fall 2013, IEEE Microwave Theory and Techniques Society, Tampa, FL, USA

2009 – 2012 **BS in Electrical, Computer Science and Telecommunication Engineering, Alma Mater Studiorum - University of Bologna, Cesena**, graduated in October 2012 with *110/110, summa cum laude*

Thesis **Studio di topologie d'antenne su substrati magneto-dielettrici.**

The thesis studied the state-of-the-art of magneto-dielectric materials, and developed a transmission line theory to define new rules to select optimized antenna topologies.

Other activities included the position as a student representative for the degree programme.

2004 – 2009 **Perito Capotecnico, Elettronica e Telecomunicazioni, ITIS Leonardo da Vinci, Rimini**

Awards *WAVE, Waves As Virtual Eyes*

This project consisted in an ultrasound extended reality belt aimed to assist and guide blind people.

- Expo Science Europe 2010, Moscow, Russia
- 2010 Intel Excellence in Computer Science Award
- I Giovani e le Scienze 2010, Milano, Italy
- Concorso CNA/CAR 2009, Rimini, Italy

Work Experience

04/22 – **Power System Application Engineer, Infineon Technologies AG, Villach, Austria**
present Power System Application Engineer in the Optimized Power Transfer, Innovation Lab group.

11/20 – **Product Definition Engineer, Infineon Technologies AG, Villach, Austria**
03/22 Product Definition Engineer for high voltage GaN power devices.

11/18 – **Electronics Engineer, Metaboards, Oxford UK, *metaboards.com***

10/20 Metaboards is a spin-out from Oxford University focused on metamaterials for inductive power transfer. Responsible for the R&D and project definition of power and RF hardware solutions and to provide the hardware as a system to demonstrate the metamaterial design. This includes feasibility study, specification, design, simulation, testing, failure analysis, and documentation.


- 04/18 – **Visiting PhD Student – Imperial College, London, UK**, “*Position Readout by Current Sensing in a Position and Load Independent Sliding IPT*”, Control and Power Research Group, Prof. Paul Mitcheson
 07/18 Designed, built and measured a transmitter side and feedback-less receiver position sensing mechanism with sub-cm accuracy for IPT applications. See my PhD thesis for more details.
- 03/18 – **Contract Researcher – Alma Mater Studiorum, Università di Bologna**, “*Experimental Characterization of an Inductive Link between Planar Coils*”
 04/18 Characterisation in term of its quality factors and coupling coefficients for different distances between coils. This was performed with a VNA and custom post-processing Python scripts.
- 12/17 – **Contract Researcher – Alma Mater Studiorum, Università di Bologna**, “*Experimental Characterization of a Wearable RFID Tag at 2.45GHz*”
 01/18 Antenna Gain, Link Budget and EMI measurements.
- 05/17 **Visiting PhD Student – Imperial College, London, UK**, “*Measurements of a Position-Independent Sliding IPT*”, Control and Power Research Group, Prof. Paul Mitcheson, Supported by COST IC1301 (WiPE)
 The multi-coil system [2] designed in the previous STSM has been built, optimised and characterised. The total measured dc-dc efficiency at 100W is 83%, independent of receiver’s position.
- 02/17 – **Teaching Assistant – Alma Mater Studiorum, Università di Bologna, Forlì**, “*Elettrotecnica (Circuit Theory)*”, Prof. Franco Mastri
 09/18 Assistant for all the tasks related to lectures, from classroom exercises to exam corrections. Designed a \LaTeX template for exam typesetting (cesenaexam on CTAN).
- 07/16 – **Visiting PhD Student – Imperial College, London, UK**, “*Position-Independent Sliding Inductive WREL*”, Control and Power Research Group, Prof. Paul Mitcheson, Supported by COST IC1301 (WiPE)
 09/16 Designed a 6.78 MHz position and load independent IPT system, composed of multiple transmitting constant current GaN Class EF inverters and a SiC Class E rectifier, for an output power of 100W. The work was completed in the following STSM and published in [2].
- 06/15 – **Contract Researcher – Alma Mater Studiorum, Università di Bologna, Cesena**,
 09/15 “*Design of UWB planar antennas on unconventional magneto-dielectric substrates*”
 This work consisted in the development of a transmission line method for the characterisation of magneto-dielectric substrates and the design of an optimal antenna as defined in [3].
- 03/12 – **Internship – Alma Mater Studiorum, Università di Bologna, Cesena**, “*Electromagnetic Characterization and Modelling of Magneto-Dielectric Composites*”
 06/12
- 06/08 – **BL Elettronica**, *Design, test and repair of PCB for industrial systems*
 08/08
- 06/07 – **BL Elettronica**, *Design, test and repair of PCB for industrial systems*
 08/07
- 06/05 – **Waeco Italcold**, *Production of portable refrigerators*
 09/05


Other Skills


- Hardware** RF/Power Lab Equipment, Fault Finding, EMC, Embedded HW Design, PCB design (KiCad, Altium) and assembly, 3D printing, Test Driven Development.
- Software** Python, C, \LaTeX , Linux, git, svn, FreeRTOS, RegEx, protobuf, make/CMake, CI (GitLab, BitBucket), Jira, Docker, FreeCad, Web Design.
- Simulation** Advanced Design System (ADS), SPICE (NGspice, Xyce, LTspice, Simetrix), CST Microwave Studio.

Publications



 alexpacini.gitlab.io/pubs.html

 0000-0002-0316-4989

 scholar.google.com/citations?user=zBUuFHEAAAAJ

Journal Papers

- [1] A. Pacini, F. Mastri, D. Masotti, and A. Costanzo, "Criticality Mitigation in a Quasi-Constant Coupling Position Independent Resonant IPT Network," *International Journal of Microwave and Wireless Technologies*, vol. 10, no. 8, pp. 911–920, Jun. 2018. DOI: 10.1017/S1759078718000788.
- [2] A. Pacini, A. Costanzo, S. Aldhafer, and P. D. Mitcheson, "Load- and Position-Independent Moving MHz WPT System Based on GaN-Distributed Current Sources," *IEEE Transactions on Microwave Theory and Techniques*, vol. 65, no. 12, pp. 5367–5376, Dec. 2017. DOI: 10.1109/tmtt.2017.2768031.
- [3] A. Pacini, A. Costanzo, and D. Masotti, "A Theoretical and Numerical Approach for Selecting Miniaturized Antenna Topologies on Magneto-Dielectric Substrates," *International Journal of Microwave and Wireless Technologies*, vol. 7, no. 3-4, pp. 369–377, May 2015. DOI: 10.1017/s1759078715000859.

Conference and Workshop Papers

- [4] A. Pacini, F. Berra, D. Masotti, and A. Costanzo, "Uniform sliding system for Simultaneous WPT and Communication Data Transfer," in *2019 IEEE Radio and Wireless Symposium (RWS)*, Jan. 2019. DOI: 10.1109/rws.2019.8714337.
- [5] A. Pacini, F. Benassi, D. Masotti, and A. Costanzo, "Design of a Miniaturized Omni-Directional RF-to-dc IR-WPT," in *2018 IEEE Wireless Power Transfer Conference (WPTC)*, Jun. 2018. DOI: 10.1109/wpt.2018.8639104.
- [6] A. Pacini, F. Benassi, D. Masotti, and A. Costanzo, "Design of a RF-to-dc Link for in-body IR-WPT with a Capsule-shaped Rotation-insensitive Receiver," in *2018 IEEE MTT-S International Microwave Symposium (IMS)*, Jun. 2018, pp. 1289–1292. DOI: 10.1109/MWSYM.2018.8439499.
- [7] A. Pacini, A. Costanzo, and D. Masotti, "Position-Independent Wireless Power Transfer in Sliding Inductive Links," in *2018 48th European Microwave Conference Workshop WF-06*, Institute of Electrical & Electronics Engineers (IEEE), Sep. 2018.
- [8] A. Pacini, A. Costanzo, and F. Mastri, "Single or Distributed Inverter for Position Independent Inductive Power Transfer: Comparison of Solutions," in *2nd URSI Atlantic Radio Science Meeting*, May 2018.
- [9] A. Pacini, A. Costanzo, S. Aldhafer, and P. D. Mitcheson, "Design of a Position-Independent End-to-End Inductive WPT Link for Industrial Dynamic Systems," in *2017 IEEE MTT-S International Microwave Symposium (IMS)*, Jun. 2017, pp. 1053–1056. DOI: 10.1109/MWSYM.2017.8058774.
- [10] A. Pacini, F. Mastri, R. Trevisan, A. Costanzo, and D. Masotti, "Theoretical and Experimental Characterization of Moving Wireless Power Transfer Systems," in *2016 10th European Conference on Antennas and Propagation (EuCAP)*, Institute of Electrical and Electronics Engineers (IEEE), Apr. 2016, pp. 1–4. DOI: 10.1109/eucap.2016.7481913.
- [11] A. Pacini, F. Mastri, R. Trevisan, D. Masotti, and A. Costanzo, "Geometry Optimization of Sliding Inductive Links for Position-Independent Wireless Power Transfer," in *2016 IEEE International Microwave Symposium*, Institute of Electrical & Electronics Engineers (IEEE), May 2016. DOI: 10.1109/mwsym.2016.7540073.
- [12] A. Pacini, A. Costanzo, and D. Masotti, "A Theoretical and Numerical Approach for Selecting Miniaturized Antenna Topologies on Magneto-Dielectric Substrates," in *2014 44th European Microwave Conference*, Institute of Electrical & Electronics Engineers (IEEE), Oct. 2014. DOI: 10.1109/eumc.2014.6986573.

Language Skills

Italian First Language

English Full Working Proficiency

Others

Diver CMAS International Certificate ★

AVIS Blood Donor – Silver Medal

Driving License EEA – A, B

Villach, AT,
April 18, 2022


Alex Pacini