

Lefteris Kampianakis, Ph.D.

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Profile

I am an Electrical Engineer with 10+ years of experience in designing, integrating, fabricating, and testing electronics for wireless communication systems, sensors, backscatter tags and medical devices. I am currently working as a Senior Applications Engineer with Cirtec Medical

Technical Interests and Expertise

- System-level design of sensors and communication systems
- Low power & high data-rate backscatter tags
- Low power implantable communication systems
- Software-defined radio receivers
- Wireless power transfer for implantable devices

Education

University of Washington, Electrical Engineering

Seattle, WA, USA

Ph.D., Thesis: "High data-rate low-power wireless communication systems for brain computer interfaces"

March 2019

Advisor: Prof. Matthew Reynolds

Technical University of Crete, Electronic & Computer Engineering

Chania, Greece

M.Sc., Thesis: "Scatter radio sensor network with analog frequency modulation principles"

July 2014

Advisor: Prof. Aggelos Bletsas

Diploma of Eng. (5 year program), Thesis: "Custom over the air programmable embedded radios"

December 2011

Advisor: Prof. Aggelos Bletsas

Selected Work Experience

More information and multimedia available at <http://ekampianakis.github.io/projects.html>

Senior Applications Engineer, Integrated Circuits Dept., Manager: Andrew Kelly

Cirtec Medical

Solace Implantable Pulse Generator / Outreach

May 2019 - Today

- Tech-leading the "Solace" implantable pulse generator platform. Assembled and coordinated engineering team and lead the project migration and verification and validation. Developed verification and validation methods and systems, and upgraded firmware and hardware components.
- Designed and fabricated custom embedded automated testing system, saving approximately 800 hours of manual testing.
- Conducted system feasibility studies, simulations and IC debugging using Matlab and Cadence Virtuoso.
- Represented the company in 6 conferences, composed abstracts and presentations, attracted new customers.

Graduate Researcher, Advisor: Prof. Matthew Reynolds

University of Washington

NSF: Center for Sensorimotor Neural Engineering project "Wireless Bidirectional BCI"

Sept. 2014–March 2019

- Developed 24 Mbps backscatter-based implantable systems using software defined radios, custom RF physical layer communication, and real-time signal processing; demonstrated 5x data-rate improvement compared to prior art. [J1,J2,J3,C2,P2]
- Designed and implemented wireless, μ Power interface for translating the input spectrum of existing neural recording ICs using analog circuit design simulation and fabrication; demonstrated spectral improvement of 19 dB and allowed the reuse of expensive custom ICs. [C1]

Amazon Catalyst Fellow

University of Washington

Amazon Inc.-funded project "Automated Continuous Bladder Irrigation (ACBI)"

June 2017–May 2019

- Developed real-time hardware and firmware for embedded sensor/actuation system to monitor and control the medical procedure of continuous bladder irrigation. The developed device could save \$285 million per year on healthcare in the United States alone. [P1]

Graduate Researcher, Telecom Lab, Advisor: Prof. Aggelos Bletsas

Technical University of Crete

ERC-04-BLASE research project "Backscatter Networks for Large-Scale Environmental Sensing"

Dec. 2011–Aug. 2014

- Designed and implemented low-power agricultural/environmental sensor network hardware, firmware, and custom physical layer communication, and signal processing; first demonstration of wireless backscatter sensor network in real-world application. [J4,J5,C4,C5,C6]

Independent Contractor, Supervisor: Prof. Konstantinos Providakis

Technical University of Crete

THALES Programme: "Wireless Admittance Monitoring System (WiAMS)"

Jan. 2011–Jan. 2013

- Developed a novel wireless real-time monitoring system for structural integrity assessment of concrete structures using piezoelectric sensors; successfully detected cracks in concrete structures in real-time. [J7,J8]
- Designed and fabricated driving circuit for an admittance measuring system using precision DACs and ADCs. Designed MySQL database with query optimization, UNIX shell scripting and custom driver development for the Raspberry Pi to interface the driving circuit.

Technical skills

Embedded Systems: 8051, ATmega128, Cortex M0+, Silabs/TI Radios, Arduino, Xilinx FPGA/CPLD, VHDL

CAD & Simulation: HFSS, ADS, Eagle Board Design, AutoCAD, TiNA, LTSpice, Cadence

Software Tools: Matlab, C/C++, Java, GnuRadio, Python, Cuda, UNIX Shell scripting, MySQL, CORBA, Java RMI, IDL, Fortran

Circuit Prototyping/Testing: PCB Milling, RF & SMD Board Fabrication, Testing using VNA, SA, SG, Oscilloscope

Leadership

Technical: Tech-Lead for Solace IPG Platform Hardware (2019-2020), IEEE RFID 2017 organizing committee member

Teaching: Teaching and lab assistant for 4 classes (2011-2012), Paid tutor for Matlab, C, Java, Fortran (2010-2014)

Awards/Achievements

Publications: 8 Peer-reviewed Journal publications, 10 Conference publications (IEEE & other), 2 Patents (filed), 2 Theses

Best Paper/Poster: Best Poster, IEEE RFID 2017, Best paper (finalist), IEEE RFID 2017, Top 10% Qualification, IEEE Sensors 2017

Grants: Amazon Catalyst Grant for Project "ACBI", NCESD Grant for Solar Car Project "Hephaestus"

Academic: 3rd Place in health innovation challenge (HIC) in 2017, 1st Prize at the Pan-Hellenic IEEE Final/Diploma Thesis Competition for the years 2009-2011, Graduate Fellowship Award from Technical University of Crete 2011-2013,

Athletic/Arts: 2nd Place in the Pan-Cretan Prelim Olympic Weightlifting Championship 2014, Professional Greek Folk Dancing 2009-2012

Patent Applications

[P1]: PCT/US2017/637,311. System and Method for Automated Urine Assessment and Monitoring. Filed 3/1/2018

[P2]: PCT/US2017/016,573. Antenna Elements, Implanted Devices, and Systems for Communication With Implanted Devices. Filed 2/3/2017

Selected Peer-reviewed Journal Publications

[J1]: **E. Kampianakis**, A. Sharma, James Rosenthal and M. S. Reynolds "Wideband UHF DQPSK Backscatter Communication in Reverberant Cavity Animal Cage Environments ", in IEEE Trans. on Antennas and Propagation (TAP), June 2018. (Submitted)

[J2]: **E. Kampianakis**, A. Sharma, J. T. Arenas and M. S. Reynolds "A Dual-Band Wireless Power Transfer and Backscatter Communication Approach for Real-Time Neural/EMG Data Acquisition", IEEE Journal of Radio Frequency Identification (JRFID), vol. 1, no. 1, pp. 100-107, March 2017.

[J3]: A. Sharma, **E. Kampianakis** and M. Reynolds. "A dual-band HF and UHF antenna system for implanted neural recording and stimulation devices", in IEEE Antennas and Wireless Propagation Letters, vol. 16, pp. 493-496, 2017.

[J5]: **E. Kampianakis**, J. Kimionis, K. Tountas, C. Konstantopoulos, E. Koutroulis and A. Bletsas "Wireless Environmental Sensor Networking with Analog Scatter Radio and Timer Principles", in IEEE Sensors Journal, vol. 14, no. 10, pp. 3365-3376, Oct. 2014.

[J4]: S. N. Daskalakis, S. D. Assimonis, **E. Kampianakis** and A. Bletsas. "Soil moisture Scatter Radio Networking with Low Power", IEEE Trans. on Microwave Theory and Techniques (TMTT), vol. 64, no. 7, pp. 2338-2346, July 2016.

[J6]: A. Bletsas, A. Vlachaki, **E. Kampianakis**, G. Sklivanitis, J. Kimionis, K. Tountas, M. Asteris, and P. Markopoulos, "Building the low-cost digital garden as a telecom lab exercise", in IEEE Pervasive Computing, vol. 12, no. 1, pp. 48-57, Jan.-Mar. 2013.

[J7]: C. P. Providakis, S. Tsistrakis, M. Voutetaki, Y. Tsompanakis, M. Stavroulaki, J. Agadakos, **E. Kampianakis** and G. Pentes, "A new damage identification approach based on impedance-type measurements and 2D error statistics", Structural Monitoring and Maintenance, vol. 2, no. 4, pp. 319-338, June 2015.

[J8]: C. P. Providakis, E. V. Liarakos, and **E. Kampianakis**, "Nondestructive Wireless Monitoring of Early-Age Concrete Strength Gain Using an Innovative Electromechanical Impedance Sensing System", Smart Materials Research, 2013.

Selected Peer-reviewed Conference Publications

[C1]: **E. Kampianakis** and M. S. Reynolds. "A Biosignal Analog Front-End Leveraging Frequency Translation", in proc. IEEE Sensors 2017.

[C2]: **E. Kampianakis**, A. Sharma and M. S. Reynolds. "A Dual-Band Wireless Power Transfer and Backscatter Communication Approach for Implantable Neuroprosthetic Devices", in proc. IEEE RFID 2017 pp. 67-72. **Best poster award and best paper nomination.**

[C3]: X. Fu, A. Sharma, **E. Kampianakis**, A.P. Engel, D. Arnitz and M. S. Reynolds. "A Low Cost 10.0-11.1 GHz X-Band Microwave Backscatter Communication Testbed with Integrated Planar Wideband Antennas", in proc. IEEE RFID 2016.

[C4]: S. Assimonis, **E. Kampianakis** and A. Bletsas. "Microwave Analysis and Experimentation for Improved Backscatter Radio", in proc. European Conference on Antennas and Propagation (EuCAP), 2014

[C5]: **E. Kampianakis**, S. Assimonis and A. Bletsas. "Network Demonstration of Low-cost and Ultra-low-power Environmental Sensing with Analog Backscatter", in proc. Radio Wireless Week (RWW), Wireless Sensors and Sensor Networks (WiSNet) Topical Conference 2014

[C6]: **E. Kampianakis**, J. Kimionis, K. Tountas, C. Konstantopoulos, E. Koutroulis and A. Bletsas. "Backscatter Sensor Network for Extended Ranges and Low Cost with Frequency Modulators: Application on Wireless Humidity Sensing", in proc. IEEE SENSORS 2013 **Nominated as top %10 among presented papers.**