Alanson P. Sample

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(Full version of C.V. available upon request)

University of Michigan
EECS Department
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RESEARCH INTERESTS

My research efforts focus on enabling new interactive experiences through innovations in sensing and computing devices by applying novel approaches to electromagnetics, RF and analog circuit design, and embedded systems.

EDUCATION

Ph.D. in Electrical Engineering **6/2011**
University of Washington
Dissertation Title: "Cutting the Last Cord with Wireless Power"

M.S. in Electrical Engineering **12/2008**
University of Washington
Thesis Title: "Design of a Battery Free Wireless Identification and Sensing Platform"

B.S. in Electrical Engineering **6/2005**
University of Washington
Area of Concentration: Integrated Circuit Design

NOTABLE RESEARCH PROJECTS

Quasi-Static Resonant Cavity Enabled Wireless Power Transfer **11/2014 - Present**
I led a research team in the development of a new wireless power method based on quasi-static cavity resonance, which generates near-field standing waves that fill the interior of structures with uniform magnetic fields. We have demonstrated a wireless power room capable of safely delivering kilo-watts of wireless power to small coil receivers in nearly any position with 40% to 95% efficiency.

Interactive RFID (ID-Sense / RapID) **11/2014 - Present**
I led a team of researchers in developing an unobtrusive object interaction detection method using battery free UHF RFID tags. By monitoring changes in the low-level communication channel parameters it is possible to classify a wide variety of events and interactions. The resulting projects explore new methods of enabling activity detection and inferencing, rapid prototyping of functional user interfaces and enabling natural human robot interaction.

Wireless Identification and Sensing Platform (WISP) **6/2005 – 10/2015**
I developed the hardware and testing tools for the UHF and NFC versions of the WISP, which are programmable, battery-free sensing and computational platforms designed to explore sensor-enhanced RFID applications. WISPs are powered exclusively from harvested RF energy. The UHF WISP has an operating range of over 9 meters, while the NFC version is compatible with many smart phones. The WISPs have been open sourced and to date over 300 WISPs have been donated to over 50 universities around the world. In 2015 Intel announced a vehicle tolling system based the original WISP 4.1 prototype.

Wireless Resonant Energy Link (WREL) **1/2007 – 8/2012**
While at Intel Research Seattle I developed a novel methods of using magnetically coupled resonators to safely and efficiently transmit large amounts of power wirelessly over a distance of several feet. Results where tech transfer to an Intel business unit which announced a laptop and cell phone charging solution in 2012. Later as a Postdoc at the UW, I worked with the Yale School of Medicine to develop a transcutaneous wireless power system to drive an implanted Left Ventricular Assist Device, commonly known as a heart pump, which was used in preliminary animal trials in March of 2013.

EMPLOYMENT

University of Michigan, EECS Department **8/2018 – Present**

Associate Professor

As tenure track faculty in the Electrical Engineering and Computer Science department at the University of Michigan, I lead the Interactive Sensing and Computing lab which focuses on the intersection of Human Computer Interaction, embedded sensing systems, and wireless technology.

Disney Research, Los Angeles **12/2017 – 7/2018**

Executive Lab Director

As the Executive Lab Director of Disney Research in Los Angeles I led researchers in creating new guest experiences through innovations in Robotics, Artificial Intelligence, Computer Vision, and Human Computer Interaction. DRLA is a +30 person, multi-million-dollar research lab focused on delivering scientific & technological innovation to The Walt Disney Company. Duties include overseeing all daily operations, defining research agendas with stake holders, managing lab research activities and tech-transfer projects, hiring research scientists and postdocs, harvesting intellectual property, as well as building relationships with TWDC business units.

Disney Research, Pittsburgh **10/2016 – 12/2017**

Associate Lab Director & Principal Research Scientist

In my role as acting director I lead a +50 person, multi-million-dollar research lab focused on delivering scientific & technological innovation to The Walt Disney Company. Duties include overseeing all daily operations, defining research agendas with stake holders, managing lab research activities and tech-transfer projects, leading talent hiring and retention, protecting and harvesting intellectual property through publications, as well as building relationships with TWDC business units and external universities.

Disney Research, Pittsburgh **12/2013 – 10/2016**

Research Scientist

I led the Wireless Systems group at DRP consisting of 6-10, Associate Research Scientist, Postdocs, interns and consultants, which focuses on enabling new guest experiences and sensing and computing devices by applying novel approaches to electromagnetics, RF and analog circuits, and embedded systems.

Intel Labs **8/2012 – 10/2013**

Research Scientist

My research focus is developing novel energy harvesting techniques and systems for wearable devices and power autonomous sensor nodes.

Computer Science and Engineering Department, UW **6/2011 - 8/2012**

Post-Doctoral Research Associate, Sensor Systems Lab

Led research efforts and supervised graduate students on a number of wirelessly power projects including FREE-D, WREL, WARP, and WISP, as well as taught an introductory electrical engineering class.

Intel Labs **9/2010 - 10/2011**

Graduate Intern

I developed a semi-passive RFID tag reference design for encrypted electronic tolling and security applications. Additionally, I supported efforts to transfer WREL technology from the research lab to internal Intel business groups.

Intel Research, Seattle **9/2008 – 9/2010**

Contract Research Scientist

As part of a two year contract with Intel Labs Seattle, I created methods for wirelessly powering devices at a range of several feet, at high power levels, and with an efficiency >85% using magnetically coupled resonators. These efforts directly led to a spin-off project, which focused on developing a proof of concept for wirelessly powered applications.

EMPLOYMENT (CONTINUED)

Intel Research, Seattle **9/2007 – 9/2008**
Graduate Intern
I was the lead researcher on the Wireless Resonate Energy Link project. The goal of this project was to investigate the feasibility of wirelessly transmitting large amounts of power safely and efficiently using magnetically coupled resonators.

Intel, DEG Architecture and Planning **6/2007 – 9/2007**
Graduate Intern
I was an analog and digital integrated circuit designer for the Ozette test chip, which used a CMOS compatible magnetic layer to enable a high power, on die voltage regulator for microprocessors. My primary responsibility was to design a digital control block for an ADC, which continuously monitored the system and reported an interrupt if limits were met.

MITRE Corporation **2/2007 – 7/2007**
Part Time Contractor
I developed an ambient RF energy harvesting device for a demonstration application. This included working with the customer and third-party vendors to define system specifications. I independently designed, manufactured, assembled, and tested several prototype devices capable of continuously harvesting RF power and storing DC energy for the customer's application.

University of Washington **1/2007 - 6/2007**
Research Assistant, Silicon Systems Research Lab
Designed and taped out a 130nm CMOS RF rectifier and RFID EPC Gen 1 state machine.

Intel Research, Seattle **6/2006 - 1/2007**
Graduate Intern
Designed and prototyped the first working versions of the Wireless Identification and Sensing platform, which had a wirelessly powered range of 4.1 meters from a commercial UHF RFID reader.

University of Washington **1/2006 - 6/2006**
Research Assistant, Sensor Energy and Automation Lab
Led efforts to complete the autonomous robotic cable inspection project that was developed to monitor the health of power distribution cables.

Intel Research, Seattle **6/2005 - 1/2006**
Graduate Intern
Designed and taped out a UHF power harvester and RFID demodulating circuit in 180nm CMOS.

TEACHING EXPERIENCE

EECS 598: Engineering Interactive Systems for HCI **Fall 2018**
University of Michigan

EE 215: Fundamentals of Electrical Engineering **Winter 2012**
University of Washington – Bothell

GRANTS AWARDED

"Development of the NFC-WISP as a standardized framework for wireless power delivery and bidirectional communication with neural implants." Awarded as a seed grant from the Center for Sensorimotor Neural Engineering (NFS Research Center), on September 15, 2011 **Amount: $12,000**

JOURNAL PUBLICATIONS

[J16] "Enabling Interactive Infrastructure with Body Channel Communication"; Virag Varga, Gergely Vakulya, Alanson Sample, and Thomas R. Gross; *Proceedings of the ACM Interactive, Mobile, Wearable Ubiquitous Technologies* (IMWUT); Vol.1, Iss.4, Article 169, 2018 (Presented at UbiComp 2018)

[J15] "Electrical power to run ventricular assist devices using the Free-range Resonant Electrical Energy Delivery system"; Benjamin H. Waters, Jiheum Park, J. Christopher Bouwmeester, John Valdovinos, Arnar Geirsson, Alanson P. Sample, Joshua R. Smith and Pramod Bonde; *The Journal of Heart and Lung Transplantation*; August 2018

[J14] "EM-Comm: Touch Based Communication via Modulated Electromagnetic Emissions"; Chouchang (Jack) Yang and Alanson Sample; *Proceedings of the ACM Interactive, Mobile, Wearable Ubiquitous Technologies* (IMWUT); Vol.1, Iss.3, Article 12, 2017 (Presented at UbiComp 2017)

[J13] "RFID Light Bulb: Enabling Ubiquitous Deployment of Interactive RFID Systems"; Jeremy Gummeson, James Mccann, Chouchang (Jack) Yang, Damith Ranasinghe, Scott Hudson, and Alanson Sample; *Proceedings of the ACM Interactive, Mobile, Wearable Ubiquitous Technologies* (IMWUT); Vol.1, Iss.2, Article 12, 2017 (Presented at UbiComp 2017) - Distinguished Paper Award

[J12] "Quasistatic Cavity Resonance for Ubiquitous Wireless Power Transfer;" Matthew J. Chabalko, Mohsen Shahmohammadi and Alanson P. Sample*; PLOS ONE*; February 2017

[J11] "Electromagnetic Time Reversal Focusing of Near Field Waves in Metamaterials"; Matthew J. Chabalko and Alanson P. Sample; *Applied Physics Letters*; 109, December 2016

[J10] "3-Dimensional Charging via Multi-Mode Resonant Cavity Enabled Wireless Power Transfer"; Matthew J. Chabalko and Alanson P. Sample; *IEEE Transactions on Power Electronics*; November 2015

[J9] "Resonant Cavity Mode Enabled Wireless Power Transfer"; Matthew J. Chabalko and Alanson P Sample; *Applied Physics Letters;* 105, December 2014

[J8] "Enabling Seamless Wireless Power Delivery in Dynamic Environments"; Alanson P. Sample, Benjamin H. Waters, Scott T. Wisdom, Joshua R. Smith; *Proceedings of the IEEE*; vol.101, no.6, pp.1343-1358, June 2013

[J7] "Evaluation of Wireless Resonant Power Transfer Systems with Human Electromagnetic Exposure Limits"; Andreas Christ, Mark G. Douglas, John Roman, Emily B. Cooper, Alanson P. Sample, Benjamin H. Waters, Joshua R. Smith, and Niels Kuster; *IEEE Transactions on Electromagnetic Compatibility*; vol.55, no.2, pp.265-274, April 2013

[J6] "Powering a Ventricular Assist Device (VAD) With the Free-Range Resonant Electrical Energy Delivery (FREE-D) System"; Benjamin H. Waters, Alanson P. Sample, Pramod Bonde, and Joshua R. Smith; *Proceedings of the IEEE*; vol.100, no.1, pp.138-149, January 2012

[J5] "Toward Total Implantability Using Free-range Resonant Electrical Energy Delivery System: Achieving Untethered Ventricular Assist Device Operation over Large Distances"; Benjamin H. Waters, Alanson P. Sample, Joshua R. Smith, and Joshua Smith; *Cardiology Clinics*, November 2011, Vol. 29, N.4, pp.609-625

[J4] "Powering a Ventricular Assist Device (VAD) With the Free-Range Resonant Electrical Energy Delivery (FREE-D) System"; Benjamin H. Waters, Alanson P. Sample, Pramod Bonde, and Joshua R. Smith; *Proceedings of the IEEE, Special issue on Cyber-Physical System;* vol.100, no.1, pp.138-149, January 2012

[J3] "Analysis, Experimental Results, and Range Adaptation of Magnetically Coupled Resonators for Wireless Power Transfer"; Alanson P. Sample, David T. Meyer, and Joshua R. Smith. *IEEE Transactions on Industrial Electronics;* vol.58, no.2, pp.544-554, February 2011

JOURNAL PUBLICATIONS (CONTINUED)

[J2] "RFID: From Supply Chains to Sensor Nets"; Sumit Roy, Vikram Jandhyala, Joshua R. Smith, David Wetherall, Brian Otis, R. Chakraborty, Michael Buettner, Daniel J. Yeager, You-Chang Ko, and Alanson P. Sample. *Proceedings of the IEEE*; vol.98, no.9, pp.1583-1592, Sept. 2010

[J1] "Design of an RFID-Based Battery-Free Programmable Sensing Platform"; Alanson P. Sample, Daniel J. Yeager, Pauline S. Powledge, Alexander V. Mamishev, and Joshua R. Smith. *IEEE Transactions on Instrumentation and Measurement*; vol.57, no.11, pp.2608-2615, Nov 2008

CONFERENCE PUBLICATIONS

[C39] "Designing Groundless Body Channel Communication Systems: Performance and Implications"; Virag Varga, Marc Wyss, Gergely Vakulya, Alanson Sample, and Thomas R. Gross" *In Proceedings of the 31st Annual ACM Symposium on User Interface Software and Technology* (UIST); 2018

[C38] "Wall++: Room-Scale Interactive and Context-Aware Sensing"; Yang Zhang, Chouchang (Jack) Yang, Scott E. Hudson, Chris Harrison, and Alanson P. Sample; *ACM Conference on Human Factors in Computing Systems* (CHI), 2018 - Best Paper Award

[C37] Force Jacket: Pneumatically-Actuated Jacket for Embodied Haptic Experiences"; Alexandra Delazio, Ken Nakagaki, Roberta Klatzky, Scott E. Hudson, Jill Lehman, and Alanson P. Sample; *ACM Conference on Human Factors in Computing Systems* (CHI), 2018

[C36] "Riding the Airways: Ultra-Wideband Ambient Backscatter via Commercial Broadcast Systems"; Chouchang (Jack) Yang, Jeremy Gummeson and Alanson P. Sample; *IEEE International Conference on Computer Communications* (INFOCOM), May 1-4, 2017

[C35] "Circuit Model for Resonant Cavity Mode Enabled Wireless Power Transfer"; Mohsen Shahmohammadi, Matt Chabalko and Alanson P. Sample; *2016 European Microwave Conference* (EuMC), October 3–7, 2016

[C34] "RapID: A Framework for Fabricating Low-Latency Interactive Objects with RFID Tags"; Andrew Spielberg, Alanson Sample, Scott E. Hudson, Jennifer Mankoff, and Jim McCann; *ACM Conference on Human Factors in Computing Systems* (CHI), May, 2016 Best Paper Award

[C33] "PaperID: A Technique for Drawing Functional Battery-Free Wireless Interfaces on Paper"; Hanchuan Li, Eric Brockmeyer, Elizabeth J. Carter, Josh Fromm, Scott E. Hudson, Shwetak N. Patel, and Alanson P. Sample; *ACM Conference on Human Factors in Computing Systems* (CHI), May 7–12, 2016

[C32] "ID-Match: A Hybrid Computer Vision and RFID System for Recognizing Individuals in Groups"; Hanchuan Li, Peijin Zhang, Samer Al Moubayed, Shwetak N. Patel, and Alanson P. Sample; *ACM Conference on Human Factors in Computing Systems* (CHI), May 7–12, 2016

[C31] "EM-ID: Tag-less Identification of Electrical Devices via Electromagnetic Emissions"; Chouchang (Jack) Yang and Alanson P. Sample; *IEEE International Conference on RFID*, May 3-5, 2016 Winner Best Demo/Poster Nominated for the Best Paper Award

[C30] "High-Q, Over-Coupled Tuning for Near-Field RFID Systems"; Mohsen Shahmohammadi, Matt Chabalko, and Alanson P. Sample; *IEEE International Conference on RFID*, May 3-5, 2016

[C29] "An Energy-interference-free Hardware/Software Debugger for Intermittent Energy-harvesting Systems"; Alexei Colin, Graham Harvey, Brandon Lucia, and Alanson P. Sample; *International Conference on Architectural Support for Programming Languages and Operating Systems* (ASPLOS '16), April 2–6, 2016

[C28] "EMSense: Recognizing Handled, Uninstrumented, Electro-Mechanical Objects Using Software-Defined Radio"; Gierad Laput, Chouchang (Jack) Yang, Robert Xiao, Alanson P. Sample, and Chris Harrison; *ACM User Interface Software and Technology Symposium* (UIST), November 8-11, 2015 Awarded Best Talk

CONFERENCE PUBLICATIONS (CONTINUED)

[C27] "Energy-Interference-Free System and Toolchain Support for Energy-Harvesting Devices"; Alexei Colin, Alanson P. Sample, and Brandon Lucia; *IEEE International Conference on Compilers, Architecture and Synthesis for Embedded Systems* (CASES), October 4-9, 2015

[C26] "Self-Localizing Battery-Free Cameras"; Saman Naderiparizi, Yi (Eve) Zhao, James Youngquist, Alanson P. Sample, and Joshua R. Smith; *ACM International Joint Conference on Pervasive and Ubiquitous* Computing (UBICOMP), September 7-11, 2015

[C25] "Electric Field Coupling to Short Dipole Receivers for Cavity Mode Enabled Wireless Power Transfer"; Matthew J. Chabalko and Alanson P. Sample; *IEEE Antennas and Propagation Symposium* (APS), July 19-24, 2015

[C24] "IDSense: A Human Object Interaction Detection System Based on Passive UHF RFID"; Hanchuan Li, Can Ye, and Alanson P. Sample; *ACM Conference on Human Factors in Computing Systems* (CHI), April 18-24, 2015

[C23] "NFC-WISP: A Sensing and Computationally Enhanced Near-Field RFID Platform"; Yi (Eve) Zhao, Joshua R. Smith, and Alanson P. Sample; *IEEE International Conference on RFID*, April 15-17, 2015 Nominated for the Best Paper Award

[C22] "WINDWare: Supporting ubiquitous computing with passive sensor enabled RFID"; Asanga Wickramasinghe, Damith C. Ranasinghe, and Alanson P. Sample; *IEEE International Conference on RFID;* April 8-10, 2014

[C21] "Wirelessly Powered Bitstable Display Tag"; Jeremy Gummeson, Aaron Parks, Artem Dementyev, Deepak Ganesan, Joshua Smith, and Alanson P. Sample; *ACM International Joint Conference on Pervasive and Ubiquitous Computing* (UbiComp 2013); September 8-12, 2013 Nominated for the Best Paper Award

[C20] "Sensor Enabled Wearable RFID Technology for Mitigating the Risk of Falls Near Beds"; Roberto L. Shinmoto Torres, Qinfen Shi, Alanson P. Sample, and Damith C. Ranasinghe; *IEEE International Conference on RFID*; April 30 – May 2, 2013 Nominated for the Best Paper Award

[C19] "A Wireless Sensing Platform Utilizing Ambient RF Energy"; Aaron Parks, Alanson Sample, Yi Zhao, and Joshua R. Smith; *IEEE Topical Meeting on Wireless Sensors and Sensor Networks (WiSNET)*; January 20-23, 2013

[C18] "Towards falls prevention: A wearable wireless and battery-less sensing and automatic identification tag for real time monitoring of human movements"; Damith C. Ranasinghe, Roberto L. Shinmoto Torres, Alanson P. Sample, Joshua R. Smith, Keith Hill, and Renuka Visvanathan; *International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*; August 28 - September 1, 2012

[C17] "Adaptive Impedance Matching for Magnetically Coupled Resonators"; Benjamin H. Waters, Alanson P. Sample, and Joshua R. Smith; *Proceedings of PIERS*; August 19-23, 2012

[C16] "Optical Localization of Passive UHF RFID Tags with Integrated LEDs"; Alanson P. Sample, Craig Macomber, Liang-Ting Jiang, and Joshua R. Smith; *IEEE International Conference on RFID*; April 3-5, 2012 Nominated for the Best Paper Award

[C15] "Promise of unrestricted mobility and freedom with wireless powering of a Ventricular Assist Device (VAD)"; Benjamin Waters, Alanson Sample, Joshua Smith, Pramod Bonde; *19th congress of the International Society of Rotary Blood Pumps*; September 8-10, 2011 Winner of the Sezai Innovation Research Award

CONFERENCE PUBLICATIONS (CONTINUED)

[C14] "Wireless Power for Ventricular Assist Devices: Innovation with the Free-Range Resonant Electrical Energy Delivery System (FREE-D) for Mechanical Circulatory Assist"; Pramod Bonde, Alanson Sample, Benjamin Waters, Emily Cooper, Yoshiya Toyoda, Robert Kormos, Joshua R. Smith; *Proceedings 91st Annual Scientific Meeting of American Association of Thoracic Surgeons*; May 7-11, 2011

[C13] "Photovoltaic Enhanced UHF RFID Tag Antennas for Dual Purpose Energy Harvesting"; Alanson Sample, Jeff Braun, Aaron Parks, and Joshua Smith; *IEEE International Conference on RFID*; April 12-24, 2011

[C12] "Innovative Free-range Resonant Electrical Energy Delivery System (FREE-D System) for a ventricular assist device using wireless power", Joshua Smith, Alanson Sample, Benjamin Waters, Yoshiya Toyoda, Robert L Kormos, and Pramod Bonde; *American Society for Artificial Internal Organs Journal*; March 2011

[C11] "Numerical Electromagnetic Analysis of Human Exposure for Wireless Power Transfer Systems"; Andreas Christ, Mark G. Douglas, John Roman, Emily B. Cooper, Alanson P. Sample, Joshua R. Smith, and Niels Kuster; *Proceedings of the Tenth International Congress of the European Bioelectromagnetics Association*; February 21-24, 2011

[C10] "A Capacitive Touch Interface for Passive RFID Tags"; Alanson P. Sample, Daniel J. Yeager, and Joshua R. Smith; *2009 IEEE International Conference on RFID*; April 27-28, 2009. Winner of Best Paper Award

[C9] "Experimental Results with Two Wireless Power Transfer Systems"; Alanson P. Sample and Joshua R. Smith; *2009 IEEE Radio and Wireless Symposium;* January 18-22, 2009

[C8] "Demonstration: RFID Sensor Networks with the Intel WISP"; Michael Buettner, Ben Greenstein, Richa Prasad, Alanson P. Sample, Joshua R. Smith, Daniel J. Yeager, and David Wetherall; *6th ACM Conference on Embedded Networked Sensor Systems* (Sensys); November 5-7, 2008 Winner of Best Demo award

[C7] "Revisiting Smart Dust with RFID Sensor Networks"; Michael Buettner, Ben Greenstein, Alanson P. Sample, Joshua R. Smith, and David Wetherall; *Seventh ACM Workshop on Hot Topics in Networks*; October 6-7, 2008

[C6] "Design of a Passive Sensing and Programmable Computational Platform for UHF RFID Systems"; Alanson P. Sample, Daniel J. Yeager, Pauline S. Powledge, and Joshua R. Smith; *IEEE International Conference on RFID*; March 26-28, 2007

[C5] "A Wirelessly-Powered Platform for Sensing and Computation"; Joshua R. Smith, Alanson P. Sample, Pauline S. Powledge, Sumit Roy, and Alexander V. Mamishev; *8th International Conference on Ubiquitous Computin*g; September 17-21, 2006

[C4] "Energy Harvesting in RFID Systems"; Alanson P. Sample, Daniel J. Yeager, Joshua R. Smith, Pauline S. Powledge, and Alexander V. Mamishev; *IEEE International Conference: Actual Problems of Electronic Device Engineering*; September 2006.

[C3] "Sensor Application in RFID Technology"; Daniel J. Yeager, Alanson P. Sample, Joshua R. Smith, Pauline S. Powledge, and Alexander V. Mamishev; *IEEE International Conference: Actual Problems of Electronic Device Engineering*; September 21-22, 2006

[C2] "Mobile Monitoring for Distributed Infrastructures"; Bing Jiang, Alanson P. Sample, and Alexander V. Mamishev; *IEEE International Conference on Mechatronics & Automation*; July 29 - August 1, 2005

[C1] "Autonomous Robotic Monitoring of Underground Cable Systems"; Bing Jiang, Alanson P. Sample, Ryan Wistort, and Alexander V. Mamishev; *IEEE International Conference on Advanced Robotics*; June 17-20, 2005

BOOK CHAPTERS & MAGAZINE ARTICLES

[B6] "An Energy-Aware Debugger for Intermittently Powered Systems"; Alexei Colin, Graham Harvey, Alanson P. Sample, and Brandon Lucia; IEEE Micro, vol.37, no.3, pp.116-125, 2017

[B5] "Building a Toolkit for Fabricating Interactive Objects "; Andrew Spielberg, Alanson Sample, Scott E. Hudson, Jennifer Mankoff and Jim McCann; XRDS: Crossroads - The ACM Magazine for Students, Volume 22 Issue 3, Spring 2016, Pages 38-43

[B4] "The Wireless Identification and Sensing Platform"; Alanson P. Sample and Joshua R. Smith; Wirelessly Powered Sensor Networks and Computational RFID; Pages 33-57; Springer, 2013

[B3] "Wireless Ambient Radio Power"; Alanson P. Sample, Aaron N. Parks, Scott Southwood, and Joshua R. Smith; *Wirelessly Powered Sensor Networks and Computational RFID*; Pages 223-234; Springer, 2013

[B2] "A Portable Transmitter for Wirelessly Powering a Ventricular Assist Device Using the Free-Range Resonant Electrical Energy Delivery (FREE-D) System"; Benjamin H. Waters, Jordan T. Reed, Kara R. Kagi, Alanson P. Sample, Pramod Bonde, and Joshua R. Smith; *Wirelessly Powered Sensor Networks and Computational RFID*; Pages 235-350; Springer, 2013

[B1] "WISP: A Passively Powered UHF RFID Tag with Sensing and Computation"; Daniel J. Yeager, Alanson P. Sample, and Joshua R. Smith. Chapter 14 in the *RFID Handbook: Applications, Technology, Security, and Privacy*, Boca Raton: CRC Press, 2008

PATENTS ISSUED

[P11] US-9,805,233: "Systems and methods for following distinguishing members using tags in combination with a localizing device"; Alanson P. Sample, Hanchuan Li, and Samer Al Moubayed; May 9, 2016

[P10] US-9,805,232: "Systems and methods for detecting human-object interactions"; Alanson P. Sample, and Hanchuan Li; October 21, 2015

[P9] US-9,537,346: "Extendable Wireless Power Delivery for Small Devices"; Emily B. Cooper, Joshua R. Smith, Alanson P. Sample, and John C. Neumann; June 18, 2015

[P8] US-9,473,209: "Wireless Power Transfer Apparatus and Method Thereof"; Alanson P. Sample and Joshua R. Smith; September 30, 2010

[P7] US-9,461,478: "Wireless Power Transfer Apparatus and Method Thereof"; Joshua R. Smith and Alanson P. Sample; October 10, 2012

[P6] US-8,827,889: "Method and System for Powering Implantable Devices"; Joshua R. Smith, Pramod Bonde, Benjamin H. Waters, Alanson P. Sample; September 9, 2014

[P5] US-9,378,446: "Solar Powered RFID Tags and Method of Manufacture Therefore"; Alanson P. Sample and Yuri A. Sylvester; March 14, 2011

[P4] US-8,952,571: "Extendable Wireless Power Delivery for Small Devices"; Emily B. Cooper, John C. Neumann, Alanson P. Sample, Joshua R. Smith; November 5, 2010

[P3] US-8,827,889: "Method and System for Powering Implantable Devices"; Joshua R. Smith, Pramod Bonde, Benjamin H. Waters, Alanson P. Sample; March 15, 2013

[P2] US-8,446,045: "Flat, Asymmetric, and E-field Confined Wireless Power Transfer Apparatus and Method thereof"; Joshua R. Smith, Alanson P. Sample, and Emily B. Cooper; August 20, 2009

[P1] US-8,299,652: "Wireless Power Transfer Apparatus and Method Thereof"; Alanson P. Sample and Joshua R. Smith; April 6, 2010

PATENTS PENDING

[PA12] US-2017-0270198: "EM-ID: Tag-less Identification Of Electrical Devices Via Electromagnetic Emissions"; Chouchang Yang and Alanson P. Sample; March 17, 2017

[PA11] US-2017-0200033: "Systems and Methods for Enabling User Interactions with Wireless Tags"; Hanchuan Li, Josh Fromm, Scott Hudson, Eric Brockmeyer, Elizabeth Carter, Shwetak Patel, and Alanson Sample; May 23, 2016

[PA10] US-2017-0200031: "Systems and Methods for Determining Interaction States of Wireless Tags Based on Probability Distributions"; James McCann, Andrew Spielberg, Scott Hudson, Alanson Sample, and Jennifer Mankoff; April 18, 2016

[PA9] US-2017-0116446: "Automatic object detection and state estimation via electronic emissions sensing"; Chouchang Yang, Gierad Laput, Robert Xiao, Christopher Harrison, and Alanson Sample; Oct 28, 2015

[PA8] 20170124790: "High-Q and Over-Coupled Near-Field RFID Reader Antenna for Improved Tag Read Range"; Alanson P. Sample; October 31, 2015

[PA7] US-2017-0034618: "System and Method for Data Transmission and Power Supply Capability Over an Audio Jack for Moblie Devices"; Indira Negi; Lakshman Krishnamurthy; Brian K. Vogel; Darren S. Crews; Sai Hemachandra Vemprala; Xiaochao Yang; Howard D. Millett; Alexander Essaian; Alanson P. Sample; December 28, 2013

[PA6] US-2016-0164301: "Resonant Cavity Mode Enabled Wireless Power Transfer"; Alanson P. Sample, Matthew J. Chabalko; April 28, 2015

[PA5] US-2016-0043572: "Range Adaptation Mechanism for Wileless Power Transfer"; Emily B. Cooper, Songnan YangCharles J. Bonsavage, Joshua R. Smith, Alanson P. Sample, and Anand S. Konanur; August 14, 2015

[PA4] US-2015-0280444: "Wireless Power Delivery in Dynamic Environments"; Joshua R. Smith, Benjamin Waters, Scott Wisdom, Alanson P. Sample; May 21, 2013

[PA3] US-2012-0153739: "Range Adaptation Mechanism for Wireless Power Transfer"; Emily Cooper, Songnan Byang, Charles J. Bonsavage, Joshua R. Smith, Alanson P. Sample, and Anand S. Konanur; December 21, 2012

[PA2] US-2010-0081379: "Wirelessly Powered Speaker"; Emily B. Cooper, Joshua R. Smith, and Alanson P. Sample; September 25, 2009

[PA1] US-2008-0143192: "Dynamic Radio Frequency Power Harvesting"; Alanson P. Sample and Joshua R. Smith; December 14, 2006

INVITED LECTURES AND SEMINARS

[T19] "Beyond the Charging Pad: Exploring Large Area, 3-Dimensional Wireless Charging"; Alanson P. Sample; *IEEE Radio & Wireless Week* (RWW2019); January 22, 2019; Orlando, FL

[T18] Keynote: "Pushing Beyond the Charging Pad: Exploring large-scale, 3D volume wireless charging using near-field magnetic coupling"; *IEEE MTT-S Wireless Power Transfer* Conference (WPTC); June 3rd-7th, 2018; Montreal, Quebec, Canada

[T17] "Imagining A World Without Wires"; *Accenture's International Utilities and Energy Conference* (IUEC); Alanson P. Sample, April 11, 2018; Paris, France

[T16] "Hacking the RF Phy: Wireless Power Transfer, RF Sensing, Battery-Free Communication and Beyond"; *The Age of Super Sensing: International Conference on Advanced Sensing and Design Technology*; Alanson P. Sample; New York, NY December 13th, 2017

INVITED LECTURES AND SEMINARS (CONTINUED)

[T15] "Hacking the RF Phy: Wireless Power Transfer, RF Sensing, Battery-Free Communication and Beyond"; *University of Rochester: Computer Science Department Seminar Series*; Alanson P. Sample; October 2, 2017

[T14] "Hacking the RF Phy: Wireless Power Transfer, RF Sensing, Battery-Free Communication and Beyond"; *Pennsylvania State University: Department Electrical Engineering Graduate Colloquium Department*; Alanson P. Sample; September 7, 2017

[T13] "Hot Topics in RFID: RFID and Machine Learning"; Alanson P. Sample; *IEEE International Conference on RFID*; May 9-10, 2017; Phoenix, AZ

[T12] "Reading the Waves: Using RFID for Human Object Interaction Detection"; Alanson P. Sample; *RFID Journal Live 2017*; May 10, 2017; Phoenix, AZ

[T11] "Powering the Third Dimension: 3D Volume Charging via Resonant Cavity Enabled Wireless Power Transfer"; Alanson P. Sample; *Wireless Power Summit 2016*; November 10-11, 2016; Seattle, WA

[T10] Keynote: "Running on Empty: Getting Work Done on Battery-Free Energy Harvesting Platforms"; Alanson P. Sample; *IEEE International Symposium on Workload Characterization* (IISWC); September, 25-27 2016; Providence, RI

[T9] "Reading the Waves: Using RFID for Human Object Interaction Detection"; Alanson P. Sample; *RFID Journal Live 2016*; May 4, 2016; Orlando, FL

[T8] "Hacking the RF Phy: Wireless power transfer, RF sensing, battery-free communication and beyond"; Alanson P. Sample; *Carnegie Mellon University, Department of Electrical and Computer Engineering Department Seminar*; December 3, 2015; Pittsburgh, PA

[T7] "Evolving Passive RFID Beyond the Supply Chain with the Wireless Identification and Sensing Platform"; Alanson P. Sample and Joshua R. Smith; *IDTeckEx: Wireless Sensor Networks & RTLS Summit Europe*; June 21, 2011; Munich, Germany

[T6] "WISP Architecture and Programming Model"; Alanson Sample, as part of the workshop on "Reader Essentials: Learn how to build your own RFID Reader"; *Workshop at the IEEE International Conference on RFID*; April 12-24, 2011; Orlando, FL

[T5] "WISP & WARP: Far Field Wirelessly Powered Sensing"; Alanson P. Sample; *University of Washington Computer Science & Engineering Affiliates*; October 27, 2010; Seattle, WA

[T4] "RF Energy Harvesting Techniques and Applications"; Alanson P. Sample; *MEMS International Sensor Symposium 2009*; May 27, 2009; Tokyo, Japan

[T3] "Crossing the Chasm Between Humans and Machines"; Alanson P. Sample; *Intel Developers Forum* (as part of Kevin Kahn's R&D Key Note); October 21, 2008; Taipei, Taiwan

[T2] "Cutting the Last Cord - Wireless Power Transfer"; Alanson P. Sample; *Intel Developers Forum* (as part of Justin Rattner's R&D Key Note); August 21, 2008; San Francisco, CA

[T1] "Wireless Identification and Sensor Platform (WISP)"; Alanson P. Sample; *Texas Instruments Advanced Technical Conferences*; November 9, 2006; Dallas, TX

PROFESSIONAL SERVICE

- PC Member: UIST 2019 - ACM International Conference on Mobile Computing and Networking
- PC Member: UIST 2019 - ACM Conference on Human Factors in Computing Systems
- PC Member: UIST 2017 - ACM Symposium on User Interfaces and Software Technology
- PC Member: CHI 2017 - ACM Conference on Human Factors in Computing Systems
- PC Member: UIST 2016 - ACM Symposium on User Interfaces and Software
- PC Member: UbiComp 2015 - ACM International Joint Conference on Pervasive and Ubiquitous Computing
- PC Member: UbiComp 2014 - ACM International Joint Conference on Pervasive and Ubiquitous Computing
- Technical Program Committee Co-Chair (Sensors): IEEE International Conference on RFID, 2016
- Technical Program Committee Chair: IEEE International Conference on RFID, 2015
- Technical Program Committee Chair: IEEE International Conference on RFID, 2014
- PC Member: IEEE International Conference on RFID, 2013
- Technical Program Committee Co-Chair (Sensors): IEEE International Conference on RFID, 2012
- PC Member: IEEE International Conference on RFID, 2011
- PC Member: IEEE International Conference on RFID, 2010

NOTABLE PRESS COVERAGE

- Mashables "Disney reveals room-filling, wireless-charging breakthrough"; February, 2017
- CBS News: "Scientists turned an entire metal room into a wireless charger"; March 10, 2017
- Gizmodo: "New Scanner Uniquely Identifies Gadgets Just From the Noise They Emit"; May, 2016
- Seattle Times: "Piece of Paper that Connects to Internet? UW/Disney Make it a Reality"; May 2016
- BBC News: Click (TV Program, Aired Live), "The Smartwatch Gets Serious"; Nov 2015
- NBC News: "Disney Smartwatch Knows What You're Touching and Tells You What to Do Next"; November 2015
- The Economist Blog: "A Wireless Heart"; April 12, 2011
- The New York Times: "Bye-Bye Batteries: Radio Waves as a Low-Power Source"; June 18, 2010
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- New York Times: "Smart Dust? Not Quite, but We're Getting There"; January 30, 2010
- BBC News: "An End to Spaghetti Power Cables"; August 22, 2008
- New York Times: "Intel Moves to Free Gadgets of Their Recharging Cords"; August 20, 2008

HONORS & AWARDS

• Fast Company Magazine's Innovation by Design Award: EM-Sense	2016
• Intel: IPR Recognition Award	Second Quarter 2013
• Intel: Nominated for an Intel Labs Academy Award	August 2013
• Sezai Innovation Research Award	September 2011
• ASAIO: Willem J. Kolff & Don B. Olsen Award	June 2011
• Intel: Intel Labs Divisional Recognition Award	Fourth Quarter 2009
• Intel: Intel Labs Divisional Recognition Award	Second Quarter 2009
• IEEE RFID 2009: Best Paper Award	April 2009
• Intel: CTG Divisional Recognition Award	Fourth Quarter 2008
• SenSys 2008: Best Demo Award	November 2008
• Intel: CTG Divisional Recognition Award	Third Quarter 2008
• Grainger Foundation Fellowship	Autumn 2005 – Winter 2006
• Mary Gates Research Assistantship	Winter 2005 – Spring 2005
• Mary Gates Research Assistantship	Spring 2004 – Autumn 2004
• EEIC Undergrad Research Assistantship	Winter 2004 – Autumn 2003
• EE Bergseth Scholarship	

REFERENCES

References provide upon request