

Stanford



Amin Arbabian

Associate Professor of Electrical Engineering

Bio

ACADEMIC APPOINTMENTS

- Associate Professor, Electrical Engineering
- Member, Bio-X
- Member, Cardiovascular Institute

HONORS AND AWARDS

- Tau Beta Pi Award for Excellence in Undergraduate Teaching, Stanford University (June 2016)
- Best Paper Award, IEEE Conference on Biomedical Wireless Technologies, Networks, and Sensing Systems (2016)
- Best Paper Award, Progress in Electromagnetic Research Symposium (PIERS) (2015)
- NSF CAREER Award, National Science Foundation (2015)
- Best Paper Award, IEEE VLSI Circuits Symposium (2014)
- Faculty Research Award, Google (2014)
- Young Faculty Award (YFA), DARPA (2014)
- Best Paper Award, IEEE International Conference in Ultra-Wideband (2013)
- Hellman Faculty Scholar, Hellman Family Faculty Fund; Stanford University (2013)
- School of Engineering Terman Fellow, Stanford University (2012)
- Best Paper Award (2nd Place), IEEE Radio Frequency Integrated Circuits (RFIC) Symposium (2011)
- Jack Kilby Outstanding Student Paper Award, IEEE International Solid-State Circuits Conference (2010)
- Best Paper Award (2nd Place), IEEE Radio Frequency Integrated Circuits (RFIC) Symposium (2008)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Associate Editor, IEEE Solid-State Circuits Letters (2018 - present)
- Associate Editor, IEEE Journal of Electromagnetics, RF and Microwaves in Medicine and Biology (2017 - present)
- Member of steering committee, IEEE RFIC Symposium (2017 - present)

PROGRAM AFFILIATIONS

- Stanford SystemX Alliance

PROFESSIONAL EDUCATION

- BSc, Sharif University of Technology , Electrical Engineering (2005)

- MSc, UC Berkeley , Electrical Engineering and Computer Sciences (2007)
- PhD, UC Berkeley , Electrical Engineering and Computer Sciences (2011)

LINKS

- Arbabian Lab at Stanford: <https://arbabianlab.stanford.edu/>
- <http://www.stanford.edu/~arbabian>: <http://www.stanford.edu/~arbabian>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

My group's research covers circuit and system design for (1) biomedical, (2) sensing, and (3) Internet of Things (IoT) applications.

On the biomedical front we explore the design of emerging and hybrid medical imaging modalities and investigate new technologies for wireless implants, including ultrasonic power and data links.

Our work in sensing includes methods to enable next-generation interfaces (e.g., radar system design for human-computer interfaces), as well as methods of remote detection and imaging.

In the IoT area, we work on architectural solutions that enable radically miniaturized sensors for a trillion-sensor (tera-scale) future, including wireless power and wake-up radios. On the other end of the IoT space, we also work on next-generation extremely-high-throughput wireless and wireline “pipelines” that facilitate information flow on the network.

Teaching

COURSES

2018-19

- Fundamentals of Analog Integrated Circuit Design: EE 114, EE 214A (Aut)

2017-18

- RF Integrated Circuit Design: EE 314A (Spr)

2016-17

- Fundamentals of Analog Integrated Circuit Design: EE 114, EE 214A (Aut)
- RF Integrated Circuit Design: EE 314A (Spr)

2015-16

- Fundamentals of Analog Integrated Circuit Design: EE 114, EE 214A (Aut)
- RF Integrated Circuit Design: EE 314A (Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Pietro Caragiulo, Steven Herbst, Hamid Partovi

Postdoctoral Faculty Sponsor

Aslan Etminan, Christopher Sutardja

Doctoral Dissertation Advisor (AC)

Ahmed Sawaby

Master's Program Advisor

WEI HSU CHAO, Talbot Morris-Downing, Chengzhe XU

Doctoral (Program)

Ahmed Sawaby, Thomas Teisberg

Publications

PUBLICATIONS

- **MINI-SPECIAL ISSUE ON 2018 INTERNATIONAL WORKSHOP ON INTEGRATED NONLINEAR MICROWAVE AND MILLIMETRE-WAVE CIRCUITS** *IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES*
Arbabian, A.
2019; 67 (7): 2521–22
- **Ultrasonic Wake-Up With Precharged Transducers** *IEEE JOURNAL OF SOLID-STATE CIRCUITS*
Rekhi, A. S., Arbabian, A.
2019; 54 (5): 1475–86
- **Time-of-flight imaging based on resonant photoelastic modulation** *APPLIED OPTICS*
Atalar, O., Van Laer, R., Sarabalis, C. J., Safavi-Naeini, A. H., Arbabian, A.
2019; 58 (9): 2235–47
- **Beamforming Microwave-Induced Thermoacoustic Imaging for Screening Applications** *IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES*
Nan, H., Liu, S., Buckmaster, J., Arbabian, A.
2019; 67 (1): 464–74
- **End-to-End Design of Efficient Ultrasonic Power Links for Scaling Towards Submillimeter Implantable Receivers** *IEEE TRANSACTIONS ON BIOMEDICAL CIRCUITS AND SYSTEMS*
Chang, T., Weber, M. J., Charthad, J., Baltsavias, S., Arbabian, A.
2018; 12 (5): 1100–1111
- **Long-term in vivo performance of novel ultrasound powered implantable devices.** *Conference proceedings : ... Annual International Conference of the IEEE Engineering in Medicine and Biology Society. IEEE Engineering in Medicine and Biology Society. Annual Conference*
Kang, C., Chang, T. C., Vo, J., Charthad, J., Weber, M., Arbabian, A., Vasudevan, S.
2018; 2018: 2985–88
- **Thermal analysis of ultrasound-powered miniaturized implants: A tissue-phantom study.** *The Journal of the Acoustical Society of America*
Walden, C., Sonesson, J., Weber, M. J., Charthad, J., Chia Chang, T., Arbabian, A., Myers, M.
2018; 143 (6): 3373
- **A mm-Sized Wireless Implantable Device for Electrical Stimulation of Peripheral Nerves** *IEEE TRANSACTIONS ON BIOMEDICAL CIRCUITS AND SYSTEMS*
Charthad, J., Chang, T., Liu, Z., Sawaby, A., Weber, M. J., Baker, S., Gore, F., Felt, S. A., Arbabian, A.
2018; 12 (2): 257–70
- **A Miniaturized Single-Transducer Implantable Pressure Sensor With Time-Multiplexed Ultrasonic Data and Power Links**
Weber, M. J., Yoshihara, Y., Sawaby, A., Charthad, J., Chang, T., Arbabian, A.
IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC.2018: 1089–1101
- **Wireless Data Links for Next-Generation Networked Micro-Implantables** *Proc. 2018 IEEE Custom Integrated Circuits Conference*
Wang, M. L., Baltsavias, S., Chang, T., Weber, M. J., Arbabian, A.
- **Scaling of Ultrasound-Powered Receivers for Sub-Millimeter Wireless Implants** *IEEE Biomedical Circuits and Systems Conference (BioCAS)*
Chang, T., Weber, M. J., Charthad, J., Baltsavias, S., Arbabian, A.

- **A mm-sized wireless implantable device for electrical stimulation of peripheral nerves** *IEEE Trans. Biomedical Circuits and Systems*
Charthad, J.
2018
- **A Dual-Element VNA Electronic Calibration in CMOS**
Chien, J., Arbabian, A., Niknejad, A. M., IEEE
IEEE.2018: 71–74
- **A Single-Element VNA Electronic Calibration in CMOS**
Chien, J., Arbabian, A., Niknejad, A. M., IEEE
IEEE.2018: 1304–7
- **A Programmable RF Transmitter for Wideband Thermoacoustic Spectroscopic Imaging**
Nan, H., Arbabian, A., IEEE
IEEE.2018: 1405–8
- **Array Location Uncertainty in Imaging Radar: SAR vs. MIMO-SAR**
Mamandipoor, B., Teisberg, T., Kananian, S., Arbabian, A., IEEE
IEEE.2018: 150–53
- **A 14.5mm(2) 8nW-59.7dBm-Sensitivity Ultrasonic Wake-Up Receiver for Power-, Area-, and Interference-Constrained Applications**
Rekhi, A., Arbabian, A., IEEE
IEEE.2018: 454–+
- **A 14.5mm(2) 8nW-59.7dBm-Sensitivity Ultrasonic Wake-Up Receiver for Power-, Area-, and Interference-Constrained Applications**
Rekhi, A., Arbabian, A., IEEE
IEEE.2018
- **Wireless Data Links for Next-Generation Networked Micro-Implantables**
Wang, M. L., Baltsavias, S., Chang, T., Weber, M. J., Charthad, J., Arbabian, A., IEEE
IEEE.2018
- **Microwave-Induced Thermoacoustic Imaging of Subcutaneous Vasculature With Near-Field RF Excitation** *IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES*
Aliroteh, M. S., Arbabian, A.
2018; 66 (1): 577–88
- **A miniaturized single-transducer implantable pressure sensor with time-multiplexed ultrasonic data and power links** *IEEE J. Solid-State Circuits*
Weber, M., Yoshihara, Y., Sawaby, A., Charthad, J., Chang, T., Arbabian, A.
2018
- **Ball Grid Array Module With Integrated Shaped Lens for 5G Backhaul/Fronthaul Communications in F-Band** *IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION*
Bisognin, A., Nachahe, N., Luxey, C., Gianesello, F., Gloria, D., Costa, J. R., Fernandes, C. A., Alvarez, Y., Arbolea-Arbolea, A., Laviada, J., Las-Heras, F., Dolatsha, N., Grave, et al
2017; 65 (12): 6380–94
- **Wireless Power Transfer to Millimeter-Sized Nodes Using Airborne Ultrasound** *IEEE TRANSACTIONS ON ULTRASONICS FERROELECTRICS AND FREQUENCY CONTROL*
Rekhi, A. S., Khuri-Yakub, B. T., Arbabian, A.
2017; 64 (10): 1526–41
- **Exploiting spatial degrees of freedom for high data rate ultrasound communication with implantable devices** *APPLIED PHYSICS LETTERS*
Wang, M. L., Arbabian, A.
2017; 111 (13)
- **Remote sub-wavelength focusing of ultrasonically activated Lorentz current** *APPLIED PHYSICS LETTERS*
Rekhi, A. S., Arbabian, A.
2017; 110 (16)

- **Capsule Ultrasound Device: Characterization and Testing Results**
Wang, J., Memon, F., Touma, G., Baltasvias, S., Jang, J., Chang, C., Rasmussen, M., Olcott, E., Jeffrey, R., Arbabian, A., Khuri-Yakub, B. T., IEEE
IEEE.2017
- **Communication with Crystal-Free Radios**
Shaviv, D., Ozgur, A., Arbabian, A., IEEE
IEEE.2017
- **Closed-Loop Ultrasonic Power and Communication with Multiple Miniaturized Active Implantable Medical Devices**
Wang, M. L., Chang, T., Teisberg, T., Weber, M. J., Charthad, J., Arbabian, A., IEEE
IEEE.2017
- **A High-Precision 36 mm(3) Programmable Implantable Pressure Sensor with Fully Ultrasonic Power-up and Data Link**
Weber, M. J., Yoshihara, Y., Sawaby, A., Charthad, J., Chang, T., Garland, R., Arbabian, A., IEEE
IEEE.2017: C104–C105
- **Sound Technologies, Sound Bodies** *IEEE MICROWAVE MAGAZINE*
Arbabian, A., Chang, T. C., Wang, M. L., Charthad, J., Baltasvias, S., Fallahpour, M., Weber, M. J.
2016; 17 (12): 39-54
- **Design of Tunable Ultrasonic Receivers for Efficient Powering of Implantable Medical Devices With Reconfigurable Power Loads** *IEEE TRANSACTIONS ON ULTRASONICS FERROELECTRICS AND FREQUENCY CONTROL*
Chang, T. C., Weber, M. J., Wang, M. L., Charthad, J., Khuri-Yakub, B. (., Arbabian, A.
2016; 63 (10): 1554-1562
- **Loss and Dispersion Limitations in mm-Wave Dielectric Waveguides for High-Speed Links** *IEEE TRANSACTIONS ON TERAHERTZ SCIENCE AND TECHNOLOGY*
Dolatsha, N., Chen, C., Arbabian, A.
2016; 6 (4): 637-640
- **System-Level Analysis of Far-Field Radio Frequency Power Delivery for mm-Sized Sensor Nodes** *IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS I-REGULAR PAPERS*
Charthad, J., Dolatsha, N., Rekhi, A., Arbabian, A.
2016; 63 (2): 300-311
- **Fully packaged millimetre-wave dielectric waveguide with multimodal excitation** *ELECTRONICS LETTERS*
Dolatsha, N., Saiz, N., Arbabian, A.
2015; 51 (17): 1339-1340
- **A mm-Sized Implantable Medical Device (IMD) With Ultrasonic Power Transfer and a Hybrid Bi-Directional Data Link** *IEEE JOURNAL OF SOLID-STATE CIRCUITS*
Charthad, J., Weber, M. J., Chang, T. C., Arbabian, A.
2015; 50 (8): 1741-1753
- **A Power-Harvesting Pad-Less Millimeter-Sized Radio** *IEEE JOURNAL OF SOLID-STATE CIRCUITS*
Tabesh, M., Dolatsha, N., Arbabian, A., Niknejad, A. M.
2015; 50 (4): 962-977
- **Non-contact thermoacoustic detection of embedded targets using airborne-capacitive micromachined ultrasonic transducers** *APPLIED PHYSICS LETTERS*
Nan, H., Boyle, K. C., Apte, N., Aliroteh, M. S., Bhuyan, A., Nikoozadeh, A., Khuri-Yakub, B. T., Arbabian, A.
2015; 106 (8)
- **Stepped-frequency continuous-wave microwave-induced thermoacoustic imaging** *APPLIED PHYSICS LETTERS*
Nan, H., Arbabian, A.
2014; 104 (22)
- **Frequency-modulated magneto-acoustic detection and imaging** *ELECTRONICS LETTERS*
Aliroteh, M. S., Scott, G., Arbabian, A.
2014; 50 (11): 790-791

- **mm-Wave Silicon: Smarter, Faster, and Cheaper Communication and Imaging.** *Frequency References, Power Management for SoC, and Smart Wireless Interfaces*
Niknejad, Ali, M., Arbabian, A., Callender, S., Chen, J., Chien, J., Kang, S.
Springer International Publishing.2014: 281–295
- **A power-harvesting pad-less mm-sized 24/60GHz passive radio with on-chip antennas** *IEEE VLSI Circuits Symposium*
Tabesh, M.
2014
- **Segmentation and Artifact Removal in Microwave-Induced Thermoacoustic Imaging** *36th Annual International Conference of the IEEE-Engineering-in-Medicine-and-Biology-Society (EMBC)*
Nan, H., Chou, T., Arbabian, A.
IEEE.2014: 4747–4750
- **A 135GHz SiGe Transmitter With A Dielectric Rod Antenna-In-Package For High EIRP/Channel Arrays** *36th Annual IEEE Custom Integrated Circuits Conference (CICC) - The Showcase for Integrated Circuit Design in the Heart of Silicon Valley*
Saiz, N., Dolatsha, N., Arbabian, A.
IEEE.2014
- **A mm-Sized Implantable Device with Ultrasonic Energy Transfer and RF Data Uplink for High-Power Applications** *36th Annual IEEE Custom Integrated Circuits Conference (CICC) - The Showcase for Integrated Circuit Design in the Heart of Silicon Valley*
Charthad, J., Weber, M. J., Chang, T. C., Saadat, M., Arbabian, A.
IEEE.2014
- **A 94 GHz mm-Wave-to-Baseband Pulsed-Radar Transceiver with Applications in Imaging and Gesture Recognition** *Symposium on VLSI Circuits held its 26th Meeting on State-of-the-Art Topics important to VLSI Circuit and System Designers, as well as Device and Process Technology Experts*
Arbabian, A., Callender, S., Kang, S., Rangwala, M., Niknejad, A. M.
IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC.2013: 1055–71
- **Analysis and Design of a Multi-mode Dielectric Waveguide Interconnect with Planar Excitation**
Dolatsha, N., Arbabian, A.
2013
- **Dielectric Waveguide with Planar Multi-Mode Excitation for High Data-Rate Chip-to-Chip Interconnects**
Dolatsha, N., Arbabian, A.
2013
- **A Three-Stage Cascaded Distributed Amplifier with GBW Exceeding 1.5THz** *IEEE Radio Frequency Integrated Circuits Symposium (RFIC)*
Arbabian, A., Niknejad, A.
2012: 211-214
- **A 94GHz mm-wave to baseband pulsed-radar for imaging and gesture recognition.** *In VLSI Circuits (VLSIC)*
Arbabian, A., Kang, S., Callender, S., Chien, J., Afshar, B., Niknejad, A.
2012: 56-57
- **60GHz Low-Loss Compact Phase Shifters Using A Lumped Element Hybrid** *CICC*
Tabesh, M., Arbabian, A., Niknejad, A.
2011
- **Time-Domain Ultra-Wideband Synthetic Imager (TUSI) in Silicon** *33rd Annual International Conference of the IEEE Engineering-in-Medicine-and-Biology-Society (EMBS)*
Arbabian, A., Niknejad, A. M.
IEEE.2011: 505–511
- **A 90GHz Pulsed-Transmitter with Near-Field/Far-Field Energy Cancellation using a Dual-Loop Antenna**
Arbabian, A., Kang, S., Callender, S., Afshar, B., Chien, J., Niknejad, A.
2011
- **A 90 GHz Hybrid Switching Pulsed-Transmitter for Medical Imaging** *IEEE JOURNAL OF SOLID-STATE CIRCUITS*
Arbabian, A., Callender, S., Kang, S., Afshar, B., Chien, J., Niknejad, A. M.

2010; 45 (12): 2667-2681

- **A 90GHz Carrier 30GHz Bandwidth Hybrid Switching Transmitter with Integrated Antenna** *ISSCC 2010 Digest of Tech.*
Arbabian, et. al., A.
2010: 420-421
- **A 90nm CMOS Low-Power 60GHz Transceiver with Integrated Baseband Circuitry** *IEEE Journal of Solid State Circuits*
Marcu, C., Chowdhury, D., Thakkar, C., Park, J., Kong, L., Tabesh, M., Arbabian, A.
2009; 44 (12): 3434-3447
- **A 90nm CMOS Low-Power 60GHz Transceiver with Integrated Baseband Circuitry** *ISSCC 2010 Digest of Tech. Papers*
Marcu, C., Chowdhury, D., Thakkar, C., Kong, L., Tabesh, M., Park, J., Arbabian, A.
2009: 314-315
- **Design of a CMOS Tapered Cascaded Multistage Distributed Amplifier** *IEEE Transactions on Microwave Theory and Techniques*
Arbabian, A., Niknejad, A., M.
2009; 57 (4): 938-947
- **A Tapered Cascaded Multi-Stage Distributed Amplifier with 370GHz GBW in 90nm CMOS**
Arbabian, A., Niknejad, A., M.
2008
- **A Broadband Distributed Amplifier with Internal Feedback Providing 660GHz GBW in 90nm CMOS** *ISSCC 2008 Digest of Tech. Papers*
Arbabian, A., Niknejad, A., M.
2008: 196-197
- **A 60-GHz 90-nm CMOS Cascode Amplifier with Interstage Matching**
Heydari, B., Reynaert, P., Adabi, E., Bohsali, M., Afshar, B., Arbabian, A.
2007
- **Internal Unilaterization Technique for CMOS mm-Wave Amplifiers**
Heydari, B., Adabi, E., Bohsali, M., Afshar, B., Arbabian, A., Niknejad, A., M.
2007
- **The Optimizations of PRF Staggering in a MTI Radar**
Arbabian, A., Bastani, M., H., Tabesh, M.
2005
- **Rural Telecommunications in Iran: A Hybrid Solution**
Tabesh, M., Arbabian, A., Javaheri, H., Jalali, A.
2005