

Himanshu Aggrawal

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RESEARCH INTERESTS

High-speed analog circuits, impulse-based secure communication, localization and imaging, wireless time synchronization with sub-pico-second jitter, high-speed ADCs and smart e-materials

EDUCATION

Rice University, USA

M.S., Ph.D. Electrical & Computer Engineering

Thesis: Design & Applications of Silicon-Based Picosecond Pulse Systems

Academic Advisor: Prof. Aydin Babakhani

Aug. '12 – Dec. '17

Aggregate: 3.8/4

Indian Institute of Technology (IITJ), India

B.Tech. Electrical Engineering

Aug. '08 – Apr. '12

Aggregate: 8.8/10

Universidad de Sevilla, Spain

Student exchange program

Sept. '10 – Aug. '11

Aggregate: 9.8/10

PUBLICATIONS

- **H. Aggrawal** and A. Babakhani, “A Nonlinear Sampler for Detection of Picosecond Pulses and its Applications” (In preparation, *IEEE Transactions on Microwave Theory and Techniques*)
- **H. Aggrawal**, P. Chen, M. Assefzadeh, B. Jamali and A. Babakhani, “Techniques for Generation and Detection of Picosecond Pulses and Their Applications”, *RWS special issue of IEEE Microwave Magazine*, 2016 (**Invited**)
- **H. Aggrawal**, R. Puhl, C. Studer and A. Babakhani, “Ultra-Wideband Joint Spatial Coding for Secure Communication and High-Resolution Imaging”, *IEEE Transactions on Microwave Theory and Techniques*
- **H. Aggrawal** and A. Babakhani, “A Nonlinear Sampler for Detection of Picosecond Pulses in 90 nm SiGe BiCMOS” *The European Microwave Integrated Circuits Conference (EuMIC)*, 2017 (**Won Best Paper Award, declined for GAAS Fellowship**)
- **H. Aggrawal**, R. Puhl and A. Babakhani, “Ultra-Wideband Pulse-based Directional Modulation”, *IEEE Radio and Wireless Symposium (RWS)*, 2016 (**Selected for Best Paper Award**)
- **H. Aggrawal** and A. Babakhani, “An Ultra-Wideband Impulse Receiver for sub-100 fsec Time-Transfer and sub-30 μ m Localization”, *IEEE MTT-S International Microwave and RF Conference*, 2015 (**Selected for Best Paper Award**)
- **H. Aggrawal** and A. Babakhani, “A 40 GS/s Track-and-Hold Amplifier with 62dB SFDR3 in 45nm CMOS SOI”, *IEEE MTT-S Int. Microwave Symposium (IMS) 2014* (**Secured 4th Prize in Best Paper Award**)
- **H. Aggrawal**, J.I. Leon, L.G. Franquelo, S. Kouro, P. Garg and J. Rodriguez, “Model predictive control based selective harmonic mitigation technique for multilevel cascaded H-bridge converters”, *37th Annual Conference on IEEE Industrial Electronics Society (IECON) 2011*

PATENTS

- **H. Aggrawal** and A. Babakhani, “RF Ultra-short Pulse-based Flow Imaging” – to be filed 2018
- **H. Aggrawal** and A. Babakhani, “Secure Communication under Adversaries” – to be filed 2018
- **H. Aggrawal** and A. Babakhani, “New Architecture for Ultra-fast Samplers” – filed 2016

- **H. Aggrawal** and M. El-Chammas, “High Speed Sampler with Active Cancellation” – Granted
- **H. Aggrawal** and A. Babakhani, “Ultra-Wideband Pulse-based Directional Modulation” – Granted
- **H. Aggrawal** and A. Babakhani, “Systems and methods for active cancellation for improving isolation of transmission gates in high-frequency analog to digital converters”, United States 14/596,582 – Granted

SELECTED GRANTS WRITTEN

- Wireless Network Security: Limits of Channel State Secrets and New Foundations – NSF’17
- Terabit-per-second Scale Networking – NSF’16
- Securing Highly-Directional High-Frequency Communication – NSF’15
- Scaling WLAN Throughput and Range with Wide Aperture and $100\times$ Spectrum Diversity – NSF’14

SELECTED SCHOLARSHIPS

- Recipient of the IEEE European Microwave Association (EuMA) GAAS PhD Fellowship, 2017
- Recipient of student grant by the IEEE European Microwave Association (EuMA), 2017
- Recipient of the IEEE Microwave Theory and Techniques Society (MTT-S) Graduate Fellowship, 2016
- Recipient of student sponsorship from the IEEE MTT-S at Int. Microwave Symposium, 2014 & 2016
- Awarded student scholarship by the IEEE Industrial Electronic Society(IES), 2011

SELECTED ACHIEVEMENTS AND AWARDS

- Won Young Engineer Prize at the European Microwave Integrated Circuit Conference (Declined), 2017
- Selected for Best Student Paper Award at the IEEE Radio and Wireless Symposium, 2016
- Selected for Best Student Paper Award at the IEEE International Microwave and RF Conference, 2015
- Honorable Mention in Student Paper Award at IEEE International Microwave Symposium, 2014
- Selected for the *Will-Power Exchange Program* to the Universidad de Sevilla (Spain), funded entirely by the government of India and France from Sept.’10 – Aug.’11
- Recipient of Summer Undergraduate Research Grant for Excellence (SURGE) in 2010
- Ranked 6th for Physics in India’s National Level Science Talent Search Examination (NSTSE) in 2005
- Honored for Distinctive Performance in the 6th National Science Olympiad held in India and abroad

INTERNSHIPS

University of California, Los Angeles

Mentor: Prof. Aydin Babakhani

Visiting Scholar

Jan’18 – April’18

Designing a complete UWB ultra-short impulse transceiver for secure communication and radar imaging. The custom ASIC is designed in IBM 90 nm BiCOMS technology which contains on-chip impulse generator and receiver.

Texas Instruments, Dallas, USA

Mentor: Dr. Manar El-Chammas

Analog Design Engineer

May’15 – Aug.’15

Designed the front end of high-speed ADCs with 40nm CMOS technology. Developed new active-cancellation architecture to increase the linearity of the system. A patent was granted on the novel idea.

SELECTED GRADUATE PROJECTS

- **Ultra-Wideband Impulse Receiver** *Oct.’14 – present*
A novel architecture for receiving ultra-short pulses (a few picoseconds wide) is being developed for high-speed secure communication, radar and hyperspectral imaging in TSMC 40 nm CMOS technology. (*Best Paper Award*)

- **Ultra-Wideband Pulse-based Directional Modulation** *Dec. '12 – Jan. '16*
In this project, ultra-short (a few picosecond wide) pulses are being used for directional communication, localization and imaging. An information beamwidth of less than 1° was achieved for communication systems and images were resolved with a resolution of a few millimeters. (*Nominated for Best Paper Award*)
- **High Speed ADC with Active Cancellation** *Aug. '12 – May. '16*
40 GS/s track-and-hold sampler was developed with an active cancellation technique. The active cancellation technique was used to mitigate the parasitic leakage of the transmission gate during the sampling mode in order to increase the effective number of bits (EOB). (*Secured 4th Prize in Best Paper Award*)

SELECTED UNDERGRADUATE PROJECTS

- Nano-Satellite: *JUGNU* *Dec. '08 – Jul. '10*
- Anti-Collision System for Indian Railways *Dec. '11 – May '12*
- Development of 'AAKASH', a low cost \$35 tablet *Aug. '11 – May '12*
- Research Internship at AICIA on advance power converters *Feb. '11 – Jul. '11*
- Summer Undergraduate Research Grant for Excellence (SURGE) *Summer '10*

MEDIA RECOGNITION

HindustanTimes, a leading newspaper in India, posted an article about my involvement and contribution in *JUGNU*, a Nano-Satellite project. The article appeared on the front page of the Sunday edition. [16-10-2011]

SELECTED POSITIONS OF RESPONSIBILITY

- Mentored six interns and one research engineer at Rice Integrated Systems and Circuits lab from 2012 – 17
- Mentoring Director for ECE Graduate Student Association, 2016 – 17
- Student mentor for senior design project in 2012, 2014, 2015 and 2016
- Mentor in ECE mentoring program for 2013 – 17
- Co-organizer of the Integrated Sensors and Systems Seminar series at Rice University, which invites academic or industrial professionals to showcase their work to the Rice community, 2013 – 15
- Publicity Coordinator for the Indian Student Association at Rice university for 2013 – 14
- Initiator and Coordinator of the electronics club from 2008 – 10

OUTREACH

- Resident Assistant at Rice Graduate Apartment with the primary responsibility of ensuring a smooth transition for incoming graduate students into their academic career at Rice, 2013 – 17
- Volunteer for Christmas *Toys for Tots* donation drive every year since 2013
- Volunteer and member of the Graduate Student Community Service Committee

EXTRA-CURRICULAR ACTIVITIES

- Professional racing driver and certified pit-crew for 24 hours endurance racing at *24 Hours of LEMONS*
- Amateur student pilot with lifetime member of the Gliding & Soaring Center at IIT Kanpur
- Lead solo and bass-rhythm guitar player in ISAR music band from 2012 – 17
- RC car racing hobbyist

REFERENCES

Available upon request