

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 <i>M.S., Ph.D. Electrical & Computer Engineering</i> Research Assistant in Rice Integrated Systems and Circuits (RISC)	<i>Academic Advisor: Prof. Aydin Babakhani</i> <i>Aug. '12 – May '17 (expected)</i> Aggregate: 3.81/4
Indian Institute of Technology (IITJ), India <i>B.Tech. Electrical Engineering</i>	<i>Aug. '08 – Apr. '12</i> Aggregate: 8.76/10
Universidad de Sevilla, Spain <i>Student exchange program</i>	<i>Sept. '10 – Aug. '11</i> Aggregate: 9.8/10

PUBLICATIONS

- **H. Aggrawal**, R. Puhl, C. Studer and A. Babakhani, “Ultra-Wideband Joint Spatial Coding for Secure Communication and High-Resolution Imaging” (In review, *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” (Submitted to *RWS special issue of IEEE Microwave Magazine, 2016*) (**Invited**)
- **H. Aggrawal** and A. Babakhani, “High-speed Track-and-Hold Sampler with Active Cancellation” (In review, *IEEE Transactions on Microwave Theory and Techniques*)
- **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-100fsec Time-Transfer and sub-30m 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, “New Architecture for Ultra-fast Samplers” – filed 2016
- **H. Aggrawal** and M. El-Chammas, “High Speed Sampler with Active Cancellation” – filed 2015
- **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

- 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

INTERNSHIP

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 disclosure was submitted on the novel idea.

SELECTED ACHIEVEMENTS AND AWARDS

- Recipient of the IEEE Microwave Theory and Techniques Society (MTT-S) Graduate Fellowship
- 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
- Recipient of Ph.D. student sponsorship from the IEEE MTT-S at Int. Microwave Symposium, 2014
- Awarded student scholarship by the IEEE Industrial Electronic Society(IES), 2011
- 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
- Awarded the Certificate of Honor in the Indo-US Advance School on Quantum and Nano Computing Systems and Applications in 2009

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 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.
- **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.
- **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). Future work includes reducing the sampling window using new architecture, increasing sampling rate and band-width of the system.
(*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*

SELECTED POSITIONS OF RESPONSIBILITY

- ECE Graduate Student Association Mentoring Director, 2016
- Mentored four interns at Rice Integrated Systems and Circuits lab
- Student mentor for senior design project in 2012, 2014, 2015 and 2016
- Mentor in ECE mentoring program for 2013 – till date
- 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
- Volunteer and member of the Graduate Student Community Service Committee
- Publicity Coordinator for the Indian Student Association at Rice university for 2013 – 14
- Initiator and Coordinator of the electronics club from 2008 – 10
- Coeditor of NERD, the institute magazine of IIT-Kanpur, 2009

SKILLS

Software & Operating Systems: Cadence, Eagle, MATLAB, LabVIEW, Simulink, Altium, PSpice, FPGA Workbench, AutoCAD, L^AT_EX, Microsoft Office, iWorks, Windows, Linux and Macintosh
Workshop Experience: lathe, drilling, milling, boring, reaming, welding and casting
Programming: C, HTML, CSS, VHDL, markdown, and assembly Language
Languages: English (Fluent), Hindi (Native) and Spanish (Conversational)

PROFESSIONAL SOCIETY MEMBERSHIPS

IEEE Student Membership, IEEE MTT-S, IEEE Solid-State Circuits Society, IEEE Power & Energy Society, IEEE Industrial Electronics Society, Society of Automobile Engineering, and IEEE Young Professionals.

EXTRA-CURRICULAR ACTIVITIES

- Lifetime member of the Gliding and Soaring Center at IIT Kanpur
- Lead guitar player in ISAR music band

REFERENCES

Available upon request