SYED ABDULLAH NAUROZE

988/B Satellite Town,
Rawalpindi, Pakistan

+92-51-4944035
nauroze@gatech.edu

EDUCATION

Doctor of Philosophy in Electrical Engineering – Electromagnetics 2014-19
Georgia Institute of Technology, Atlanta, Georgia, USA
Research topic: Next generation shape-shifting and origami-based tunable RF structures using additive manufacturing technologies.

Master of Engineering in Electrical Engineering 2014-18
Georgia Institute of Technology, Atlanta, Georgia, USA

Management of Technology – Entrepreneurship 2018
Scheller College of Business – Georgia Institute of Technology

Master of Engineering in Wireless systems - radio communication 2006-08
Royal Institute of Technology, Stockholm, Sweden
Thesis: Investigation of novel on-chip antennas for 77GHz automotive radar applications

RESEARCH EXPERIENCE

Co-op - RF Desense Engineer May – August 2019
Amazon Lab126, Sunnyvale, CA, USA
- Model noise generated due to data transfer between memory and processor
- Study effect of desense due to changes in noise location and polarization
- Design and investigate antennas with small form factor that have minimal effect due to noise

Graduate Research Assistant August 2015 - Present
Georgia Institute of Technology, Atlanta, GA, USA
- Origami-inspired deployable & tunable RF components (FSS, absorbers, antennas and arrays)
- Part of NSF I-Corps entrepreneurial startup program to use research during PhD studies in solving real-world problems, find early adopters and make minimal viable product.

Co-op - 5G phased array antenna *Aug – Dec 2017*
Qualcomm, San Diego, CA, USA
- Design, optimize and evaluate single and dual band 5G phased array antennas.
- Ran process corner and material characterization simulations and evaluate overall performance variation due to fabrication tolerances
- Investigation of novel techniques for miniaturized 5G single-band antenna arrays that meet fabrication process and vendor requirements. This include reduced size antenna elements and integrated structures to reduce inter-element coupling.

Research Graduate Jan 2008 - Nov 2008
Microsystems Tech Lab - Royal Institute of Technology (KTH), Stockholm, Sweden
- Design & investigation of novel on-chip antennas for 77GHz automotive radar applications

Research Graduate Sept. 2005-July 2006
University of technology Petronas (UTP), Malaysia
- Fractal antenna design for MIMO systems for an Intel sponsored project

TEACHING EXPERIANCE

Assistant Professor Jan 2012 – Aug 2014
National University of Computer & Emerging Sciences, Pakistan
- Responsible for two undergraduate courses in electromagnetic theory and wave propagation & antenna theory
- Supervisor to four (4) undergraduate final year project groups

Teaching Fellow Aug 2009 – Dec 2011

LUMS – School of Science and Engineering, Lahore, Pakistan

- Responsible for four undergraduate courses: EM fields and waves, introductory electronics, digital logic circuits and signals & systems.
- Created all materials for tutorials, homework and helped in the preparation of final exams.
- Member of Accreditation and Industrial Liaison committee.
- Member of undergraduate curriculum committee.

Lecturer Dec 2008 - July 2009

University of Engineering and Technology, Taxila, Pakistan

- Taught two undergraduate courses in linear algebra and queuing theory
- Created all materials for lectures, tutorials and exams
- Managed and guided a teaching assistant for queuing theory course.
- Head of the mathematics and communication related courses committee.

Teaching/Research Assistant Jan. 2005 - Aug. 2005

University of Engineering & Technology, Taxila, Pakistan

- Taught two undergraduate courses in computer programming and electronics. Also supervised labs for these courses.
- Created all materials for lectures and final exams.

HIGHLIGHTED PUBLICATIONS

Book

1. Syed Abdullah Nauroze, *Novel On-Chip Antennas for 77GHz Automotive Radars*. LAP Lambert Academic Publishing GmBH & Co., Germany, 2013, ISBN 978-3-8433-6542-0

Book chapter

2. Larissa Novelino, Syed Abdullah Nauroze, Manos Tentzeris, and Glaucio H. Paulino, "Multiphysics Origami: Achieving Tunable Frequency Selective Surfaces from Origami Principles", *Origami7: Seventh International Meeting of Origami Science, Maths, and Education, Tarquin*, vol. 3, 2018
3. Manos Tentzeris, Syed Abdullah Nauroze, "Flexible RF Components and Sensors Using Inkjet-printing Technologies", *Wiley Encyclopedia of Electrical and Electronics Engineering: Wiley, 2017*
4. Aline Eid et. al., "Inkjet-/3D-/4D-Printed Nanotechnology-Enabled Radar, Sensing and RFID Modules for Internet of Things, "Smart Skin" and "Zero- Power" Medical Applications", *Wiley Encyclopedia of Electrical and Electronics Engineering: Wiley, 2020 (accepted)*

Journal papers

5. Syed Abdullah Nauroze, Manos Tentzeris. "A Thermally Actuated Fully Inkjet-printed Origami-inspired Multi-layer Frequency Selective Surface with Continuous-range Tunability Using Polyester-based Substrates" *IEEE Trans. Microw. Theory Tech., 2019.*
6. A. Eid *et al*., "Nanotechnology-Empowered Flexible Printed Wireless Electronics: A Review of Various Applications of Printed Materials," in *IEEE Nanotechnology Magazine*, vol. 13, no. 1, pp. 18-29, Feb. 2019.
7. Syed Abdullah Nauroze, Manos Tentzeris, Larissa Novelino, Glaucio H. Paulino. "Continuous-range Tunable Multi-layer Frequency Selective Surfaces Using Origami and Inkjet-printing" *Proceedings of the National Academy of Sciences (PNAS), 2018.*
8. Adeyeye, Ajibayo, et al. "Additively Manufactured Inkjet-/3D-/4D-Printed Wireless Sensors Modules." *International Journal of High-Speed Electronics and Systems* 27.01n02 (2018): 1840012.
9. Syed Abdullah Nauroze et al. "Additive Manufactured RF Components and Modules: Towards Empowering the Birth of Cost-efficient Dense and Ubiquitous IoT Implementations", in *Proc. IEEE*, vol. 105, no. 4, pp. 702-722, April 2017
10. Jo Bito et. al. "Solar and Electromagnetic Energy Harvesting System with 3D-printed Package for Energy Efficient Internet-of-Things (IoT) Wireless Sensors", *IEEE Trans. Microw. Theory Tech.,* vol. 65, no. 5, pp.1831-1842, *2017*
11. Bito, Jo, et al. "Inkjet-/3D-/4D-printed autonomous wearable RF modules for biomonitoring, positioning and sensing applications." *Micro-and Nanotechnology Sensors, Systems, and Applications IX.* Vol. 10194. International Society for Optics and Photonics, 2017.

12. Rashad Ramzan, Omar Siddiqui, Abdullah Nauroze, Omar Ramahi. "A Microstrip Probe Based on Electromagnetic Energy Tunneling for Extremely Small and Arbitrarily Shaped Dielectric Samples", *IEEE Antennas Wireless Prop. Lett.*, vol. 14, pg. 1554-1556, March 2015

Conference papers

13. Yepu Cui, S. A. Nauroze, Ryan Bahr, "3D Printed One-shot Deployable Flexible "Kirigami" Dielectric Reflectarray Antenna for mm-Wave Applications", *IEEE-MTS Int. Microwave Symposium (IMS)*, Los Angeles, USA, 2020 (accepted)
14. Syed Abdullah Nauroze, Manos Tentzeris, "Fully Inkjet-printed Multi-layer Tunable Origami-FSS Structures with Integrated Thermal Actuation Mechanism", *IEEE-MTS Int. Microwave Symposium (IMS)*, Boston, USA, 2019, pp. 1363-1366 (3MT and best student paper competition runner up)
15. S. A. Nauroze, X. He and M. Tentzeris, "Fully Additively Manufactured Tunable Active Frequency Selective Surfaces with Integrated On-package Solar Cells for Smart Packaging Applications," *2019 IEEE 69th Electronic Components and Tech. Conference (ECTC)*, Las Vegas, NV, USA, 2019, pp. 119-125.
16. Yepu Cui, Syed Abdullah Nauroze, Manos M. Tentzeris, "Novel 3D-Printed Reconfigurable Origami Frequency Selective Surfaces with Flexible Inkjet-Printed Conductor Traces", *IEEE-MTS Int. Microwave Symposium (IMS),* Boston, USA, 2019
17. Syed Abdullah Nauroze, Manos Tentzeris, "Fully Inkjet-printed Tunable Hybrid n-Ripple Miura (n-RiM) Frequency Selective Surfaces", *IEEE International Symposium on Antennas and Propagation and USNC-URSI National Radio Science Meeting (APS - URSI)*, Atlanta, 2019.
18. A. Eid *et al*., "A Flexible Compact Rectenna for 2.4GHz ISM Energy Harvesting Applications," *2018 IEEE International Symposium on Antennas and Propagation & USNC/URSI National Radio Science Meeting*, Boston, MA, 2018, pp. 1887-1888.
19. Syed Abdullah Nauroze, Aline Eid, Manos Tentzeris "n-RiM: A Paradigm Shift in Realization of Fully Inkjet-printed Broadband Tunable FSS using Origami Structures", *IEEE-MTS Int. Microwave Symposium (IMS)*, Philadelphia, USA, 2018 **(3MT competition winner**)
20. Syed Abdullah Nauroze, Bijan Tehrani, Manos Tentzeris, "An Inkjet-printed Origami-based Frequency Selective Surface with Wide Frequency and Bandwidth Tunability*", IEEE Intl. Symp on Antennas and Prop & USNC-URSI National Radio Science Meeting (APS - URSI)*, Boston, 2018
21. Bijan Tehrani, Syed Abdullah Nauroze, Ryan Bahr, Manos Tentzeris, "On-Package mm-wave FSS Integration with 3D-Printed Encapsulation", *IEEE International Symposium on Antennas and Propagation and USNC-URSI National Radio Science Meeting (APS-URSI)*, San Diego, 2017
22. H. Griguer, M. M. Tentzeris, A. Nauroze and M. Drissi, "A novel ultra-thin flexible metamaterial absorber for human body protection from EMF hazards," *2017 XXXIInd General Assembly and Scientific Symp. of the Intl Union of Radio Science (URSI GASS)*, Montreal, QC, 2017, pp. 1-4. **(Gold medalist for 20th Archimedes IP Salon)**
23. W. Su, R. Bahr, S. A. Nauroze and M. M. Tentzeris, "Novel 3D-printed "Chinese fan" bow-tie antennas for origami/shape-changing configurations," *2017 IEEE Int. Symposium on Antennas and Propagation & USNC/URSI National Radio Science Meeting*, San Diego, CA, 2017, pp. 1245-1246.
24. Syed Abdullah Nauroze, Manos Tentzeris, Larissa Novelino, Glaucio H Paulino "Inkjet-printed "4D" Tunable Spatial Filters Using On-demand Foldable Surfaces", *IEEE-MTS Int. Microwave Symposium (IMS)*, Hawaii, USA, 2017 (3MT competition finalist)
25. Wenjing Su, Syed Abdullah Nauroze, Ryan Bahr, Manos Tentzeris "Novel 3D printed Liquid-metal-alloy Microfluidics-based Zigzag and Helical Antennas for Origami Reconfigurable Antenna "Trees", *IEEE-MTS Int. Microwave Symposium (IMS*), Hawaii, USA, 2017.
26. R. Bahr, A. Nauroze, W. Su and M. M. Tentzeris, "Self-actuating 3D Printed Packaging for Deployable Antennas," *2017 IEEE 67th Electronic Components and Technology Conference (ECTC)*, Orlando, FL, 2017, pp. 1425-1430.
27. Syed Abdullah Nauroze, Jimmy Hester, Wenjing Su, Manos Tentzeris, "Inkjet-printed substrate Integrated waveguides (SIW) with "drill-less" vias on paper substrates", *IEEE-MTS Int. Microwave Symposium (IMS)*, San Francisco, USA, 2016
28. Syed Abdullah Nauroze et al., "Additive manufacturing technologies for near- and far-field energy harvesting applications", *Radio & Wireless Symp (RWS) 2016 IEEE*, pp. 159-161, 2016.
29. W. Su, R. Bahr, S. A. Nauroze and M. M. Tentzeris, "3D printed reconfigurable helical antenna based on microfluidics and liquid metal alloy," *2016 IEEE International Symposium on Antennas and Propagation (APSURSI)*, Fajardo, 2016, pp. 469-470.
30. A. Nauroze, M. Tentzeris, "A Novel Printed Stub-loaded Square Helical Antenna", *IEEE Int. Sym. on An.t and Prop. and USNC-URSI National Radio Science Meeting (APS-URSI)*, pp. 774-775, 2015
31. A. K. Rashid, S. Ullah, and S. A. Nauroze, "Three-dimensional loaded dipoles for applications in frequency selective structures," in *Proc. Prog. Electromagn. Res.*, China, 2014, pp. 1763–1766.

32. O. Sidiqui, A. Nauroze, R. Ramzan and O. Ramahi, "Tunneling of electromagnetic energy through wires in guided media," *2013 IEEE Int. Sym. on Ant. and Prop. (APS-URSI)*, Orlando, FL, 2013, pp. 1370-1371.
33. Nauroze Syed, "In-wafer Helical Antenna for Automotive Radar", *IEEE 7th European Conference on Antenna & Propagation (EuCAP)*, Gothenburg, Sweden, April 2013
34. Abdullah Nauroze, Omar Sidiqui, Rashad Ramzan and Omar Ramahi, "Energy Tunneling in Wire-Loaded Microstrip Cavities", *IEEE Int. Conference on Meta Materials, Photonic Crystals and Plasmonics (META)*, March 2013

WORKSHOPS CONDUCTED

1. Origami-inspired shaped reconfigurable tunable RF structures using additive manufacturing technologies – *IEEE Int. Sym. on Ant. and Prop. (APS-URSI)*, Atlanta, GA, 2019
2. Next generation of origami-based tunable RF structures using additive manufacturing – FlexTech Conference, Monetary, CA, 2017

RELEVANT TECHNICAL SKILLS AND INTERESTS

Software skills HFSS, CST Microwave studio, ADS, MATLAB

Hardware skills Inkjet-printing of various conductive and polymer-based inks on different substrates, 3D printing (SLA and FDM), network analyzers, VNA, antenna measurements in anechoic chamber, antenna fabrication, GHz oscilloscopes & signal generators,

Interests (UHF-mm-wave) antenna design, mm-wave packaging, additively manufactured RF components, deployable RF structures, 3D/4D printed RF structures (antennas, FSS, refelectarrays)

AWARDS RECEIVED

- Nominated for **Cleaver award 2020** for best PhD proposal at Georgia Institute of Technology
- Runner-up for best **student paper competition** & **three-minute thesis (3MT®) competition** at International Microwave Symposium (IMS) 2019 (Boston, USA)
- Best presentation and **3MT** winner at International Microwave Symposium (IMS) 2018 (Philadelphia, USA)
- **3MT** finalist at IMS 2017 (Hawaii, USA)
- Selected for **NSF I-Corps** program and awarded of $50,000 as initial funding grant to do customer discovery of proposed product from PhD research (2017)
- Recipient of **2017 gold medal award** at 20th Archimedes Inventions and Innovative Technology Salon held at Moscow
- Awarded **graduate research assistantship** by Georgia Institute of Technology for PhD at Athena Lab (2015-2020)
- Awarded **Fulbright Scholarship** to pursue PhD studies at Georgia Institute of Technology (a highly prestigious and competitive scholarship awarded every year by US government to selected few throughout the world to pursue graduate studies in USA)
- Awarded **two travel grants by Higher Education Commission** (HEC), Pakistan to attend EuCAP conference at Gothenburg (Sweden) and META conference at Sharjah (UAE) in April 2013 and March 2013 respectively.
- Received **cash prize** of $500 by FAST-NUCES (Islamabad) for excellence in research.
- **Best Project Award 2007** in Wireless Networks project at Radio Communication Systems, KTH Sweden.
- Awarded **scholarship by Swedish Institute** in collaboration with HEC (Pakistan) for master studies in Sweden (a highly prestigious and competitive award given to selected students annually by HEC)
- Awarded graduate research sponsorship **by University of Technology Petronas** (Malaysia)
- One of **top 5 highest scoring students** in the whole university and second (2nd) highest scorer of class during undergraduate studies.
- **Received distinctions** in every semester of the undergraduate degree.

Emmanouil M Tentzeris
Ken Byers Professor in Flexible Electronics
School of Electrical and Computer Engineering
Georgia Institute of Technology, Atlanta, GA, USA
Ph (office): +1 404.385.6006
Email: etentze@ece.gatech.edu

Glaucio H. Paulino
Raymond Allen Jones Chair & Professor
School of Civil & Environmental Engineering
Georgia Institute of Technology, Atlanta, GA, USA
Ph (office): +1 404.385.3996
Email: glaucio.paulino@ce.gatech.edu

Suresh K. Sitaraman
Regents' Proessor and Morris M. Bryan, Jr. Professor
George W. Woodruff School of Mechanical Engineering
Georgia Institute of Technology, Atlanta, GA, USA
Ph (office): +1 404.894.3405
Email: suresh.sitaraman@me.gatech.edu