Md Abu Saleh Tajin

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in LinkedIn Google Scholar

Education

Postdoctoral Researcher   Aug. 2023 - Present

Cornell University, Ithaca, NY

Supervisor: Dr. Alyosha Christopher Molnar

PhD in Electrical and Computer Engineering   Aug. 2023

Drexel University, Philadelphia, PA

Supervisor: Dr. Kapil R. Dandekar

Dissertation: Reconfigurable Radio Frequency Transceivers for Next-Generation Internet of Things

MS in Electrical Engineering   Sept. 2021

Drexel University, Philadelphia, PA

BS in Electrical and Electronic Engineering (Communication major)   Sept. 2015

Bangladesh University of Engineering & Technology (BUET)

Thesis: Antenna Design using Ultra Wideband (UWB) Technology for Wireless Capsule Endoscopy

Research Interests

On-body and in-body wireless sensors, wearable antennas, reconfigurable antennas,

Research Accomplishments

- Developed a novel method for extracting radio frequency sheet resistance of unconventional conductive surfaces.

- Designed a knitted conductive-fabric-based passive UHF RFID respiration sensor with a 5.8-meter read range, the highest in the literature.

- Developed a passive UHF RFID diaper moisture sensor (4.4 m read range) and real-time fluid level detector (4.6 m read range), both having maximum read range in the literature.

- Developed a new method of mapping incident power and relative phase distribution in RISs.

- Discovered the physics behind the frequency-dependent electrical conductivity of 2D conductive nanomaterial MXene.

Academic Honors

- **Joseph & Shirley Carleone Fund Award**, College of Engineering, Drexel University — 2023

- **Paul Lemmo PhD Fellowship**, Electrical and Computer Engineering, Drexel University — 2022

- **Nihat Bilgutay Fellowship**, Electrical and Computer Engineering, Drexel University — 2021

- **Best Poster Award** in the AI Systems and Applications session, IBM-IEEE AI Compute Symposium — 2021

- Outstanding Graduate Student Mentorship Award, Drexel University (Honorable mention) — 2021

- **Seiberlich Fellowship**, Electrical and Computer Engineering, Drexel University — 2020

- Bangladesh-Sweden Trust Fund travel grant — 2018

Journal Publications

(311 citations, h-index=8; Google Scholar, 04/2024)

J16. **Tajin, M. A. S.**, Hossain, M. S., Stroh, A., & Dandekar, K. R. Passive UHF RFID-based intravenous fluid level sensor. *IEEE Sensors Journal, 2023* [Impact Factor: 4.325]

J15. **Tajin, M. A. S.**, Anim, K., & Dandekar, K. R. Incident power and phase mapping in reconfigurable intelligent surfaces using energy harvesting. *IEEE Transactions on Antennas and Propagation, 2023* [Impact Factor: 4.388]

J14. **Tajin, M. A. S.**, & Dandekar, K. R. Anomalous radio frequency conductivity and sheet resistance of 2D $Ti_3C_2T_x$ MXene. *IEEE Access, 2022* [Impact Factor: 3.367]

J13. **Tajin, M. A. S.**, Amanatides, C. E., Dion, G., & Dandekar, K. R. Passive UHF RFID-based knitted wearable compression sensor. *IEEE Internet of Things Journal, 2021* [Impact Factor: 11.043]

J12. **Tajin, M. A. S.**, Jacovic M., Dion, G., Mongan, W. M., & Dandekar, K. R. UHF RFID channel emulation testbed for wireless IoT systems. *IEEE Access, 2021* [Impact Factor: 3.367]

J11. **Tajin, M. A. S.**, Levitt, A. S., Liu, Y., Amanatides, C. E., Schauer, C. L., Dion, G., & Dandekar, K. R. On the effect of sweat on sheet resistance of knitted conductive yarns in wearable antenna design. *IEEE Antennas and Wireless Propagation Letters, 2020* [Impact Factor: 3.834]

J10. **Tajin, M. A. S.**, Mongan, W., & Dandekar, K. R. Passive RFID-based diaper moisture sensor. *IEEE Sensors Journal, 2020* [Impact Factor: 4.325]

J9. **Tajin, M. A. S.**, & Dandekar, K. R. Pattern reconfigurable UHF RFID reader antenna array. *IEEE Access, 2020* [Impact Factor: 3.367]

J8. **Tajin, M. A. S.**, Bshara, O., Liu, Y., Levitt, A., Dion, G., & Dandekar, K. R. Efficiency measurement of flexible On-body antenna at varying levels of stretch in a reverberation chamber. *IET Microwaves, Antennas and Propagation Journal, 2019* [Impact Factor: 2.016]

J7. Paul, A., **Tajin, M. A. S.**, Das, A., Mongan, W. M., & Dandekar, K. R. Energy-efficient respiratory anomaly detection in premature newborn infants. *Electronics, 2022* [Impact Factor: 2.690]

J6. Bshara, O., Pano, V., **Tajin, M. A. S.**, Rey, X. R., & Dandekar, K. R. Noncooperative sub-6 GHz reconfigurable antenna DoA estimation to aid mmWave analog beamforming: Algorithm and measurements. *IEEE Access, 2021* [Impact Factor: 3.367]

J5. Bshara, O., Pano, V., **Tajin, M. A. S.**, & Dandekar, K. R. Millimeter wave coarse beamforming Using outband Sub-6 GHz reconfigurable antennas. *IET Communications, 2021* [Impact Factor: 1.542]

J4. Han, M., Liu, Y., Rakhmanov, R., Israel, C., **Tajin, M. A. S.**, Friedman, G., Volman, V., Hoorfar, A., Dandekar, K. R., & Gogotsi, Y. Solution-processed $Ti_3C_2T_x$ MXene antennas for radio-frequency communication. *Advanced Materials, 2020z* [Impact Factor: 32.09]

J3. **Tajin, M. A. S.**, Anim, K., Pano, V., & Dandekar, K. R. On the anomalous radio frequency conductivity of $Ti_3C_2T_x$ MXene and layered conductive nanomaterials. [In Preparation]

J2. **Tajin, M. A. S.**, Amanatides, C. E., Nkomo, M., Judd, N., Dion, G., & Dandekar, K. R. Knitted wearable BLEpatch antenna for COVID-19 monitoring. [In Preparation]

J1. **Tajin, M. A. S.**, Anim, K., & Dandekar, K. R. Directed-energy radio wave exposure detection. [In Preparation]

Conference and Workshop Proceedings Publications

C16. **Tajin, M. A. S.**, Helali, Z., Amanatides, C.E., Dion, G., & Dandekar, K. R. Directed high-energy radio wave exposure detection using a wearable antenna. *IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, 2023*

C15. **Tajin, M. A. S.**, Judd, N., & Dandekar, K. R. Wearable 2.4 GHz Bluetooth antenna for respiration monitoring and contact tracing. *IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, 2022*

C14. **Tajin, M. A. S.**, & Dandekar, K. R. On the design of Pattern reconfigurable Alford loop antennas. *International Conference on Electromagnetics in Advanced Applications (ICEAA), 2021*

C13. **Tajin, M. A. S.**, Levitt, A., Liu, Y., Amanatides, C. E., Schauer, C. A., Dion, G., & Dandekar, K. R. Extraction of knitted RFID antenna design parameter from transmission line measurements. *IEEE AP-S Symposium on Antennas and Propagation, 2020*

C12. **Tajin, M. A. S.**, Jacovic M., Mongan, W., & Dandekar, K. R. Channel emulation for the characterization of wearable RFID systems. *IEEE Wireless and Microwave Technology Conference (WAMICON), 2020*

C11. **Tajin, M. A. S.**, Ahmed, M., & Saha, P. K. Performance analysis of an Ultra Wideband antenna for wireless capsule endoscopy. *IEEE International Conference on Medical Engineering, Health Informatics and Technology, 2016*

C10. Anim, K., **Tajin, M. A. S.**, & Dandekar, K. R. Radio Frequency Directed Energy Weapon Mitigation via Passive Beamforming Reconfigurable Intelligent Surface. *IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, 2023*

C9. Anim, K., **Tajin, M. A. S.**, Amanatides, C. E., Dion, G., & Dandekar, K. R. Conductive fabric-based reconfigurable intelligent surface. *IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, 2022*

C8. Hossain, M. S., **Tajin, M. A. S.**, & Dandekar, K. R. UHF RFID tag localization using pattern reconfigurable reader antenna. *IEEE Wireless and Microwave Technology Conference (WAMICON), 2022*

C7. Stroh, A., Sigda, M., Carbone, K., Baun, D., **Tajin, M. A. S.**, Bshara, O., Pano, V., & Dandekar, K. R. A Pattern reconfigurable conformal mmWave antenna for 5G applications. *IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, 2021*

C6. Hansen, S., Schwartz, D., Stover, J., **Tajin, M. A. S.**, Mongan, W. M., & Dandekar, K. R. Fusion learning on multiple-tag RFID measurements for respiratory rate monitoring. *IEEE International Conference on BioInformatics And BioEngineering, 2020*

C5. **Tajin, M. A. S.**, & Dandekar, K. R. A Wearable compression and strain sensing Bluetooth antenna array. [Under Review]

C4. Anim, K., **Tajin, M. A. S.**, & Dandekar, K. R. A Conformal 360-degree Beam-steering Array Antenna for 5G Indoor Cellular Applications. [Under Review]

C3. **Tajin, M. A. S.**, & Dandekar, K. R. Wearable on-body compression sensing patch antenna miniaturization. [In Preparation]

C2. **Tajin, M. A. S.**, & Dandekar, K. R. Medical Internet of Things research opportunities. [In Preparation]

C1. **Nkomo, M., Tajin, M. A. S.**, & Dandekar, K. R. Fall-detection using wearable Bluetooth antenna. [In Preparation]

Book Chapters

B1. Amanatides, C., Hansen, S., Levitt, A. S., Liu, Y., O'Neill, P., Patron, D., Ross, R., Schwartz, D., Strover, J., **Tajin, M. A. S.**, Dion, G., Fontecchio, A. K., Pano, V., Mongan, W. M., & Dandekar, K. R. Wearable smart garment devices for passive biomedical monitoring. *IEEE Signal Processing in Medicine and Biology, Springer: December 2020*

Patents

P8. **M. A. S. Tajin** and K. R. Dandekar. Moisture sensing using radio frequency identification (RFID). U.S. Patent Application 17/929059, January 5, 2022

P7. **M. A. S. Tajin**, and K. R. Dandekar. Pattern reconfigurable UHF RFID reader antenna array. U.S. Patent Application 17/823976, March 16, 2023

P6. O. Bshara, V. Pano, **M.A.S. Tajin**, and K.R. Dandekar. Millimeter wave coarse beamforming using outband sub-6 GHz reconfigurable antennas. U.S. Patent Application 17/213,930, filed September 30, 2021

P5. **M. A. S. Tajin**, and K. R. Dandekar. Passive RFID-based intravenous fluid and blood level sensor. [Submitted]

P4. **M. A. S. Tajin**, and K. R. Dandekar. Directed high-energy radio wave exposure detection. [Submitted]

P3. **M. A. S. Tajin**, M. Nkomo, C. Amanatides, G. Dion, and K. R. Dandekar. Bluetooth Low Energy wearable textile sensor for COVID-19 monitoring. [Submitted]

P2. K. Anim, **M. A. S. Tajin**, C. E. Amanatides, G. Dion, and K. R. Dandekar. Functional fabric reconfigurable intelligent surfaces. [Submitted]

P1. K. Anim, **M. A. S. Tajin**, C. E. Amanatides, G. Dion, and K. R. Dandekar. Radio frequency directed energy weapon mitigation via passive beamforming reconfigurable intelligent surface. [Submitted]

Grant-writing experience

Actively participated to the following grant proposals with my supervisor:

G3. Electromagnetic shields based on MXene nano-metamaterials, funded by the National Science Foundation (NSF) (award link)

G2. In-body and on-body MXene antennas for the Internet of Things, submitted to the NSF

G1. Functional fabric reconfigurable intelligent surfaces for next-generation Internet of Things [in preparation]

Teaching Experience

Drexel University | Electrical and Computer Engineering

- **Teaching Assistant**

Foundations of Electric Circuits	Summer 2019
Digital Logic Design	Winter 2019
Computation Lab	Fall 2017, Winter 2018
Linear Engineering Systems	Fall 2018
Analog and Digital Communications	Spring 2018

- **Senior Design Mentor**

Reconfigurable Intelligent Surfaces for 6G	2023
mmWave in 5G cellular communication	2022
Conformal mmWave antenna for 5G (Co-authored [C6])	2021

- **STAR, VIP, and Graduate Mentor**

Zyad Helali | Electrical Engineering undergrad, Drexel University   Fall-Winter 2022
Project: Wearable RF exposure detection

Nnaemeka Achebe | Electrical Engineering undergrad, Drexel University   Winter 2022
Project: BLEpatch antenna impedance matching

Musa Ashary | Electrical Engineering remote researcher (volunteer),   Summer 2022
BRAC University, Bangladesh
Project: BLEpatch antenna design for COVID-19 monitoring

Claudia Offutt | Computer Engineering undergrad, Drexel University   Summer 2021
Project: BLEpatch antenna design for COVID-19 monitoring

Abe Jeyaprathap | Computer Science undergrad, Drexel University   Summer 2021 Project:
BLEpatch antenna design for COVID-19 monitoring

Antonio Stroh | Electrical Engineering undergrad, Drexel University   Summer 2020, Fall 2021
Project: Fluid level monitor for smart medical transfusion

Nate Judd | Computer Engineering undergrad, Drexel University   Summer 2020, Fall 2021
Project: BLEpatch antenna design for COVID-19 monitoring

Sabrina Ahmed | Electrical Engineering graduate student (volunteer),   Summer 2021
Villanova University, PA
Project: BLEpatch antenna design for COVID-19 monitoring

- **Course Design**

1. ECET 512/580 – Wireless Systems / Simulation of Wireless Systems (with my supervisor)

- **Online Course Development Training**

1. Applying the Quality Matters Rubric

2. Online Accessibility and Inclusivity

Research Experience

Drexel University | Drexel Wireless Systems Lab

Research Assistant   Sept. 2017 - Present

- In collaboration with **Drexel Center for Functional Fabrics**, invented multiple wireless sensors (respiration, moisture, fluid level, and COVID-19 monitoring) and systems for medical IoT applications. Developed a new method for extracting radio frequency (RF) sheet resistance that is crucial for textile antenna design. Designed a smart RFID interrogator antenna and a channel emulation testbed. (award 1 link) (award 2 link) (award 3 link)

- In collaboration with **Drexel Nanomaterials Institute**, discovered that MXenes (a conductive 2D nanomaterial) demonstrate superior conductivity at RF compared to direct current (DC). Developed a theoretical model for explaining the DC-RF behavior of MXene. (award link)

- Demonstrated that pattern reconfigurable antennas at sub-6 GHz can speed up mmWave beamforming by reducing the search space. Mentored a senior design team for designing beam-steerable conformal mmWave antenna at 28 GHz. (award link)

Academic Service

Journal Reviewer

R9.	Scientific Reports	2023
R8.	IEEE Transactions on Mobile Computing	2022
R7.	Digital Signal Processing - Elsevier	2022
R6.	IEEE Transactions on Antennas and Propagation	2019-2021
R5.	IEEE Internet of Things Journal	2021
R4.	IEEE Sensors Journal	2021
R3.	IEEE Transactions on Wireless Communications	2021
R2.	IET Communication	2020
R1.	IEEE Access	2019

Invited Talks

T3. 'Reconfigurable Radio Frequency Transceivers for Next Generation IoT'
Villanova University, Feb 2023

T2. 'Reconfigurable Radio Frequency Transceivers for Next Generation IoT'
University of Missouri Kansas City, Feb 2023

T1. 'Reconfigurable Radio Frequency Transceivers for Next Generation IoT'
Villanova University, Feb 2023

Media Coverage

Selected reports on [J6]

- Drexel Now: Ultrathin, Spray-Applied MXene Antennas Are Ready for 5G

- Phy.org: Ultrathin spray-applied MXene antennas are ready for 5G

- Nano.gov: Ultrathin spray-applied MXene antennas are ready for 5G

Outreach and Memberships

- Demonstrated sensor prototypes to encourage STEM education among high school students from underrepresented backgrounds in Philadelphia, PA

- Former president of 'Badhon' (a voluntary blood donors' organization in Bangladesh) SBH unit, 2015

Member:

Institute of Electrical and Electronics Engineers (IEEE)	2019 - Present
IEEE HKN - International Honor Society	2022 - Present

References

Dr. Alyosha C. Molnar
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