I K M REAZ RAHMAN

Ph.D. Candidate at University of California, Berkeley

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EDUCATION

Doctor of Philosophy in Electrical and Electronics Engineering

2021 – 2026 (Expected) UC Berkeley

Master of Science in Electrical and Electronic Engineering

2018 – 2020 BUET
CGPA: 3.92/4.00

Bachelor of Science in Electrical and Electronic Engineering

2013 – 2017 BUET
CGPA: 3.96/4.00, Position: 5th out of 214 students

Advanced Level, Edexcel

2011 – 2012 Maple Leaf International School

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PUBLICATIONS

Journal Articles

Rahman, IKM Reaz, et al. "Deterministic Patterning and Alignment of Tellurium Quantum Wires using Nanoscale Templates." manuscript submitted.

Rahman, IKM Reaz, et al. "Thermally Stable Ruthenium Contact for Robust p-Type Tellurium Transistors." *Nano Letters* 25.10 (2025): 3956-3963.
https://doi.org/10.1021/acs.nanolett.4c06553

Geng, Jamie, et al. "Unusually Strong Near‐Infrared Photoluminescence of Highly Transparent Bulk InSe Flakes." *Advanced Functional Materials* 35.3 (2025): 2413672.
https://doi.org/10.1002/adfm.202413672

Byeon, Kyeong-Jae, et al. "Quantitative Characterization of ZrO_2 Gate Dielectric Interface with Tellurium." *Applied Physics Letters* 126.23 (2025).
https://doi.org/10.1063/5.0267586

Kim, Inha, et al. "Low Contact Resistance WSe_2 p-Type Transistors with Highly Stable, CMOS-Compatible Dopants." *Nano Letters* 24.43 (2024): 13528-13533.
https://doi.org/10.1021/acs.nanolett.4c02948

Rahman, IKM Reaz, et al. "Gate Controlled Excitonic Emission in Quantum Dot Thin Films." *Nano Letters* 23.22 (2023): 10164-10170.
https://doi.org/10.1021/acs.nanolett.3c02456

Higashitarumizu, Naoki, et al. "Anomalous thickness dependence of photoluminescence quantum yield in black phosphorous." *Nature Nanotechnology* 18.5 (2023): 507-513.
https://doi.org/10.1038/s41565-023-01335-0

Rahman, IKM Reaz, et al. "Low Voltage AC Electroluminescence in Silicon MOS Capactors." *Applied Physics Letters* 121.19 (2022): 193502.
https://doi.org/10.1063/5.0120507

RESEARCH INTEREST

My research focuses on characterizing low-dimensional semiconductor systems, with an emphasis on improving device performance for nanoelectronic and optoelectronic applications. I am particularly interested in enhancing the spectral purity of single-photon emission in two-dimensional chalcogenides and investigating quantum phenomena that emerge in chalcogens at reduced dimensionality. My work also includes simulation and analytical modeling of advanced solid-state devices, as well as developing fabrication strategies to integrate these novel materials with conventional silicon technology.

RESEARCH EXPERIENCE

Aligning crystal orientation of Tellurium using nanoscale templates

Supervisor: Prof. Ali Javey, UC Berkeley
- Exploring control over the intrinsic anisotropy of tellurium to reduce device variability
- Probing quantum transport which can now be accessed from the aligned crystal structure

Performance limits of tellurium based semiconductors

Supervisor: Prof. Ali Javey, UC Berkeley
- Exploring thermally stable contacts to tellurium for back-end-of-line integration to CMOS technology
- Probing the performance of tellurium transistors in nanoscale

Enhancing brightness in van der Waals semiconductors through electrostatic doping and strain.

Supervisor: Prof. Ali Javey, UC Berkeley
- Investigation of the transition from free carriers to an excitonic system in black phosphorus as a function of thickness scaling
- Suppressing non-radiative recombination in layered van der Waals semiconductors by application of strain

Gated Photoluminescence in Quantum Dot Thin Films

Supervisor: Prof. Ali Javey, UC Berkeley
- Optimizing a device structure for gating thin film quantum dots
- Analyzing the various recombination pathways under charge injection

Electroluminescence in Silicon MOS Capacitors

Supervisor: Prof. Ali Javey, UC Berkeley
- Fabrication of MOS devices in CMOS framework.
- Optical and electrical characterization of device performance metrics.

PUBLICATIONS

Uddin, Shiekh Zia, et al. "Efficiency Roll-Off Free Electroluminescence from Monolayer WSe_2." *Nano Letters* 22.13 (2022): 5316-5321.

https://doi.org/10.1021/acs.nanolett.2c01311

Rahman, IKM Reaz, Khan, Md Irfan, and Khosru, Quazi DM. "Analytical drain current and performance evaluation for inversion type InGaAs gate-all-around MOSFET." *AIP Advances* 11.6 (2021): 065108.

https://doi.org/10.1063/5.0052718

Rahman, IKM Reaz, Khan, Md Irfan, and Khosru, Quazi DM. "Electrostatic characterization and threshold voltage modeling of inversion type InGaAs gate-all-around MOSFET." *Journal of Computational Electronics* 20.4 (2021): 1504-1512.

https://doi.org/10.1007/s10825-021-01716-5

Khan, Md Irfan, Rahman, IKM Reaz, and Khosru, Quazi DM, "Surface potential-based analytical modeling of electrostatic and transport phenomena of GaN nanowire junctionless MOSFET," *IEEE Transactions on Electron Devices* 67.9 (2020): 3568-3576.

https://doi.org/10.1109/TED.2020.3011645

Rahman, IKM Reaz, Khan, Md Irfan and Khosru, Quazi DM. "A rigorous investigation of electrostatic and transport phenomena of GaN double-channel HEMT." *IEEE Transactions on Electron Devices* 66.7 (2019): 2923-2931.

https://doi.org/10.1109/TED.2019.2915837

Conference Proceedings

Khan, Md Irfan, IKM Reaz Rahman, and Quazi DM Khosru. "Analytical Modeling of Capacitance-Voltage Characteristics of GaN Nanowire Junctionless MOSFET." 2020 *IEEE* 20th International Conference on Nanotechnology (IEEE-NANO). IEEE, 2020.

https://doi.org/10.1109/NANO47656.2020.9183461

Rahman, IKM Reaz, et al. "Analytical modeling of electrostatic characteristics of enhancement mode GaN double channel HEMT." 2018 *IEEE* 13th Nanotechnology Materials and Devices Conference (NMDC). IEEE, 2018.

https://doi.org/10.1109/NMDC.2018.8605851

WORK EXPERIENCE

Affiliate

2021–Present Lawrence Berkeley National Laboratory

Material Sciences Division

Assistant Professor

2021–Present (On Leave) BUET

Department of Electrical and Electronic Engineering

Lecturer

2018–2021 BUET

Department of Electrical and Electronic Engineering

Educational and Outreach Coordinator

2019–2021 IEEE

IEEE ED/SSCS Bangladesh Chapter

RESEARCH EXPERIENCE

Electrostatic Characterization and Drain Current Modeling of Inversion Type InGaAs Gate-All-Around MOSFET

Supervisor: Dr. Quazi D. M. Khosru, BUET

- Solving quasi 2-D Poisson equation in a continuous manner with inclusion of short channel non-ideal effects.

A Rigorous Investigation of GaN Double Channel MOS-HEMT

Supervisor: Dr. Quazi D. M. Khosru, BUET

- Self-consistent solution of Schrodinger-Poisson equation leading to spatial distribution of carrier density, drain current formulation including inter channel coupling.

TECHNICAL SKILLS

Skillset

- Microfabrication, Nanofabrication, Physical vapor deposition, Electrical characterization, SEM, AFM, Raman spectroscopy, Optical spectroscopy, Cryogenic deposition, Cryogenic measurement

Programming Languages

- Matlab, Python, Verilog, Latex

Software

- TCAD:Sentaurus Device, Lumerical, COMSOL Multiphysics

RELEVANT COURSEWORK

Graduate Courses (UC Berkeley)

- Integrated-Circuit Devices (EE230A), Introduction to Optical Engineering (EE218A), Lightwave Devices (EE232), Introduction to Microelectromechanical Systems (EE247A)

Undergraduate Courses

- Solid State Devices, Compound Semiconductor and Heterojunction Devices, Semiconductor Device Theory, MOS Devices, Optoelectronics, Power Electronics, Control Systems, Electronics (I + II), Energy Conversion, VLSI, Microprocessor and Interfacing, Measurement and Instrumentation, Communication Theory, Digital Signal Processing