# I K M REAZ RAHMAN

**Ph.D. Candidate at University of California, Berkeley**

ikmreaz_rahman@berkeley.edu | +1 341-2078910 | California, United States | I K M Reaz Rahman | 0000-0003-3911-4681
reaz_rahman | I K M Reaz Rahman | I K M Reaz Rahman | I K M Reaz Rahman

## 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
**4 A***

## PUBLICATIONS

### Journal Articles

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

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

Electrical and optical characterization of low-dimensional systems and electronic devices with an emphasis on performance enhancement in optoelectronic applications. Simulation and analytical modeling of nanoscale device and state-of-the-art solid state devices. Nanowire fabrication and simulation using novel materials.

## 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 the 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.

**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.

# 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

**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

**Analytical Modeling of GaN Nanowire Junctionless MOSFET using surface potential**

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

- Solution of Poisson equation using regional approach, gate voltage correction for short channel effect, inclusion of non-ideal effects and transport analysis.

**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

**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