

MUHAMMAD AHMED

Research Assistant

NILOP-PIEAS

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EDUCATION

PIEAS UNIVERSITY, ISLAMABAD, PK

NOV 2023 - NOV 2025

M.S. in Physics

- **GPA:** 3.51 out of 4.00
- *Funded by Higher Education Commission (HEC) under NRPU Research Grant.*
- **Thesis:** *High Dimensional Quantum Key Distribution* (completed Oct. 2025)

THE ISLAMIA UNIVERSITY of BAHAWALPUR, BAHAWALPUR, PK

NOV 2021 - MAY 2023

B.S. in Physics

- **GPA:** 3.97 out of 4.00

THE ISLAMIA UNIVERSITY of BAHAWALPUR, BAHAWALPUR, PK

SEP 2018 - MAR 2021

B.Sc. in Physics

Minor in Mathematics

- **MARKS:** 645 out of 800

AWARDS & HONORS

Winner (1st Place), Quantum Computing Hackathon Pakistan (Supported by OQI, CERN)

2026

HEC NRPU Graduate Research Scholarship (HEC NRPU Project No. 15313)

2024

PIEAS ESF Scholarship

2024

Gold Medalist, BS Physics (1st Position, The Islamia University of Bahawalpur)

2023

Diya Scholarship

2023

FCS Scholarship, The Islamia university of Bahawalpur

2023

Punjab Educational Endowment Fund (PEEF) Scholarship

2015

RESEARCH

NATIONAL INSTITUTE OF LASERS & OPTRONICS (NILOP), PIEAS, ISLAMABAD, PK

SEP 2025 - PRESENT

Advisor: *Dr. RAMIZ UL ISLAM*

- BBM92 entanglement-based QKD using free-space optical telescope.
- Implementation of fiber-based decoy-state QKD.
- Bell state measurement and State Tomography.
- Single-photon detector characterization.

PAKISTAN INSTITUTE OF ENGINEERING & APPLIED SCIENCES, ISLAMABAD, PK

SEP 2024 – AUG 2025

CENTER FOR QUANTUM SCIENCE AND TECHNOLOGY (QST), HEC NRPU PROGRAM

Advisor: *Dr. AFSHAN IRSHAD*

- Played a key role in establishing the Quantum Science & Technology Laboratory (QST Lab).
- Designed experimental quantum cryptography system.
- Hands on work in single photon generation, detection, and quantum state preparation.

PRESENTATIONS & PAPERS

M.Ahmed, Afshan. *High-Dimensional Decoy-State Quantum Key Distribution Using Spin-Orbit Photonic Qudits*. paper: in preparation.

M.Ahmed, Rameez. *Complete Experimental Certification of a Polarisation-Entangled Photon Source via Cross-Validated Quantum Measurements*.

M.Ahmed, Afshan, Waseem. *High Dimensional Quantum Key Distribution*. The International Nathia-Gali Summer College (INSC) on Physics and Contemporary Needs, Nathia Gali, Pakistan, Poster presentation: June 26, 2025.

COURSE INSTRUCTOR

- Course instructor for the following undergraduate courses:
 - 1. PHY 01704: Numerical Methods F 2023
 - 2. PHY 01505: Thermal Physics S 2023
 - 3. PHY 01502: Basic Electronics S 2023
- *Responsibilities include* designing and delivering lectures, leading problem-solving and review sessions, developing assignments, grading exams and homework, and holding regular office hours to support undergraduate learning.

ACTIVITIES
& LEADERSHIP**QUBIT SOCIETY**, Department of Physics, Quaid-i-Azam University, Islamabad APR 2025 – PRESENT

MEMBER

- Participated in scientific seminars, workshops, and academic outreach activities promoting science awareness.

KHWARIZMI SCIENCE SOCIETY

MAY 2024 – PRESENT

MEMBER (MEMBERSHIP ID 1122)

- Engaged in discussions and activities related to quantum science, quantum computing, and emerging quantum technologies.

IUB SCIENCE PROMOTION SOCIETY

JAN 2023 – DEC 2023

VICE PRESIDENT-II

- Organized STEM outreach activities, science awareness programs, and academic events for undergraduate students.
- Promoted research engagement and scientific literacy by mentoring students and encouraging participation in research-oriented activities.

PROFESSIONAL
EXPERIENCE**NATIONAL INSTITUTE OF LASERS & OPTRONICS (NILOP)**, PIEAS UNIVERSITY SEP 2025 - PRESENT

RESEARCH ASSISTANT

- Implemented fiber-based decoy-state QKD and free-space BBM92 QKD systems.
- Characterizing single-photon detectors.
- Characterization of non-classical light source.
- Faint Pulse Source generation for fiber-based QKD systems.

QST LABS, PIEAS UNIVERSITY, ISLAMABAD, PK.

SEP 2024 – MAY 2025

GRADUATE ASSISTANT

- Contributed to the establishment of the QST Laboratory from the ground up.
- Designed and executed BB84 protocol setup.

CONFERENCES &
WORKSHOPS

- International Nathia Gali Summer College on Physics and Contemporary Needs (Quantum Technologies) JUN 2025
- Recent Advances in Quantum Science & Technology — PIEAS FEB 2025
- 18th National Symposium on Frontiers of Physics — Quaid-i-Azam University, Islamabad FEB 2025
- Exploring the nexus of artificial intelligence and quantum computing exploring the nexus of artificial intelligence and quantum computing, GIKI. FEB 2025
- International Young Quantum Scientists' Meet (IYQSM) 2024 Jaypee Institute SEP 2024
- 2nd National Symposium on Quantum Information Science and Technology, NILOP, Islamabad MAY 2024

CERTIFICATES & COURSES

- Quantum optics I & Quantum Optics II: Two Photons and More — Institut Polytechnique de Paris
- Introduction to Quantum Information — KAIST
- Quantum Cryptography and the Future of Cybersecurity — LinkedIn Learning
- Practical Introduction to Quantum-Safe Cryptography — IBM
- The Complete Quantum Computing Course for Beginners — Packt
- Quantum Mechanics — University of Colorado Boulder
- Quantum Computing Fundamentals — LinkedIn Learning
- Practical Quantum Computing with IBM Qiskit for Beginners — Packt
- Hands-on quantum error correction with Google Quantum AI — Courser
- How to Write and Publish a Scientific Paper — École Polytechnique

SKILLS & OTHER INFO

Programming: MATLAB, Python, Qiskit (Quantum circuit simulation, basic algorithms, Quantum Machine Learning, Quantum Optimization).

Lab: Optical alignment, single-photon generation and detection, polarization optics, fiber and free-space optical systems.

Electronics: Pulsed laser generation, photodiode-based detectors, Arduino, FPGA.

Data Analysis & Simulation: QBER analysis, key-rate estimation, experimental data processing, numerical simulations (Python).

Software: LaTeX, Microsoft Office, laboratory instrumentation software.

Language: English

Interests: Music, Running, Book reading.