

Muhammad Tahir – Curriculum Vitae

Work experience

- **PhD in MATHEMATICAL MODELS FOR ENGINEERING, ELECTROMAGNETICS AND NANOSCIENCES** [01/11/2023 – Current]

Sapienza University of Rome

(Rome, Italy, PNRR project)

The project focuses on the investigation and post-growth control of the optical and electronic properties of III–V semiconductor nanowires (NWs), which are promising building blocks for next-generation microscale electronic, photonic, and quantum devices. Particular emphasis is placed on bandgap engineering of indium nitride (InN) nanowires through controlled hydrogenation and thermal annealing. By locally tuning the bandgap and carrier properties of the nanowires, spatially confined low-energy regions can be created, enabling the formation of quantum-dot-like structures within individual nanowires. This approach provides a pathway toward the development of scalable, wavelength-tunable quantum emitters and reliable single-photon sources for emerging quantum technologies.

Education and training

- **Master's degree in Materials Science Physics** [01/01/2018 – 01/02/2020]
COMSATS University Islamabad (Islamabad, Pakistan)
Thesis: Synergistic Electrical and Thermal Conductivity Approach for Modified Thermoelectricity in Bismuth Telluride Selenide
- **M.Sc in Physics** [01/01/2015 – 01/3/2017]
Bahauddin Zakariya University Multan (Multan, Pakistan)
- **B.Sc in Double Math, Physics** [01/08/2012 – 01/07/2015]
Bahauddin Zakariya University Multan (Multan, Pakistan)

PUBLICATIONS

- [2026] - **Tuning bandgap energy and light emission via post-growth hydrogenation of InN nanowires: experimental and theoretical foundations.** (In preparation)
Authors: Francesca Santangeli, Muhammad Tahir, Todesco, Pietro, Ernesto Placidi, Giorgio Pettinari, Nadine Denis, Marco Sbroscia, Zetian Mi, Antonio Polimeni, Songrui Zhao and Marta De Luca.
- [2026] - **Investigation of hydrogen diffusion in InN Nanowires through bandgap variation.** (in preparation)
Authors: Muhammad Tahir, Francesca Santangeli, Harikrishnan Gopalakrishnan, Akant

Sagar Sharma, Ernesto Placidi, Marco Sbroscia, Antonio Polimeni, Songrui Zhao and Marta De Luca.

- [2025] - **Bandgap engineering across telecom wavelengths of InN nanowires by post-growth hydrogen irradiation** (Poster, Nanowire Week, Cambridge, United Kingdom)
Authors: Francesca Santangeli, Muhammad Tahir, Todesco, Pietro, Ernesto Placidi, Giorgio Pettinari, Nadine Denis, Marco Sbroscia, Zetian Mi, Antonio Polimeni, Songrui Zhao and Marta De Luca.
- [2025] - **Hydrogenation-Driven Bandgap Engineering in InN Nanowires for Quantum Technologies and Optoelectronic Devices** (Poster, Nanowire Week, Cambridge, United Kingdom)
Authors: Muhammad Tahir, Francesca Santangeli, Todesco, Pietro, Ernesto Placidi, Giorgio Pettinari, Marco Sbroscia, Zetian Mi, Antonio Polimeni, Songrui Zhao and Marta De Luca.