

Muhammad Muneeb Bin Shoaib

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Padova, 35134, Italy

EDUCATION

- **University of Padova** Oct 2021 - Sept 2024
MSc Physics (Course Track: Fundamental Interactions) Padova, Italy
 - Key Courses: Theoretical Physics, General Relativity, Nuclear Physics, Subnuclear Physics
Astroparticle Physics, Multimessenger Astrophysics
 - Score: 101/110
- **Habib University** Oct 2016 - Jul 2020
BS Electrical Engineering (Minor: Physics) Karachi, Pakistan
 - Key Courses: Classical Mechanics, Modern Physics, Quantum Mechanics,
Mathematical Methods for Physics
 - Score: 3.50/4.00

EXCHANGE PROGRAMMES

- **Heidelberg University** Oct 2022 - Mar 2023
MSc Physics Heidelberg, Germany
 - Coursework: Cosmology, Theoretical Statistical Physics, Statistical Methods in Particle Physics

HONORS AND AWARDS

- **Undergraduate Research Achievement Award** July 2020
Habib University
 - Awarded for working on a final year project on 'Empirical Study of Planar Inverted-F Antenna'.
- **HU TOPS Scholar** Oct 2016
Habib University
 - Awarded 100% Merit Scholarship for 4 years of undergraduate studies

RESEARCH PROJECTS

- **MSc Thesis: Detection prospects for Axion-Like Particles (ALP) Searches with SWGO** Oct 2023 - Sept 2024
 - Analyzed the prospective performance of the Southern Wide Field Gamma-ray Observatory (SWGO) for detecting very high-energy gamma-ray sources (GeV-TeV) under axion-like particle (ALP)-photon conversion scenarios.
 - Modeled multiwavelength spectra of blazars using radiative processes like synchrotron self-Compton (SSC) to study AGN emission mechanisms.
 - Developed expertise in gamma-ray data analysis using Gammapy, GammaAlps, and the MMDC platform, gaining hands-on experience in astrophysical modeling and interpretation.
- **Course Project: CP Violation in Kaon Decay** Jun 2022 - July 2022
 - Explored the first conclusive evidence of direct CP violation in neutral kaon decays, as observed by the NA48 experiment at CERN in 1999.
 - Discussed the measurement of the $Re(\frac{\epsilon'}{\epsilon})$ parameter, confirming CP violation in the weak interactions of the Standard Model.
 - Reviewed experimental techniques and data analysis methods used in NA48, highlighting their impact on precision tests of fundamental symmetries in particle physics.
- **Course Project: Strong Interaction in the Nuclear Medium** Dec 2021 - Jan 2022
 - Analyzed the role of effective field theories and chiral perturbation theory in modeling the strong nuclear force within many-body systems.

- Explored the connection between lattice QCD results and phenomenological models of nuclear interactions.
- Delivered a seminar-style presentation summarizing key theoretical developments and their implications for modern nuclear structure research.

• Course Project: Time-Independent Perturbation Theory

Nov 2019 - Jan 2020

- Studied and applied time-independent perturbation theory to approximate solutions of quantum systems with known unperturbed states.
- Explored first- and higher-order corrections to energy levels and eigenstates in systems like the hydrogen atom and quantum harmonic oscillator.
- Analyzed relativistic corrections contributing to the fine structure of the hydrogen atom, deepening understanding of quantum mechanical perturbative methods.

PUBLICATIONS AND PRESENTATIONS

- [1] Muhammad Muneeb Shoaib, et al. (2020). **Planar Inverted-F Antennas for Mobile Devices: An Empirical Study of the Resonant Frequency**. In *2020 IEEE Texas Symposium on Wireless and Microwave Circuits and Systems (WMCS)*, IEEE. Waco, TX, USA. DOI: 10.1109/WMCS49442.2020.9172273
- [2] Muhammad Muneeb Shoaib, et al. (2020). **Planar Inverted-F Antenna for Portable Devices: An Empirical Study of the Resonant Frequency and Fractional Bandwidth**. In *2020 13th International Conference on Communications (COMM)*, IEEE. Bucharest, Romania. DOI: 10.1109/COMM48946.2020.9142005
- [3] **10th SWGO General Meeting, Mexico**: Presented my thesis work on prospective study of Southern Wide-Field Gamma-ray Observatory (SWGO) sensitivity and investigating the Axion-Like Particles (ALP) searches with SWGO.

EXPERIENCE

• R&D Altanova Pvt. Ltd.

Oct 2020 - Sept 2021

Job title: Design Engineer

Karachi, Pakistan

- Designed and developed test boards for Device Under Test (DUT) using Allegro PCB Editor, ensuring high-performance signal integrity and reliability in semiconductor testing.
- Collaborated with the Multi-Layer Organic (MLO) team to design advanced multi-layer PCB substrates, optimizing electrical and mechanical performance for wafer sort and final test applications.
- Worked closely with cross-functional teams to integrate SI/PI simulations and advanced fabrication techniques, enabling efficient testing of next-generation semiconductor devices.

SKILLS

- **Programming Languages:** C/C++, Python
- **High Energy Astrophysics / Numerical Modelling:** GammaPy, GammaAlps, Firmamento, MMDC
- **Technical Softwares:** Matlab, Mathematica, HFSS (Antenna Simulation), Maple, Labview, OrCad
- **Microsoft Office:** Word, Powerpoint, Excel
- **Scientific Writing:** LaTeX
- **Interpersonal:** Teamwork, Flexibility, Communication, Writing & Research
- **Languages:** English (Proficient), Italian (Intermediate), Urdu (Native)

REFERENCES

1. **Michele Doro**
Associate Professor, Physics
University of Padova
Email: michele.doro@unipd.it
Relationship: Thesis Advisor (MSc)
2. **Shafayat Abrar**
Professor, Electrical Engineering
Habib University
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Relationship: Thesis Advisor (BS)
3. **Antonio Caciolli**
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Relationship: Course Instructor (MSc)