Shehroze Amir

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EDUCATION

University of Calgary — Alberta, Canada
Master of Science in Electrical Engineering — *Aug. 2025 – June 2027*

- **Supervisor** – Fadhel M. Ghannouchi | Google Scholar

National University of Sciences & Technology (NUST) — Islamabad, Pakistan
Bachelors of Engineering in Electrical Engineering — *Aug. 2019 – June 2023*

- **CGPA** – 3.56/4.0
- **Senior Design Thesis:** Controlled Reception Pattern Antenna to mitigate unwanted signals | Presentation
- **Rectors Gold Medal:** Among 2 nominees for best UG Final Year Project (Jun 2023)
- **Best Adjudged Industry Project:** 3rd position in NUST UG Open House 2023 for "Controlled Reception Pattern Antenna" (May 2023)

SKILLS

Professional Software: ADS, CST Studio Suite, HFSS, ANSYS Lumerical, MATLAB/Simulink, Vivado, Altium Designer, Cadence Virtuoso, Keil, Raspberry Pi OS, LaTeX

RF Measurements: Skilled in operating Keysight M9019A and Agilent N5230A VNAs, R&S FSW43 signal and spectrum analyzers, NI 5793 transmitters and 5646R transceivers, logic analyzers, and precision RF power meters

Programming & Technical Skills: C/C++, Python, Verilog, FreeRTOS, MQTT, Linux kernel (Vanilla), RFSoC development, RF PCB and antenna design, RF system debugging and testing

Languages: English (C1 – Advanced), Urdu (Native)

CORPORATE EXPERIENCE

Electro-dynamic systems — June 2023 – July 2025
Location NSTP, Islamabad
Domain: Hardware Design Engineer

- Working on the design and development of the phased array for SATCOM communication for Ku-band as the project lead.
- Worked on the Quad Transmit Receive Module (QTRM) and frequency converter unit of a 160 W, 64-element X-band AESA pulse-Doppler radar, including transfer of technology (TOT).
- Designed layouts for X-band FMCW radar components, including PLL synthesizer and spectrum analyzer, achieving a reduction in signal degradation by 5percent.
- Implemented MUSIC algorithm for direction finding, extending detection capabilities up to 6 GHz on Xilinx ZCU-104+ FPGA and AD9361 SDR.
- Led multi-chip synchronization of ADRV9002 transceivers, ensuring phase alignment and delay consistency across all channels.

Fusion Technologies (Part Time) — Jan 2025 – Auguest 2025
Location UK (Remote)

- Working on the time tagger signal photon counting for laser scanning microscopy and frequency stability analysis using modified Allan deviation measurement.
- Worked on the ZCU111 RFSOC to implement and validate the frequency stability algorithm.

RESEARCH EXPERIENCE

iRadio Lab, Canada — Aug 2025 – Present
Advisor: Dr. Fadhel M. Ghannouchi — Google Scholar

- Started working on the programming of the ZCU216 RFSoC.
- Modeling and linearization of power amplifiers using neural network-based digital predistortion techniques.

AEEL Lab, Saudi Arabia — June 2023 – Aug 2025
Advisor: Dr. Muhammad Amin — Google Scholar
Project: Electromagnetically Induced Transparency Resonator Design for a classical system (Working)

- Designed and developed an Electromagnetically Induced transparency-based resonator for passive beamsteering at sub-terahertz antenna.

Project: Anomalous Phase Detection in Monostatic Ground Penetrating Radar Sensing Application
Submitted in: Nature Communication Journal

- Worked on the development of a novel ground penetrating radar sensor by calibrating a distinct double shift in the phase-slope of scattering near the resonance of an antenna due to anomalous dispersion.

Project: Ultra-Sensitive Metal Detectors design for Small Object Detection
Submitted in: IEEE Sensors Journal

- Working on designing high-sensitivity metal detectors using Lorentz Dispersion and Proximity Coupling in Microwave Resonators to detect small metallic objects with precision. Implemented advanced electromagnetic field interaction techniques to optimize frequency shifts and resonance quality factor changes, resulting in enhanced detection sensitivity and real-time monitoring capabilities.

TUIL Virtual Research Lab   June 2024 – June 2025
Advisor: Dr. Nosherwan Shoaib | HOD Research, SEECS   Google Scholar
Project: GNSS Record/Replay and Simulator Module

- Designed a GNSS record/play and simulator module for L1, L2, and L5 bands of GPS ass well as B1, B2 and B3 of BeiDou , providing critical solutions for GPS signal testing and simulation in real-time scenarios. The project involved system integration, circuit design, and artificial baseband GPS and BeiDou signal generation
- Genereted L1 and B1 GNSS on the raspberry pi 4 and transmitted these signals using bladeRF SDR.

Project: Fluid-Driven Pattern Reconfigurable Antenna With Cavity-Backed Slot
Advisor: Dr. Muhammad Umar Khan   Google Scholar
To be submitted in: IEEE Transactions on Antennas and Propagation

- Developing a 10 GHz cavity-backed slot antenna featuring liquid mercury-filled PLA posts for dynamic beam steering, enabling 360-degree azimuth scan coverage with high efficiency.
- Achieved a directivity of 12 dBi by integrating cone structures at the cavity extremities, demonstrating enhanced performance for radar and communication applications requiring precise beam steering.

NWN Lab   April 2024 – Oct 2024
Supervisor: Muhammad Tahir | Chairman EE, UET   Google Scholar
Project: Step frequency Continuous Wave Radar Mounted on UAV

- Worked and implemented the RF chain for step-frequency radar, achieving a 2-3 range resolution.
- Processed radar data using signal imaging techniques for clutter elimination, improving detection accuracy for buried metallic objects.

Radar Research Lab   May 2023 – June 2023
Advisor: Dr. Hammad Mehmood Cheema | Dean and Principal SINES | Director NCDC, NUST   Google Scholar
Project: Beamforming Butler Matrix

- Designed and implemented a high-performance Tx Butler matrix (13 by 5) for RADAR, optimizing power division and coupling characteristics using Keysight ADS and MATLAB.

Bismillah Electronics   Feb 2024 – Apr 2024
Advisor: Dr. Inam Elahi Rana | CEO Bismillah Electronic
Project: PLL Synthesizer Design

- Designed the layout and control algorithm for a Phase-Locked Loop (PLL) synthesizer with an LO frequency range up to 15GHz using ADF5355 and ADF4351 ICs.
- Worked on RF receiver chain design for a superheterodyne receiver operating in the X-band, enhancing receiver sensitivity and selectivity.

TUIL Virtual Research Lab   Spt 2022 – May 2023
Advisor: Dr. Muhammad Umar Khan   Google Scholar
Project: Controlled Reception Pattern Antenna for Beamsteering Applications
Published in: 12th International Conference on Radar, Antenna, Microwave, Electronics and Telecommunications | GitHub

- Designed antipodal Vivaldi phased array for horizontal and vertical configurations and beamforming network for active beam steering applications, focusing on improving the beam-steering capability of traditional antenna arrays.
- Developed algorithms for active beam steering and signal enhancement in multi-band phased array systems.

SELECTED PROJECTS

64-Element X-band AESA Pulse-Doppler Radar | **Industry Project** | **Advised by:** Dr. Inam Elahi Rana

- ∗ Worked on the **QTRM and frequency converter unit** for a **160 W, 64-element X-band AESA pulse-Doppler radar**. Successfully completed **technology transfer (TOT)** and ensured compliance with system specifications for high-power radar applications.

Step-Frequency Continuous Wave (SFCW) Radar for UAV | **Advised by:** Dr. Muhammad Tahir

- ∗ Worked on designing and implementing the RF chain of **UAV-mounted SFCW radar** for detection, achieving **sub-centimeter range resolution** for precise imaging and target identification.

* Worked on the signal processing for data acquisition and imaging on **ZCU-104+ FPGA** and **Raspberry Pi**.

Anomalous Phase Detection in Monostatic Ground Penetrating Radar | **Advised by:** Dr. Muhammad Amin

* Working a novel **ground penetrating radar sensor** by calibrating a distinct **double shift in the phase-slope of scattering** near the resonance of an antenna due to **anomalous dispersion**, enabling accurate detection of subsurface anomalies.

Fluid-Driven Pattern Reconfigurable Antenna | **Advised by:** Dr. Muhammad Umar Khan

* Developed a **10 GHz cavity-backed slot antenna** using **liquid mercury-filled PLA posts** for **dynamic beam steering** and **360-degree azimuth scan coverage**, achieving **12 dBi directivity** for radar and communication applications.

Metal Detection via Proximity E-field Coupling | **Advised by:** Dr. Omar Siddiqui

* Designed a **circular patch microwave resonator** with an open-circuit stub for detecting metallic objects by analyzing changes in the transmission coefficient (**S12**). Leveraged **proximity E-field coupling** to reliably identify metallic objects with high sensitivity, achieving **-10 dB attenuation** as the object approaches the sensor.

X-band FMCW Radar Component Design | **Industry Project**

* Designed **PLL synthesizer** and **spectrum analyzer layouts** for X-band FMCW radar, achieving a **5% reduction in signal degradation** and improving overall system performance.

CRPA to mitigate unwanted signals | **Advised by:** Dr. Muhammad Umar Khan

* Designed and optimized a **Controlled Reception Pattern Antenna (CRPA)** system to mitigate unwanted signals and enhance WiFi connectivity. Developed **antipodal phased arrays** for different configurations to increase beam-steering capability up to **120° at 2.4 GHz**, controlled via **MATLAB and Thingspeak server** for dynamic reception pattern steering, improving performance and jamming intruder signals.

GNSS Record, Replay, and Simulation Module | **Advised by:** Prof. Nosherwan Shoaib

* Designed and developed a **GNSS record/play and simulator module** for L1, L2, and L5 GPS bands as well as B1, B2, and B3 BeiDou bands. Integrated RF circuit design and system simulation for real-time GPS/BeiDou testing.

Direction Finding Systems for microwave-Wave Applications | **Industry Project** |**Advised by:** Dr. Muhammad Umar Khan

* Implemented the **MUSIC algorithm** for high-accuracy **direction finding** up to **6 GHz**, using **Xilinx ZCU-104+ FPGA** and **AD9361 SDR**, enhancing detection capability for microwave-wave signals. Developed an **automatic direction finder antenna system** based on correlative interferometry, enabling **precise localization of signals** within the millimeter-wave frequency range.

PUBLICATIONS

Fluid-Driven Pattern Reconfigurable Antenna With Cavity-Backed Slot

IEEE Transactions on Antennas and Propagation | Working

Awab Muhammad, <u>Shehroze Amir</u> , Adnan Nadeem , Muhammad U. Khan , Ravi Kumar Arya , Prashant Chaudhary, Raj Mittra

Anomalous Phase Detection in Monostatic Ground Penetrating Radar Sensing Application

Nature Communication Journal | Submitted   Paper

<u>S. Amir</u> , M. Amin, O. Siddiqui, T. Almoneef

A "See-Through" Metallic Sensor Implemented through Proximity Resonant Coupling

IEEE Sensors Journal | Submitted   Paper

T. Almoneef, <u>S. Amir</u> , M. Amin, O. Siddiqui

CONFERENCES

Antipodal Vivaldi Array Systems for Azimuth and Elevation Beamsteering Applications

12th International Conference on Radar, Antenna, Microwave, Electronics and Telecommunications | Published

<u>Shehroze A.</u>, M. Umar Khan, A. Muhammad

HONORS AND ACHIEVEMENTS

Position: Third position at UG open house for best industrial project.
Scholarship Pointers: NUST Merit Scholarship for top GPAs (2022)
Clubs and Societies: *IEEE*, Executive member, (2021)
NUST Robotics Club, member Directorate, (2021-2022)
Community Service: 120 hours of community service completed in Chadar Foundation.
Participated in a Flood relief campaign in 2022.
Volunteer teaching of high school students at undeveloped areas of Punjab.
Funding: Secured a funding of 0.7 million PKR for senior year project from RAC.