Rishi Nandha V | EE21B111 | PR/22/EE/25/111

Tapeout/Fabrication Portfolio

- **Full Duplexing 6G Transceiver in TSMC65 GP** (Submitted for Fabrication)
- **High-Speed Clock Synchronization PCB** (Used by 5G Testbed on a 5G BBU)
- **GPS-sync Clock Synthesis PCB** (Showcased in Indian Mobile Congress 2024)

Skills

CAD | Cadence Virtuoso • **Spectre** • Allegro • **Innovus** • **Genus** • Keysight ADS • Ansys HFSS • **EMX**
LANGUAGES | **Verilog HDL** • **C** • **C++** • AVR Assemby • ARM Assembly • Python • Typescript • C#
OTHER SKILLS | **Design Automation** with Parameter Search • Deep Learning with Torch & **CUDA**
COURSES | **Digital IC Design** • RF IC Design • **Devices for AI** & Neuromorphic Computing • Analog IC

Research Projects

R&D of a Full Duplex 6G Transceiver at 7 GHz

Jun 2024 – Current | Research Project, Guide: Prof. Aniruddhan Sankaran

- Designed a **single-antenna RX+TX** with on-chip duplexing based on Kumar et al.'s **TCAS1** design
- Designed a passive balun and **simulated the complete chip's electromagnetics** at 7GHz with EMX
- **Synthesized SPI registers** and **initiated PnR** for input matching and frequency divider calibration
- Achieved an **RX-TX Isolation of -50dB** in simulation. Design submitted for **tapeout in TSMC 65GP**

SOM Clock Distribution for Physical Layer Protocols

May 2023 – Nov 2024 | 5G Testbed, Funded by GOI[5] Department of Telecommunications

- Designed an **IEEE1588 Compliant RF Clock Structure** to synchronize data interfaces & GPS clocks
- Designed & Tested a **Multi-PLL Architecture** for SyncE, IEEE-1588, and JESD204B Synchronization
- Achieved **Return Loss of -26dB**, Insertion Loss -0.1dB & **Delay-Tuning** $\pm$**6ps** in the assembled PCB
- Achieve a **phase noise of -132dBc/Hz** at 100kHz offset for a 400MHz clock; showcased in IMC 2024

Course Projects

In-Memory Computation of a Neural Network with Synaptic Arrays

Devices for AI & Neuromorphic Compute (Fall 2024) - Prof. Bhaswar Chakrabarti

- Implemented a neural network with **RRAM Crossbars for dense layers** and OpAmps for activation
- Introduced a hardware-aware soft-binary model to train ex-situ with minimal quantization error
- Demonstrated a reduction of quantization-induced errors <2% on **inference of about 640 images**

Layout of an 8-Bit Multiplier with Pipelining in CMOS 22nm

Digital IC Design (Fall 2023) - Prof. Janakiraman Viraraghavan

- Designed a Carry Save Multiplier operating at a 2.8 GHz Clock with a 0.32ns critical path delay
- Designed **C2MOS D-Flipflops for Clocked Pipelining** for faster operation & decreased race paths
- Achieved a 67% increase in Max Frequency & 21% decrease in critical path delay with pipelining

Design of an RF Front End for 5GHz WLAN in CMOS 130nm

RF IC Design (Spring 2024) - Prof. Sankaran Aniruddhan

- Designed a Cascoded Common-Source LNA with In-Band S_{11} < -30dB, NF < 1.9dB & Gain > 32dB
- Designed an Active Gilbert Cell Mixer with In-Band Gain > 18.1 dB, IIP3 = -4.1 dBm & NF < 6.1 dB
- Designed a Cross-Coupled VCO with V_{pp} > 2.8V, 1MHz phase noise < -123 dBc/Hz & ΔK_{VCO} < 3%
- Designed a Cascoded Power Amplifier with P_{1dB} > 11.4 dBm & AM-PM Deviation at $P_{1dB} < 3.4^o$

Professional Experiences

Software Internship | Microsoft [Windows + Devices]

May - Jul 2025 | Hyderabad, India

- Devised ways to interface existing programs with an LLM; Automated routines such as local setup
- Experience includes designing server-side for maintainability and testability with SOLID principles

Leadership & Teaching Experiences

Executive Head | Sahaay - Social Innovation Club, CFI, IIT Madras (Apr 2023 – Mar 2024)

- **Reformed the Club** and achieved a growth of **400%** in members and **900%** in applications inflow
- Directed **5 Socially Impactful projects** including Animal Welfare, Assistive Technology & AgriTech
- Guided 2 teams closely on **Jetson Nano–based edge computing** and **Embedded C Programming**
- **Trained 54 Freshmen** on Deep Learning, Transfer Learning, Data Augmentation & Model Evaluation

Teaching Assistant | Devices for AI & Neuromorphic Computing (Fall 2025)

- Collaborated with Professor to renovate course assignments to include **Spiking Neural Networks**
- Introduced focus on **Leaky Integrate-and-Fire neurons** and improved hardware-aware methods

Education

IIT MADRAS

Dual Degree (B.Tech + M.Tech in Electrical Engineering)
CGPA: 8.93 / 10
2021 - 2026

CLASS XII

CBSE, Mathematics & Computer Science
Score: 94.0 %
2021

CLASS X

Central Board of Secondary Education
Score: 90.8 %
2019

Scholastic Achievements

Awarded in Institute Day 2022

with Certificate Of Merit by Dean Of Academics

AIR[1] 332 in JEE Advanced 2021

Among 0.14 million candidates

Top 35 AIR[1] in CMI Entrance 2021

Thereby qualifying for Admission in Chennai Mathematical Institute (CMI), India

Secured Gold Tier in OPhO[2] 2021

Placed 6th among 800 Teams across the world

Placed 7th in Physics Brawl 2021

Organized by FYKOS, Charles University, Prague

Open Source

IBM Qiskit Machine Learning

Contributed 3 natively Quantum datasets to a library with 830k+ downloads (2025)

Model Context Protocol SDK

Added samples to an SDK with 3k+ stars (2025)

Chatbot for JEE Aspirants

Developed an Open Source IRC bot adopted by 120+ aspirants with 10+ MAU till date (2021)

Interests

GUITARIST & MUSICIAN Graduated Trinity **Grade 3 in Piano**. Performed with IIT Madras Band and won **1st in IIM-B's Unmaad** and **3rd in IIT-B's Mood Indigo**. Showcased **3 original songs** as the opener for the fusion band **Masala Coffee** and **Guitar Prasanna**. Sold-out our own show in 2023

ULTIMATE FRISBEE Reserve in Insti[3] Team

Volunteering

STUDENT LEADER of Volunteer Group that aided Dean of Students & SLC[4] on Improving Measures for Women Safety On-Campus (2022)

UG COUNCIL REPRESENTATIVE in the Academic Restructuring of the Elec. Engg. Curriculum for Batches 2023 Onwards (2023)

ANIMAL WELFARE ENTHUSIAST
Collaborating with **Animal Welfare Board of India** to deploy an app for Distress Call Response.

1. All India Rank 2. Online Physics Olympiad 3. Institute 4. Student Legislative Council 5. Government of India