

Thariq Shanavas

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Indian Institute of Technology - Bombay

Research Interests: Experimental Particle Physics, Electromagnetics, RF Circuit design, Accelerator Physics

Education

2015 – Present Undergraduate, [Indian Institute of Technology – Bombay](#), Mumbai

Major in Electrical Engineering, Minor in Physics

CPI – 9.13/10.0

2013 – 2015 **Intermediate/+2**, S N Trusts Central School, Kerala, Percentage – 97.8

2012 – 2013 **Matriculation**, S N Trusts Central School, Kerala, CGPA – 10.00

Research Internships

- **Computational Electromagnetics | Modelling of Photonic nanostructures** May 2017 – July 2017
Dr Karthik Shankar, University of Alberta, Canada
 - Analytically modelled and numerically simulated the optical properties of titanium dioxide nanostructures using electromagnetic theory.
 - **Theoretically modelled** the observed surface plasmon resonances when the Titanium Dioxide nanotubes were coated with Titanium Nitride, using effective medium theories and the exact Gans theory. Calculations led to excellent agreement with experimental data.
 - Performed FEM simulations in the supercomputing cluster at the University of Alberta.
 - Findings submitted to a reputed journal; pending review.

Major Projects

- **Muon Tracker | Prof. Mandakini Patil** Aug 2017 – present
CMS collaboration | Tata Institute of Fundamental Research, Mumbai
 - Developing an FPGA based algorithm for tracing the path of a muon.
 - Testing out efficient algorithms to find a scalable method for tracing the particle from a detector matrix.
- **Silicon detector Calibrator | Prof. Pradeep Sarin** Jan 2017 – Apr 2017
Department of Physics, IIT Bombay
 - Designed a high precision **nanosecond pulse generator** for the purpose of calibrating the electronic readout of Silicon and Diamond particle detectors.
 - Implemented a low noise transconductance amplifier circuit followed by an attenuator block to convert a voltage pulse into a micro ampere current pulse.
- **Matsya, Autonomous Underwater Vehicle | AUV-IITB** Oct 2015-Oct 2016
International RoboSub, AUVSI & US Office of Naval Research

Part of a 30 member team aimed at developing unmanned AUVs. The team came second in the world at the international Robosub competition 2016, San Diego, California.

 - Developed a **DC – DC Boost Converter** for boosting the battery voltage, enabling the use of more powerful actuators.
 - Designed a **motor driver module** which is **80% cheaper and 200% as powerful** as the commercially available ones.
 - Implemented **hot-swapping** of batteries. Provided an additional layer of protection for the onboard computer in case of primary battery failure.

- Simulation of Spiral RF inductors | Prof. Dipankar Saha** *Apr 2016 - June 2016*
Department of Electrical Engineering, IIT Bombay
 - Studied and simulated **Spiral RF inductors** in the micron scale using **MATLAB** and **Comsol Multiphysics**.
 - Achieved a **95% agreement between simulation and experiment**.
 - Isolated** the chief cause of deviation from ideal behaviour by analysing the Smith chart.
 - Explored new models which were found have better characteristics than conventional ones by simulation.
 - Worked on the extraction of **S parameter** of **RF waveguides**, as a function of the frequency of operation.
- Coverage Control of multi-agent robotic systems | Prof. Sukumar Srikant** *Nov 2016 – Feb 2017*
Systems and Control Engineering, IIT Bombay
 - Worked on the control of decentralised autonomous mobile robots.
 - Suitable for decentralised sensing and action, for example, cleaning up oil spills.
 - Proposed a Lyapunov-type proof for the stability and convergence of the system.
 - Numerical simulations carried out for the proposed controller. Results found to agree very well with coverage objective.

Scholastic Achievements

- Secured **All India Rank 69** in IIT JEE 2015 among 1.35 million candidates for admission to IITs.
- Secured **International Rank 31** in the 17th National Science Olympiad Competition.
- Secured **National Rank 11** in the National Level Science Talent Search Examination-2015.
- Secured **International Rank 136** in the 8th International Mathematics Olympiad Competition.

Scholarships

- Kishore Vygyanik Protsahan Yojana (**KVPY**) awarded by Department of Science and Technology for promotion of basic Sciences among high school students to ~250 students in the country - 2015
- National Talent Search Examination (**NTSE**) awarded by the National Council for Educational Research and Training to ~1000 students in the country – 2013

Positions of Responsibility

- Manager, Maths and Physics Club, IIT Bombay.** *2015 - present*
 - Leading a team of six conveners to foster enthusiasm in mathematics and physics, tending to a community of 400 – 500 and an outreach of over 6000 online.
 - Over **five times increase in participation** in the Summer of Science initiative, a one to one mentoring program between enthusiasts and experienced senior students.
 - Organised several institute-wide quizzes and events to promote interest in the fundamental sciences.
 - Provided funding and mentorship to over 100 freshmen to pursue technical projects as part of Institute Technical Summer Projects – 2017

Technical Skills

Programming Languages	: C++, MATLAB, python
CAD Software	: Eagle, Altium, SolidWorks, AutoCAD
Simulation Software	: Comsol Multiphysics
Other software	: Atmel studio, Arduino IDE, HTML, CSS, Latex, gnuradio

Extracurricular Activities

- Completed a year-long course on playing the Keyboard.
- Built a line follower using an AVR microcontroller, implemented the **PID control loop**.
- Gave a talk on **Control loops** and the **PID algorithm** for the Robotics club, IIT Bombay.
- Successfully completed the Summer of Science initiative under an experienced senior mentor, on Cosmology under the Maths and Physics Club. [Report](#)
- Secured third prize in Electric Jhatka General Championship by the Electronics club, an institute-wide circuit design competition.