

# Asmeeta Prakash Sayaji

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🔗 [https://github.com/asmeeta-quantum/ETH\\_Qiskit\\_Workspace](https://github.com/asmeeta-quantum/ETH_Qiskit_Workspace)

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## Research Profile

Quantum researcher with a unique background in cryogenic microwave hardware engineering at ISRO, now focused on superconducting quantum computation. Bridges deep practical knowledge of low-noise cryogenic systems with advanced software skills in quantum simulation and error mitigation. Aiming to apply this combined hardware–software expertise to solve critical challenges in qubit characterization, noise modeling, and pulse-level control for scalable quantum error correction.

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## Quantum Computing Research Portfolio

A publicly available collection of code and notebooks demonstrating practical implementation of quantum simulations, algorithm design, and noise modeling.

**GitHub:** [https://github.com/asmeeta-quantum/ETH\\_Qiskit\\_Workspace](https://github.com/asmeeta-quantum/ETH_Qiskit_Workspace)

### Featured Projects:

- **Superconducting Qubit Noise Simulation ( $T_1$ ,  $T_2$ , depolarizing):** Simulated relaxation, dephasing, and depolarizing noise to evaluate qubit performance.
  - **Open Quantum Systems Simulation:** Modeled non-unitary dynamics using the Lindblad master equation (QuTiP) for a driven transmon qubit, analyzing  $T_1/T_2$  decoherence effects on state fidelity.
  - **DRAG Pulse Design for Leakage Suppression:** Designed and simulated DRAG pulses in Qiskit Pulse to suppress  $|1\rangle \rightarrow |2\rangle$  leakage during fast gate operations.
  - **Grover's / Deutsch–Jozsa Algorithms:** Implemented Grover's search and Deutsch–Jozsa algorithms to validate quantum advantage under realistic noise.
  - **Bell State Simulations:** Generated and sampled Bell states to study entanglement and modeled noisy Bell states to evaluate fidelity degradation under depolarizing errors.
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## Advanced Quantum Research (Ongoing)

**Independent and collaborative quantum computing research focused on noise modeling, error mitigation, and pulse-level optimization.**

- **Quantum Error Mitigation:** Benchmarked Grover's algorithm on IBM noisy simulators, applying Zero-Noise Extrapolation (ZNE) to enhance success probability from  $\sim 65\%$  to  $\approx 85\%$ .
- **Noise-Aware Algorithm Design:** Implemented the Deutsch–Jozsa algorithm ( $n=3$ ) to empirically verify quantum advantage, achieving deterministic correctness in a single oracle query.
- **Transmon Qubit Modeling:** Investigated charge dispersion and anharmonicity based on the Koch et al. model. Designed and simulated DRAG pulses for leakage suppression in 2-qubit gates using Qiskit Pulse.

## **Professional Experience**

### **Space Applications Centre, ISRO, Ahmedabad, India — 2014–Present**

*Senior Assistant — Cryogenic Validation & Microwave Systems*

- **Cryogenic Hardware Characterization:** Led validation of superconducting cables and low-noise amplifiers at 4 K, using VNA S-parameter analysis to confirm performance specs ( $< 0.1$  dB insertion loss).
  - **Thermal Noise Modeling:** Developed and optimized end-to-end thermal noise budgets for cryogenic receiver chains, directly contributing to higher-fidelity readout systems.
  - **Technical Procurement Lead:** Managed annual budget of Rs 2.8 Crore, sourcing and technically validating cryogenic components.
  - **Process Automation:** Engineered Python/SQL scripts to automate procurement and inventory tracking, reducing processing time for 200+ annual orders by  $\sim 30\%$ .
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## **Education**

### **M.Sc. Computer Science — North Maharashtra University — 2009**

Thesis: *Java-based DCE–DTE Interface for CDMA-PC Communication*

### **B.Sc. Physics & Computer Science — North Maharashtra University — 2006**

Graduated Rank #1 out of 80 students

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## **Technical Skills**

**Quantum Programming:** Qiskit (Terra, Aer, Pulse), OpenQASM, QuTiP, Zero-Noise Extrapolation (ZNE)

**Quantum Theory:** Circuit QED, Dispersive Readout, Open Quantum Systems, Lindblad Master Equation, Transmon Qubits

**Programming & Data:** Python (NumPy, SciPy, Pandas, Matplotlib), C/C++, Java, SQL, Git

**Cryogenic & Microwave Engineering:** Cryogenic Systems (4 K), VNA S-Parameter Analysis, Thermal Noise Budgeting, Low-Noise Amplifier Characterization

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## **Awards Scholarships**

Ranked #1 in B.Sc. Computer Science (2006)

JNU Merit Scholarship (1997)