Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Seminar

Detection of a single microwave photon using semiconductor-superconductor hybrids: experimental and quantum challenges

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We utilised the unique properties of superconducting cavity-coupled semiconductor quantum dots to develop a microwave single photon detector. In our device, the discrete energy levels of a double-quantum dot (DQD) are tuned by plunger gate voltages; when the energy gap between the quantum dot levels matches the incident photon energy, the double dot absorbs a photon [1]. A third dot capacitively coupled to the DQD detects the tunnelling events in real time. Our device operates continuously and detects both single and multiple photon absorption events [2]. We also studied the detector back action effect causing decoherence to the semiconductor qubits and wave-particle duality at the microwave regime [3,4].

References:

[1] S. Haldar *et al.* Phys. Rev. B **109**, L081403 (2024), [2] S. Haldar *et al.* Phys. Rev. Lett. **133**, 217001 (2024), [3]. S. Haldar et al. arXiv: 2406.11383 (2024), [4] S. Haldar *et al.* Phys. Rev. Lett. **130**, 087003 (2023).

Tuesday, Dec 3rd 2024

16:00 Hrs (Tea / Coffee 15:45 Hrs)

Auditorium, TIFR-H