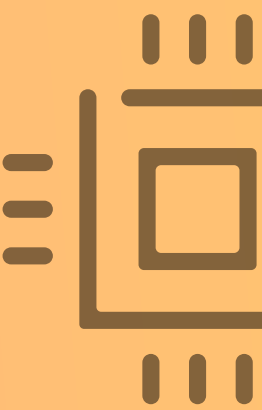
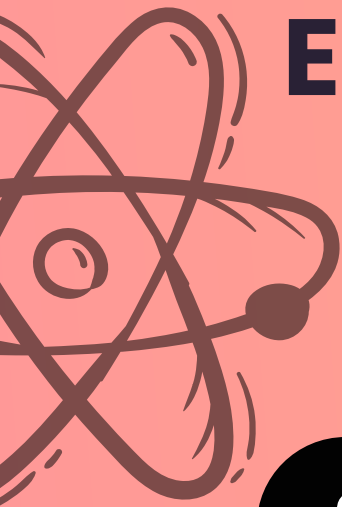




# IIT KANPUR

## PHYSICS COLLOQUIUM

### DETECTION OF A SINGLE MICROWAVE PHOTON USING SEMICONDUCTOR QUANTUM DOTS: EXPERIMENTAL AND FUNDAMENTAL CHALLENGES

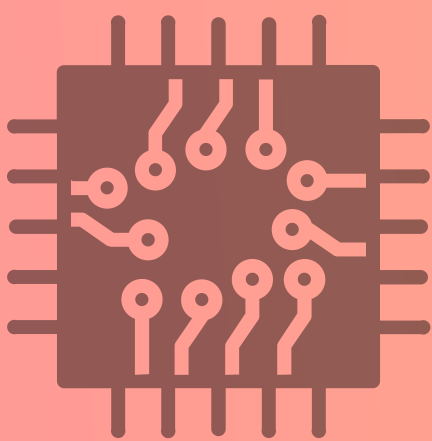


#### ABSTRACT

#### SPEAKER



**Prof. Subhomoy Halдар**  
Department of Physics  
IIT Kanpur



In the rapidly evolving field of quantum technology, high-fidelity readout and manipulation of microwave photon states are of paramount importance. Our research addresses the critical challenge of realizing microwave photodetection at the single-photon level, enabling continuous readout of qubit quantum states and probing their dynamics. In our approach, a microwave photon (energy = 30 micro-electron volt) excites an electron across the discrete energy levels of quantum dots, leading to photon-assisted resonant tunnelling. By employing an additional quantum dot as a charge sensor, we demonstrated that the device detects a single microwave photon during continuous device operation. One crucial aspect here is the detector back action effect, which is governed by fundamental laws of quantum mechanics. We investigated the coherence of the semiconductor qubits and the impact of the detector operation on the decoherence rate of the system. In this talk, I will present the experimental and quantum mechanical challenges involved in detecting single electrons and single microwave photons in circuit quantum electrodynamics architecture.

**All are cordially invited**



FB 382 (Amal Kumar Raychaudhuri Seminar Room)



Friday, March 7, 2025 at 05:15 pm  
(Refreshments at 05:00 pm)