Quantum Information Seminar Series

Quantum Information Seminar Series 2026

Friday, November 13 | 12:00pm - 1:00pm, IRCB Room 1030
Questions? Contact: Wei Guo

Interfacing Microscopic Quantum Systems with Superconducting Circuits

Abstract: Solid-state quantum systems offer promising opportunities for quantum information processing by combining long quantum coherence times with the scalability and versatility of engineered devices. In this talk, I will present our recent experimental progress on two emerging quantum systems: electrons trapped on solid neon and individual rare-earth spins in oxide crystals.

In the first part, I will introduce the electron-on-neon platform, where single electrons are trapped above the surface of solid neon and coupled to superconducting microwave resonators. The exceptionally clean environment provided by solid neon enables long quantum coherence times, making this system a promising candidate for quantum computing. In the second part, I will discuss the detection and coherent characterization of individual rare-earth spins in calcium tungstate ($CaWO_4$) using superconducting nanowire resonators. By combining strong microwave confinement with the enhanced coherence near a magnetic clock transition, we achieve single-spin detection with cooperativity exceeding 15 and observe coherence times reaching the millisecond regime. Together, these studies highlight how superconducting microwave circuits can provide a versatile interface to fundamentally different quantum systems, opening new opportunities for quantum computing, sensing, communication and hybrid quantum architectures.



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