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Johannes Pollanen leads the Laboratory for Hybrid Quantum Systems (LHQS) at Michigan State University (MSU) where his research group investigates the fundamental physics and quantum information applications of systems comprised of trapped electrons, superconducting qubits, and hybrid quantum acoustic systems. Prof. Pollanen holds the Cowen Distinguished Chair in Experimental Physics and also serves as the Co-Director of the MSU Center for Quantum Computing Science and Engineering (MSU-Q) and is a co-founder and board member of the Midwest Quantum Collaboratory (MQC). Additionally he is a co-founder and Chief Science Officer (CSO) of EeroQ Corporation, which is a quantum computing startup company located in Chicago working on building a scalable quantum processor based on the spins of electrons trapped above the surface of superfluid helium. Before joining the faculty at MSU, Pollanen was a IQIM Postdoctoral Scholar at the Institute for Quantum Information and Matter (IQIM) at Caltech. Pollanen received his Ph.D. from Northwestern University.

EeroQ: Quantum computing with electron spins on helium

Abstract: EeroQ Corporation is a quantum computing startup company located in Chicago developing a scalable quantum computer based on the spins of electrons trapped above the surface of superfluid helium. This novel approach to quantum computing promises to combine the benefits of ultra-high coherence spin qubits with a CMOS-based scaling architecture needed to create the powerful large-scale quantum computers of the future. Despite this tremendous potential, single electron quantum measurement in this system has remained elusive, until now.

In this talk I will describe EeroQ's approach to developing this new type of CMOS-compatible quantum computer and highlight our recent achievement using a hybrid circuit quantum electrodynamic (cQED) device to demonstrate, for the first time, strong coupling of a microwave-frequency photon to the charge qubit state of a single electron floating above the surface of superfluid helium. These experiments represent a key step towards realizing the massive potential of EeroQ's novel approach to quantum computing. Additionally, I will describe how EeroQ (in partnership with a commercial CMOS-foundry) has recently built the largest-ever monolithic scaling architecture in quantum computing.