Seminar/Talk

Engineering cos2phi Hamiltonians with multimode circuits

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Host: Johannes Fink

Superconducting circuits are macroscopic networks of superconducting wires and plates forming distributed inductances and capacitances that sustain microwave electromagnetic fields. Superconductivity ensures minimal loss, while Josephson junctions introduce a cosine-phase nonlinearity with negligible dissipation and dephasing. By tuning the relative energy scales and connectivity of inductors, capacitors, and Josephson junctions, one can realize a wide range of quantum systemsfrom amplifiers to superconducting qubits. This naturally raises the question: can new components further advance circuit quantum engineering? The answer is yes. Incorporating elements that generate terms such as phase slips (cos(2N)), Cooper-pair pairing (cos(2)), and Cooper-pair halving (cos(/2)) into the Hamiltonian enables enhanced device performance and the design of qubits intrinsically protected from relaxation and decoherence. In this talk, I will show how the physics of the cos(2) element can emerge effectively in multimode circuits built from conventional materials, and how this element can be harnessed either to improve qubit error resilience or to mediate high-order photon interactions in a resonator.

Wednesday, October 15, 2025 03:00pm - 04:00pm
Office Bldg West / Ground floor / Foyer seminar room (I21.EG.128)

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