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Title

Simultaneous state measurement of coupled Josephson qubits

Speaker:

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Abstract:

One of the many challenges of building a practical and scalable quantum computer includes performing single-shot state measurements on all quantum bits (qubits). These measurements are necessary for determining the fidelity of gate operations and to unambiguously prove state entanglement.

Our group has recently taken a significant step towards this goal by demonstrating in a capacitively-coupled Josephson phase qubit, using simultaneous measurements of qubits, coherent oscillations corresponding to the swap operation 01 <-> 10. The measurement probabilities of the 01 and 10 states are directly observed to be anti-correlated, as expected for an entangled quantum state.

During the course of this experiment, we discovered that fixed coupling between qubits, a common gate architecture for a variety of qubit systems, may produce significant "crosstalk" when states are measured. I will discuss this phenomenon and give our practical solution to this problem - fast simultaneous measurements.