Physicist explains how his research is helping qubits stay in sync

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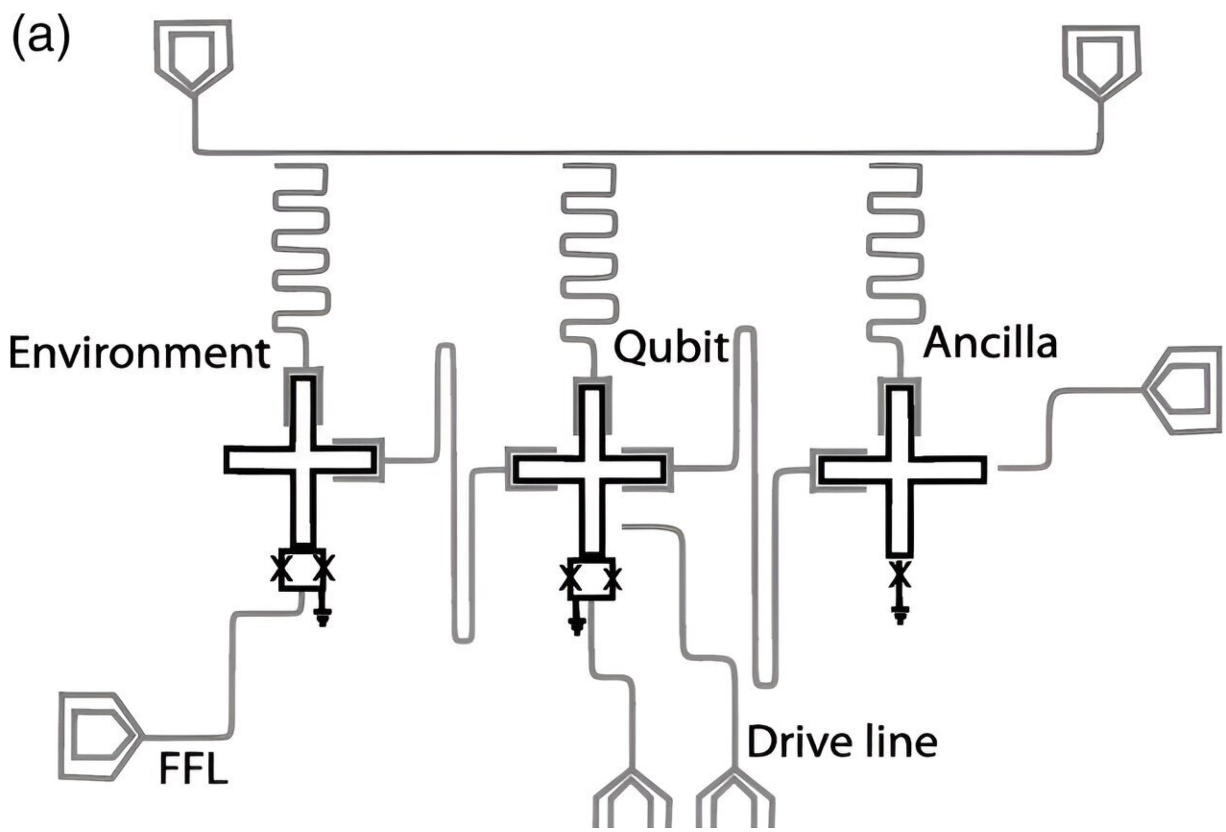

Experiment setup. (a) Sketch of the experiment which includes three qubits respectively labeled "Environment," "Qubit," and "Ancilla." The qubits share resonators that mediate nearest-neighbor coupling. Each qubit is coupled to a readout resonator, which can be probed by a common feedline. The Environment and Qubit are frequency tunable via on-chip fast flux lines (FFLs). (b) The respective frequencies of the Qubit and Ancilla; resonant coupling between the qubits is achieved by applying a parametric modulation of the Qubit at roughly $\Delta_{Q,A}/2$. (c) When the Qubit is prepared in its excited state, parametric resonance can be observed by examining the Ancilla excitation versus modulation frequency. Credit: *Physical Review Letters* (2024). DOI: 10.1103/PhysRevLett.132.200401

As part of the Center for Quantum Leaps, a signature initiative of the Arts & Sciences strategic plan, physicist Kater Murch and his research group use nano-fabrication techniques to construct superconducting quantum circuits that allow them to probe fundamental questions in quantum mechanics.

Qubits are promising systems for realizing quantum schemes for computation, simulation and data encryption.

Murch and his collaborators published a new paper in *Physical Review Letters* that explores the effects of memory in quantum systems and ultimately offers a novel solution to decoherence, one of the primary problems facing quantum technologies.

"Our work shows that there's a new way to prevent decoherence from corrupting quantum entanglement," said Murch, the Charles M. Hohenberg Professor of Physics at Washington University in St. Louis. "We can use dissipation to prevent entanglement from leaving our qubits in the first place."

The team has created a video about their research findings:

More information: Chandrashekhar Gaikwad et al, Entanglement Assisted Probe of the Non-Markovian to Markovian Transition in Open

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Quantum System Dynamics, *Physical Review Letters* (2024). DOI: 10.1103/PhysRevLett.132.200401

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