New Directions in Scalable Readout and Coherent Control of Superconducting Qubits

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- Superconducting qubits are at the threshold for fault tolerance in the surface code

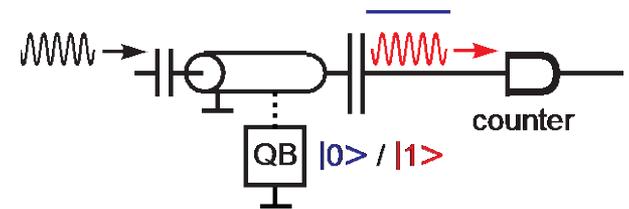- Wireup and control of a large-scale quantum machine is a formidable challenge

Integration of quantum circuit with classical Single Flux Quantum (SFQ) digital logic for a compact system footprint
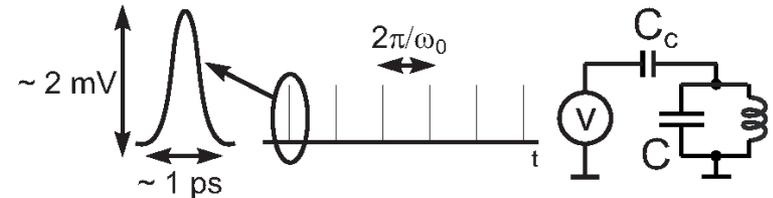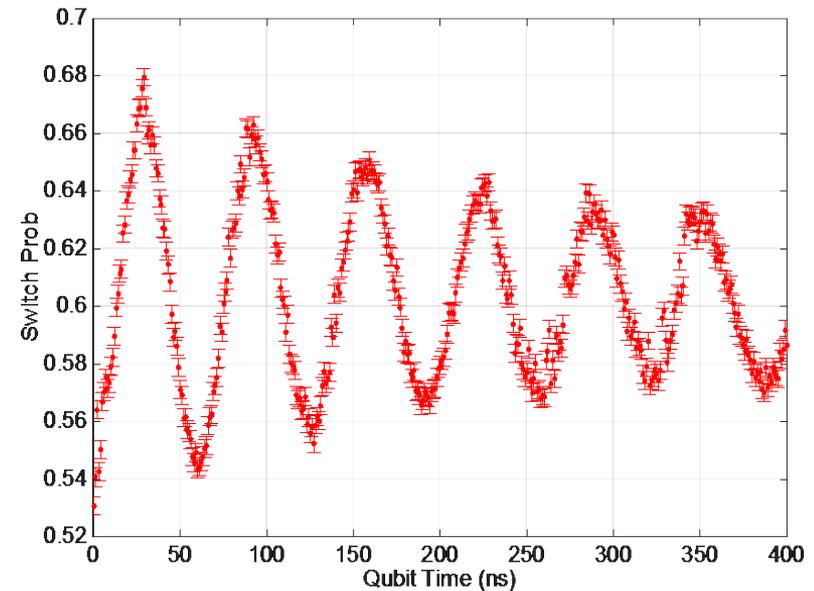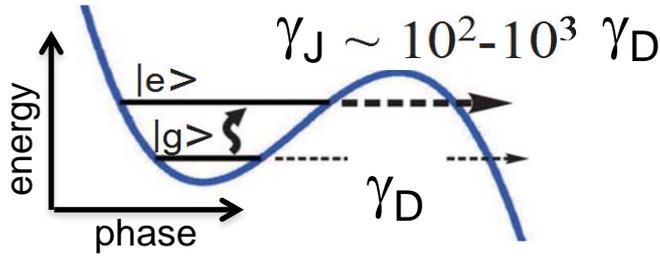
Scalable Alternative to Amp-based Readout

Single Flux Quantum (SFQ)-based Qubit Control

Counter-based qubit readout
[PRA 90, 062307 (2014)]

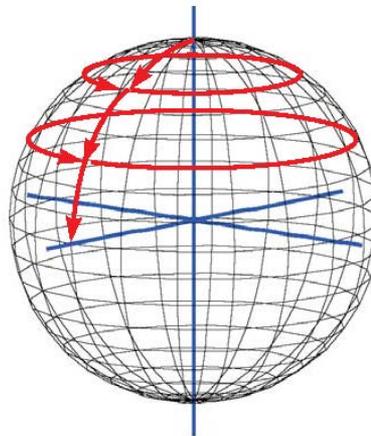$$\gamma_J \sim 10^2\text{-}10^3 \ \gamma_D$$

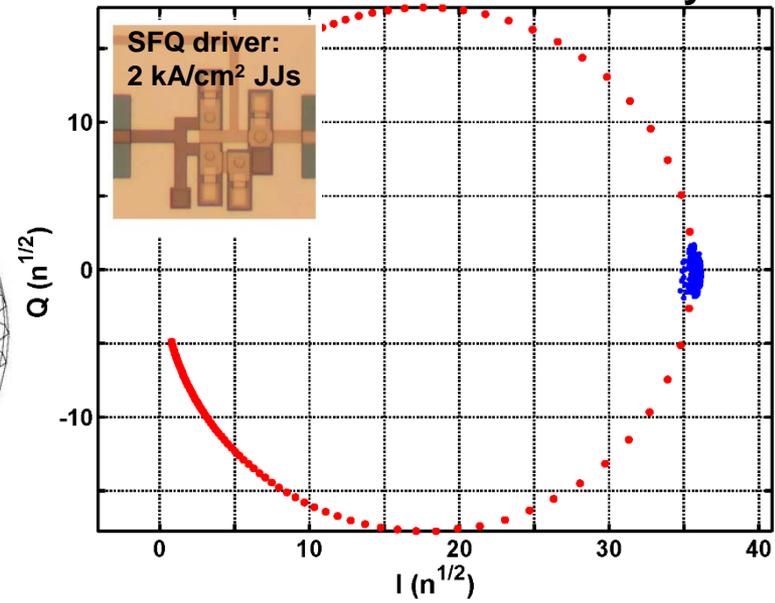- Tunneling events produce easily-measured, unambiguous "clicks".
- Natural interface to SFQ logic

SFQ-based qubit control
[PR Applied 2, 014007 (2014)]

SFQ pulse induces discrete rotation on Bloch sphere

SFQ-driven microwave cavity

SFQ driver: 2 kA/cm^2 JJs

- Seeking to team with group(s) having expertise in large-scale qubit control and SFQ design and implementation

Contact Information

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