Control @ Cleland Lab

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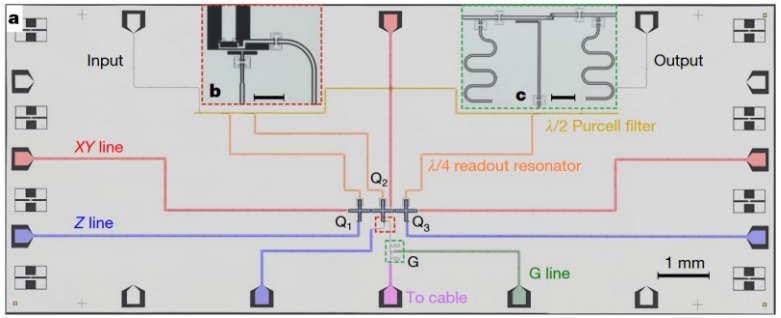
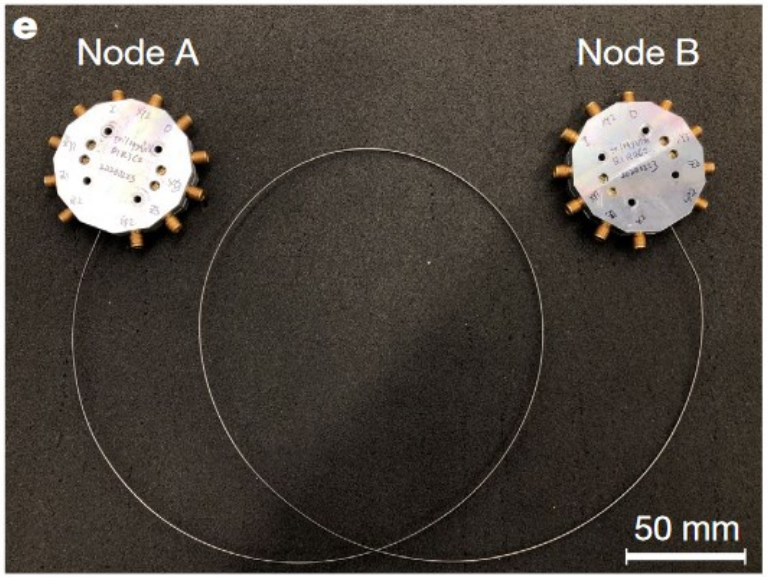
01/12/2023

Superconducting Qubits





- Superconducting qubit: 3~7 GHz
  - quantum network, modular design
- Acoustic resonator: 1~7 GHz
  - control with superconducting qubit

Superconducting Qubits and Quantum Acoustics

- Qubit
  - xy drive: 3~7 GHz (sometimes 2 x fq)
  - z control: DC~500 MHz
  - readout: 4~7 GHz, 100 ns ~ 1 us

- Acoustic resonator
  - drive: 1~7 GHz

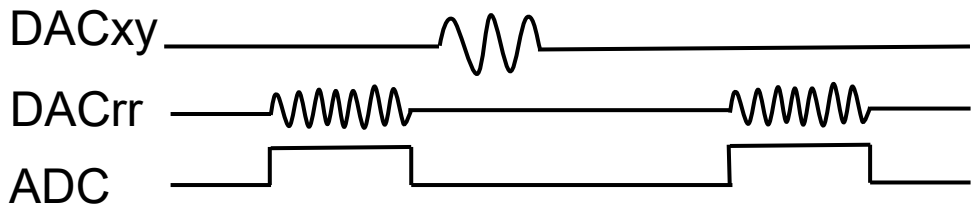
boards synchronization

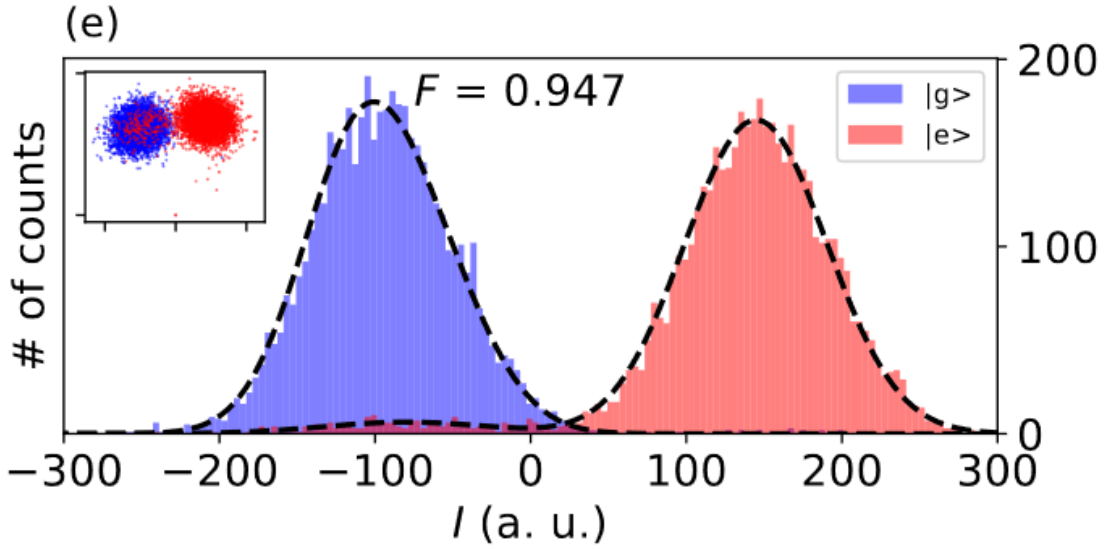
- **ZCU216**
  - 16 DACs
  - 16 ADCs

- multiplexed readout
- synchronization ≥ 3 boards

qubit reset

- Qubit reset with measurement

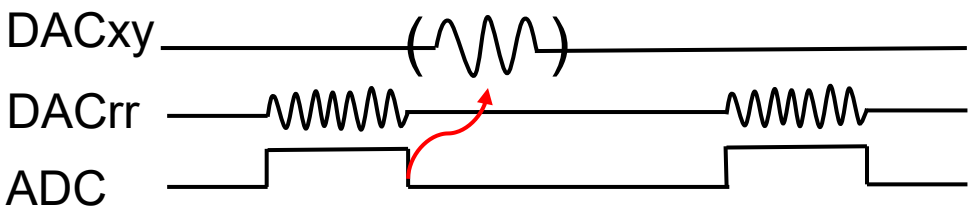


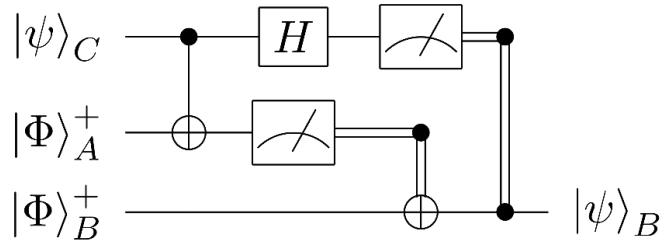


feedforward

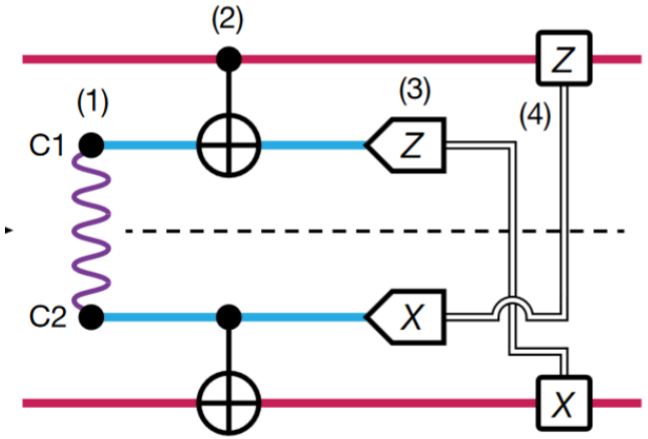
- Apply pulses based on the measurement result
- For transmon, $|g\rangle$, $|e\rangle$, $|f\rangle$, …

- feedforward on different boards?



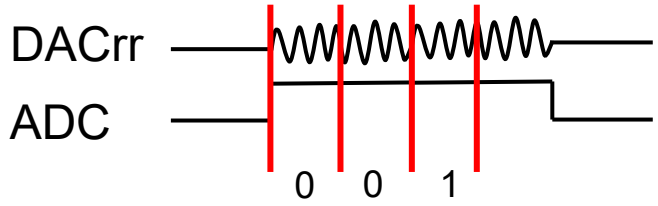


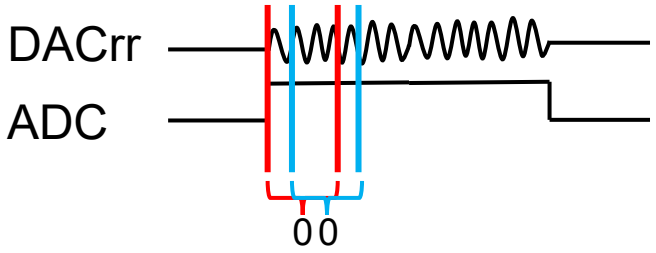
quantum teleportation



gate teleportation

continuously monitor qubit state





Thanks