Superconducting

Quantum
Computers

Superconductors

It's a lot easier to sled down a hill when it's cold outside!

And electrons can flow more easily in certain materials when they are very cold.

These materials are called "superconductors"

Qubits

A qubit can be made from a small superconducting circuit.

This circuit naturally oscillates at a few different frequencies.

We assign $|1\rangle$ and $|0\rangle$ to two of these frequencies.

Quantum Gates

We can control the state of a qubit with microwave pulses and electrical controls.

Neighboring qubits are entangled by "tuning" them to the same frequency...

Measurement

Superconducting qubits are measured via different electrical properties.

The choice of measurement depends on the specific qubit implementation.

Advantages

1. Easy to Build:

Made with standard integrated circuit technology.

2. Speed:

Superconducting quantum computers are very fast!!

Challenges

1. Temperature:

I've gotta be below -459°F to work!

2. Coherence:

Gates are error-prone and computations are short.

3. Connectivity:

Difficult to entangle arbitrary qubits

Find more Quantum Computing zines here:

https://www.epiqc.cs.uchicago.edu/resources/

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