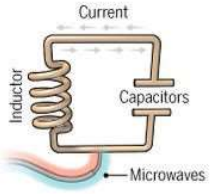
Superconducting loops



A resistance-free current oscillates back and forth around a circuit loop. An injected microwave signal excites the current into super-position states.

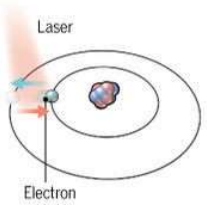
Longevity (seconds) **0.00005**
Logic success rate **99.4%**
Number entangled **9**

Company support
Google, IBM, Quantum Circuits

Pros
Fast working. Build on existing semiconductor industry.

Cons
Collapse easily and must be kept cold.

Trapped ions



Electrically charged atoms, or ions, have quantum energies that depend on the location of electrons. Tuned lasers cool and trap the ions, and put them in super-position states.

Longevity (seconds) **>1000**
Logic success rate **99.9%**
Number entangled **14**

Company support
ionQ

Pros
Very stable. Highest achieved gate fidelities.

Cons
Slow operation. Many lasers are needed.

Silicon quantum dots

These "artificial atoms" are made by adding an electron to a small piece of pure silicon. Microwaves control the electron's quantum state.

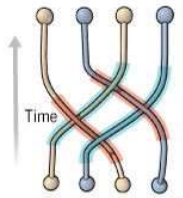
Longevity (seconds) **0.03**
Logic success rate **~99%**
Number entangled **2**

Company support
Intel

Pros
Stable. Build on existing semiconductor industry.

Cons
Only a few entangled. Must be kept cold.

Topological qubits



Quasiparticles can be seen in the behavior of electrons channeled through semi-conductor structures. Their braided paths can encode quantum information.

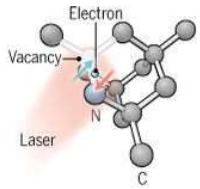
Longevity (seconds) **N/A**
Logic success rate **N/A**
Number entangled **N/A**

Company support
Microsoft, Bell Labs

Pros
Greatly reduce errors.

Cons
Existence not yet confirmed.

Diamond vacancies



A nitrogen atom and a vacancy add an electron to a diamond lattice. Its quantum spin state, along with those of nearby carbon nuclei, can be controlled with light.

Longevity (seconds) **10**
Logic success rate **99.2%**
Number entangled **6**

Company support
Quantum Diamond Technologies

Pros
Can operate at room temperature.

Cons
Difficult to entangle.

Note: Longevity is the record coherence time for a single qubit superposition state, logic success rate is the highest reported gate fidelity for logic operations on two qubits, and number entangled is the maximum number of qubits entangled and capable of performing two-qubit operations.

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