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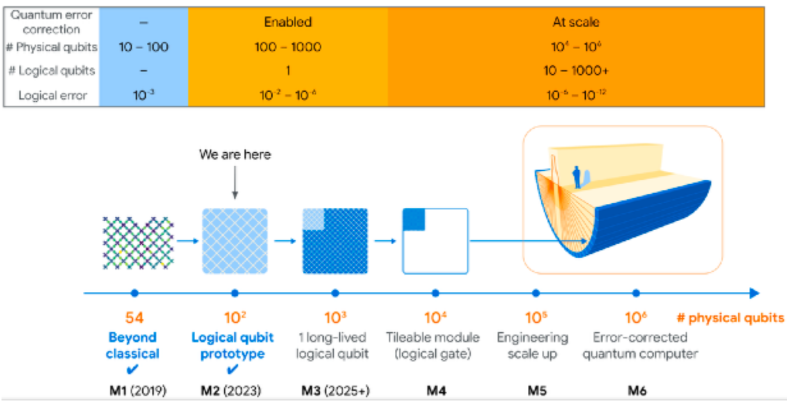
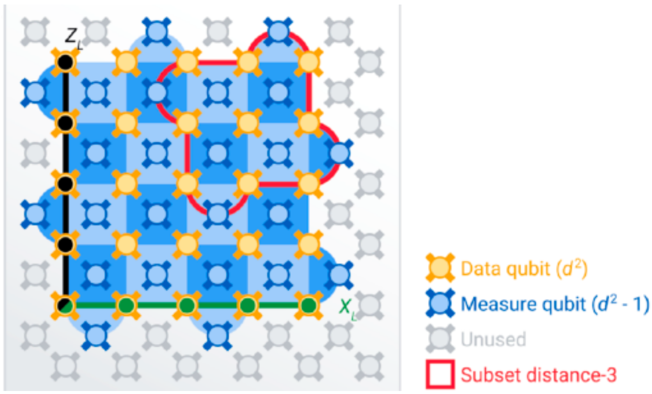
SELECTED NEWS

Suppressing quantum errors by scaling a surface code logical qubit

The Google Quantum AI team has made an important step toward the development of a large-scale useful quantum computer. This breakthrough is the first demonstration of a logical qubit prototype, showing that it's possible to reduce errors by increasing the number of qubits in a scheme known as quantum error correction.





Google has announced today in their publication "Suppressing Quantum Errors by Scaling a Surface Code Logical Qubit" in Nature that they have accomplished the second milestone on their roadmap. The experimental outcomes exhibit a prototype of a logical qubit, which is the fundamental unit of an error-corrected quantum computer, with performance approaching the threshold for scalable fault-tolerant quantum computing. Improving every aspect of quantum computers was necessary to reach the point where Quantum Error Correction (QEC) can improve with scale. This involved enhancing the fabrication process of physical qubits, optimizing control of the quantum system, and utilizing state-of-the-art 3rd generation Sycamore processor architecture. The experiments demonstrated improvements in various areas, such as increased qubit relaxation and dephasing lifetimes through environmental noise reduction, lowered cross-talk between physical qubits during parallel operation, reduced drift and improved qubit control fidelity, faster and higher-fidelity readout and reset operations, reduced calibration errors through modeling the full quantum system, employing better system-optimization algorithms, and developing context-aware and fully parallel calibrations to minimize drift and optimize control parameters for QEC circuits. Additionally, enhanced dynamical decoupling protocols were implemented to protect physical qubits from noise and cross-talk during idling operations.

Record room-temperature superconductor could boost quantum computer chips

Is this the superconductor of scientists' dreams? A new claim faces scrutiny

Superconductivity, the ability to conduct electricity with no resistance, is typically achieved in many materials only at extremely low temperatures. A handful of superconductors can function at warmer temperatures, but only under crushing pressures, rendering them unsuitable for practical use.

However, physicist Ranga Dias and his team at the University of Rochester in New York have made a groundbreaking discovery. They have created a superconductor that operates at both room temperature and relatively low pressure. This breakthrough has the potential to usher in a new era of high-efficiency machines, highly sensitive instrumentation, and groundbreaking electronics.

In a report published on March 8 in the journal Nature, Dias and his team revealed that they had developed a new superconductor made of hydrogen, nitrogen, and a rare earth element called lutetium. They combined these elements and subjected them to varying pressure and temperature using a diamond anvil cell. They then measured the resistance to electrical flow in the compound.

Remarkably, the material exhibited no electrical resistance at temperatures as high as 294 kelvins (about 21° Celsius or 70° Fahrenheit). While it still required high pressure, reaching 10 kilobars, it is far lower than the millions of atmospheres of pressure typically needed for superconductors that operate near room temperature. If verified, this development makes the material far more promising for practical applications.

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