Quantum Elements Announces Research in Nature Communications Demonstrating Record Suppression of Quantum Logical Errors

With USC, IBM and RWTH as co-authors, paper introduces dynamic decoupling method to deliver highest ever fidelity on entangled, logical superconducting qubits

LOS ANGELES, CA, UNITED STATES, March 4, 2026 /EINPresswire.com/ -- Quantum Elements, a quantum software start-up based in Los Angeles, today announced the publication of research in Nature Communications demonstrating the highest fidelity of entangled, logical qubits on a superconducting quantum computer ever achieved with a new error detection and suppression approach.

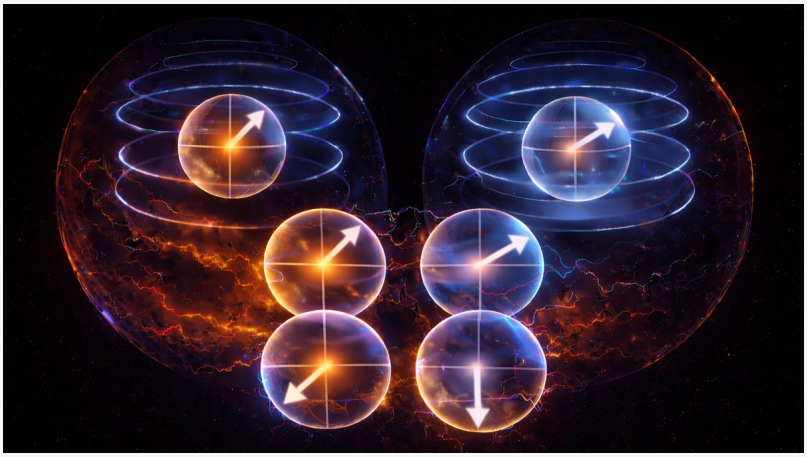
> We intend to fully integrate these new techniques into our existing software solutions to accelerate the development of fault-tolerant quantum computing for our customers and partners,"
>
> *Izhar Medalsy, Co-Founder and CEO of Quantum Elements*

In the peer-reviewed paper, Demonstration of high-fidelity entangled logical qubits using transmons, researchers use a hybrid technique combining quantum error detection (QED) with a new form of dynamical decoupling. By using the normalizer elements of a standard QED code as logical-level decoupling pulses, the method directly identifies and suppresses both logical and physical errors, significantly boosting the fidelity of entangled logical qubits on a 127-qubit IBM superconducting processor.

Co-authors of the paper include scientists from Quantum Elements, USC's Center for Quantum Information Science & Technology, IBM, and the Institute for Quantum Information of RWTH Aachen University in Germany.

"By integrating code-based dynamical decoupling directly into the logical layer, the research shows that we can suppress errors significantly more effectively than with physical techniques alone," said co-author Daniel Lidar, holder of the Viterbi Professorship of Engineering at USC and

co-founder and Chief Scientific Officer for Quantum Elements. “The method allows us to protect a pair of entangled logical qubits at record high fidelities on superconducting hardware, a potentially valuable step on the path to more reliable quantum computation at the error-corrected, logical level.”



Researchers have demonstrated the highest fidelity entangled, logical qubits on a superconducting quantum computer ever achieved.

A breakdown of key achievements from the research includes:

- First-ever experimental suppression of logical errors in a quantum error-detecting code using logical dynamical decoupling (LDD), a new technique applying carefully chosen logical-level operations to reduce error channels inaccessible to standard codes.

- ‘Beyond breakeven’ performance: Encoded logical Bell states maintain significantly higher fidelity over time than the best physical (unencoded) Bell pairs on the same hardware, even subject to physical-level dynamical decoupling.

- Long-duration high-fidelity logical entanglement: Average logical Bell state fidelities reach 91–94% over the full time window of each experiment.

- Record-setting encoded-state preparation: Post-selected encoded Bell-state fidelities reach 98%, exceeding previous transmon-based demonstrations (typically 79–93%).

- Hardware-efficient overhead: LDD uses a small, fixed set of logical pulse generators, enabling error suppression without adding qubits.

- Path toward scalable fault tolerance: Demonstrates a low-cost strategy for extending code performance without increasing code distance — keeping hardware overhead minimal while raising logical-qubit quality.

“We are very proud of this groundbreaking work by all the scientists involved in this research,” said Izhar Medalsy, co-founder and CEO of Quantum Elements. “We intend to fully integrate these new techniques into our existing software solutions to accelerate the development of fault-tolerant quantum computing for our customers and partners.”

About Quantum Elements

Founded in 2023 in Los Angeles, Quantum Elements seeks to transform the quantum computing

industry by making the path to real-world commercial applications more efficient and cost-effective through its proprietary, AI-native software stack and world-leading quantum Digital Twins.

Brittney Kuhn
HKA Marketing Communications
+1 714-426-0444
brittney@hkamarcom.com
Visit us on social media:
LinkedIn
