Alice & Bob Shares Preliminary Results Vastly Surpassing Previous Bit-Flip Time Record

New bit-flip research strengthens confidence in Alice & Bob's ambitious 2030 quantum roadmap

PARIS, CA, UNITED STATES, September 25, 2025 /EINPresswire.com/ -- Alice & Bob, a global leader in fault-tolerant quantum computing, today announced new research results showing that their cat qubits can resist one of the main errors in quantum computers, the bit-flip, for more than one hour.

The company measured hour-long bit-flip times, a considerable advance over the previous record of 430 seconds (about seven minutes) set in 2024 on Alice & Bob's Boson 4 chip.1

Alice & Bob's 2030 roadmap targets an early fault tolerant quantum computer (eFTQC) with 100 logical qubits to address first use cases in materials science. The new bit-flip result is four times longer than the requirement of 13 minutes2 for the 2030 device, solidifying one of the key pillars of cat qubit technology. The next step will be to evaluate the performance of this result under a two-qubit gate (CNOT).

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> *Raphael Lescanne, CTO and Co-Founder of Alice & Bob*

"Being able to push the stability of our cat qubits year after year makes us confident that we will deliver on our roadmap," said Raphael Lescanne, CTO and Co-Founder of Alice & Bob. "Bit-flip lifetimes are not the only metric that matters, but for cat qubits, they are foundational. The road is still long, but we are advancing fast."

This result was achieved on Alice & Bob's latest qubit design, the Galvanic Cat, the same used on their 12-cat

qubit chip Helium 2. Enabled by a year of improvements on various fronts from software to experimental techniques and more advanced engineering, the team increased bit-flip times well beyond previous levels and cat qubits' usual operability regimes. Interestingly, this bit-flip time surpasses typical timescales for cosmic rays impacts, suggesting some level of insensitivity by cat qubits to such events.

At a mean photon number of 11, the team was able to measure bit-flip times between 33 and 60 minutes at a 95% confidence interval and to run quantum operations on the cat qubit performing a Z gate with 94.2 % fidelity in 26.5 ns, a crucial step for error correction3.

By virtually eliminating one of the two main error types, Alice & Bob's cat qubits allow for more efficient error-correcting codes that require far fewer qubits.4 Assuming bit-flip protection holds during gate operations, as it is being shown in other experiments, the hardware needed for large-scale quantum computers could be reduced by up to 200 times.

Details of the method and results are available in this blog post.

1) For reference, other leading superconducting qubits achieve bit-flip times of about 0.025 seconds (25 milliseconds), millions of times shorter than Alice & Bob's latest result.

2) The 2030 bit-flip time target of 13 minutes must also satisfy more stringent requirements than the ones of this experiment, as it needs to be held during two-qubit gates (Controlled NOT).

3) In this experiment, the impact of the drive used to perform the Z gate on bit-flip incidence was not measured but should remain small based on previous experiment and current data.

4) Quantum computers are mainly affected by bit-flip and phase-flip errors. Correcting these requires error-correcting codes, which add significant hardware overheads: hundreds or thousands of physical qubits are often needed to encode a single logical qubit with low enough error rates.

About Alice & Bob□□
Alice & Bob is a quantum computing company based in Paris and Boston whose goal is to create the first universal, fault-tolerant quantum computer. Founded in 2020, Alice & Bob has already raised €130 million in funding, hired over 150 employees and demonstrated experimental results surpassing those of technology giants such as Google or IBM. Alice & Bob specializes in cat qubits, a pioneering technology developed by the company's founders and later adopted by Amazon. Demonstrating the power of its cat architecture, Alice & Bob showed that it could reduce the hardware requirements for building a useful large-scale quantum computer by up to 200 times compared with competing approaches. Follow Alice & Bob on LinkedIn, X or YouTube, visit their website www.alice-bob.com, or join The Cat Tree on Slack to learn more.

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