Budowa Silesia Photonics

Quantum Communication Bit Error Rate Calibration

Overview

Quantum algorithms play a pivotal role in minimizing bit error rates in quantum electronics, impacting the reliability and efficiency of quantum computations. The inherent sensitivity of quantum bits (qubits) to decoherence and noise necessitates advanced techniques to address these. In this paper, we analyze 12 days of calibration data from IBM's 127-qubit device (ibm_kyiv), showing the fluctuation of Pauli-X and CNOT gate error rates. We demonstrate that fixed-distance QEC can either underperform or lead to excessive overhead, depending on the selected qubit and the error. Quantum error correction (QEC) comprises a set of techniques used in quantum memory and quantum computing to protect quantum information from errors arising from decoherence and other sources of quantum noise. Unlike classical error correction, which simply.

Article Content

Reducing Bit Error Rates in Quantum Electronics: Techniques and …

Explore the revolutionary field of quantum electronics, focusing on the significance of bit error rates and their impact on quantum computing systems.

Optimization of Quantum Error Correcting Code under Temporal …

Using logical error rate modeling, we identify qubits that cannot be used and qubits that can be recovered with minimal resources. Our method avoids unnecessary resource overhead by excluding …

Demonstrating quantum error mitigation on logical qubits

In this work, we propose and experimentally demonstrate the application of zero-noise extrapolation, a practical quantum error mitigation technique, to error correction circuits on...

Quantum error correction

SummaryExperimental realizationOverviewImportant code familiesClassical codes as bias quantum codeEncoding logical qubits into physical qubitsApplicationFurther reading

There have been several experimental realizations of CSS-based codes. The first demonstration was with nuclear magnetic resonance qubits. Subsequently, demonstrations have been made with linear optics, trapped ions, and superconducting (transmon) qubits. • In 2016 for the first time the lifetime of a quantum bit was prolonged by employing a QEC code. • In 2021, an entangling gate between two logical qubits encoded in topological quantum error-correction codes ha…

Suppressing quantum errors by scaling a surface code logical qubit

Our experimental results demonstrate a prototype of the basic unit of an error-corrected quantum computer known as a logical qubit, with performance nearing the regime that enables …

Quantum Bit Error Rate: Core Metric Defining QKD …

Discover how Quantum Bit Error Rate (QBER) safeguards Quantum Key Distribution by detecting tampering and securing global communication.

Quantum BER estimation modelling and analysis for satellite-based …

In this work, we have presented a simple mathematical model to obtain the QBER of a polarisation encoded satellite-based quantum communication system by analysing the errors …

Quantum error correction

In April 2024, researchers at Microsoft claimed to have successfully tested a quantum error correction code that allowed them to achieve an error rate with logical qubits that is 800 times better than the ...

Experimental Quantum Error Correction Below Threshold

The work used Quantinuum''s H2-1 ion trap and highlights code-switching as a viable route to below-threshold universal quantum computing with ...

What Is Quantum Error Correction & How Does It Work

Learn how quantum error correction works, why it matters, and which companies are leading the race to fault-tolerant quantum computing.

CaliQEC: In-situ Qubit Calibration for Surface Code Quantum Error ...

Our evaluation demonstrates that QECali introduces modest qubit overhead and negligible increases in execution time, offering the first practical solution for in situ calibration in ...

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For more information, pricing, or custom solutions, please contact us:

Website: https://budowasilesia.pl
Email: contact@budowasilesia.pl
Phone: +48 537 192 846
Address: ul. Chorzowska 45, 40-001 Katowice, Silesian Voivodeship, Poland

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