

Software Framework For Automated Calibration Of A Trapped-Ion Quantum Computer

Monday 8 July 2024 17:24 (2 minutes)

Trapped ion quantum computers are transitioning from hands-on experiments to highavailability production systems. To achieve this, it is crucial to attain and maintain high operational fidelities of the qubit operations. Regular recalibration of system parameters is necessary due to the influence of fluctuating environmental factors. So far, this has been a labor-intensive and time-consuming task. In Mainz, we are developing a generalized software framework to automate these calibration tasks. Tight integration into the scheduler allows us to pause running measurements and recalibrate the system at any time. Detected system issues are resolved using backtracking methods. For the system currently in use, benchmarking demonstrated operational fidelities that match those achieved by trained personnel. Moreover, the calibration time was reduced from approximately one hour to eleven minutes. The implemented routines were confirmed to be robust against drifts surpassing typical daily fluctuations by an order of magnitude.

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Session Classification: Poster session

Track Classification: Quantum Information & Computing