Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Leaking mitigation using a mixed ion scheme NATALIE BROWN, Georgia Institute of Technology, KEN BROWN, Duke University — Hyperfine qubits are often favored in ion trapped quantum computers for their low memory errors. However, these ions also contain other energy states than those defining the qubit. These extra states lead to leakage errors. Zeeman qubits suffer from high memory errors, but do not have leakage energy states. Leakage errors are especially detrimental and cannot be handled by standard Pauli error correction codes. Often, extra circuitry is implemented to handle leakage errors at the cost of additional gate overhead. In this work, we proposed a mixed species layout to mitigate leakage effects. In our system, we mixed hyperfine ($^{171}Yb^{+}$) and Zeeman qubits ($^{174}Yb^{+}$) to reduce leakage errors at the cost of increasing memory errors. We find that at certain magnetic field stabilities, the mixed species system outperforms a pure hyperfine system.

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Date submitted: 01 Feb 2019 Electronic form version 1.4