**Parallel syndrome extraction with shared flag qubits for CSS codes of distance three**

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To perform achieve fault-tolerant quantum computation, one can use flagged syndrome extraction with fewer ancilla qubits. However, it suffers from long circuit depth if one stabilizer is measured at a time. Previously, Reichardt showed that it is possible to measure multiple stabilizers in parallel with at most one shared flag qubit for certain small quantum codes. In this paper, we propose a procedure for general CSS codes of distance three so that multiple -stabilizers (-stabilizers) can be fault-tolerantly measured in parallel with one shared flag qubit. We simulate the memory and computation pseudo-thresholds for various code schemes. In particular, our parallel scheme based on Shor's nine-qubit code performs better than known nine-qubit schemes in the literature when the memory error rate is high.