

Abstract Submitted  
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**Qudit-based Quantum Computing Protocol with Trapped Barium Ions** PEI JIANG LOW, BRENDAN BRAMMAN, ANDREW COX, MATTHEW DAY, NOAH GREENBERG, RICHARD RADEMACHER, CRYSTAL SENKO, University of Waterloo — We present a set of protocols for implementing a d-level qudit quantum computing system with trapped barium ions. The error sources for each procedure in the set of protocols (e.g. single and two-qudit gate implementations) are analyzed in-depth with theoretical calculations and numerical simulations. This serves as an estimate of the fundamental limits on the fidelities achievable with our proposed protocol, and provides a practical assessment of the feasibility of realizing a d-dimensional quantum computer with trapped ions.

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