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Realistic high-fidelity protocols for qudit-based quantum computing BRENDAN WHITE, PEI JIANG LOW, ANDREW COX, RICH RADEMACHER, MATTHEW DAY, NOAH GREENBERG, CRYSTAL SENKO, University of Waterloo — We present on the feasibility of implementing quantum information processing using multi-level qudits encoded within trapped ions. We describe protocols for how current technology may be used to implement high-fidelity state preparation, measurement, and single- and two-qudit gates in a trapped ion framework. A scalable measurement scheme using rapid adiabatic passage to a meta-stable state is presented, along with a discussion of single-qudit gate implementation, and a practical method for implementing two-qudit entangling gates (mediated by collective phonon modes) using a geometric phase approach. From our error estimations, we can achieve better than 99

Brendan Bramman
University of Waterloo

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