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Towards optimizing two-qubit operations in three-electron double quantum dots ADAM FREES, University of Wisconsin-Madison, Madison, WI 53706, JOHN KING GAMBLE, Center for Computing Research, Sandia National Laboratories, Albuquerque, NM 87123, SEBASTIAN MEHL, JARA-Institute for Quantum Information, RWTH Aachen University, Peter Grünberg Institute (PGI-2), Forschungszentrum Jülich, MARK FRIESEN, S.N. COPPERSMITH, University of Wisconsin-Madison, Madison, WI 53706 — The successful implementation of single-qubit gates in the quantum dot hybrid qubit motivates our interest in developing a high fidelity two-qubit gate protocol. Recently, extensive work has been done to characterize the theoretical limitations and advantages in performing two-qubit operations at an operation point located in the charge transition region. Additionally, there is evidence to support that single-qubit gate fidelities improve while operating in the so-called "far-detuned" region, away from the charge transition. Here we explore the possibility of performing two-qubit gates in this region, considering the challenges and the benefits that may present themselves while implementing such an operational paradigm. This work was supported in part by ARO (W911NF-12-0607) (W911NF-12-R-0012), NSF (PHY-1104660), ONR (N00014-15-1-0029). The authors gratefully acknowledge support from the Sandia National Laboratories Truman Fellowship Program, which is funded by the Laboratory Directed Research and Development (LDRD) Program. Sandia is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the US Department of Energy's National Nuclear Security Administration under Contract No. DE-AC04-94AL85000.

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