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A low noise exchange gate in double quantum dots ERIK NIELSEN, MALCOLM CARROLL, RICHARD MULLER, Sandia National Laboratories — Minimizing the effects of noise is a central challenge to the creation of solid-state singlet-triplet double quantum dot (DQD) quantum bits (qubits). Charge noise, electronics error or inhomogeneous fields have all separately been addressed with different approaches. The demand for qubit operations robust to the combination of all noise sources places simultaneous requirements, however, that are not clearly compatible. We investigate the feasibility of achieving an exchange gate in a DQD system that is more robust to multiple sources of noise such as slight error around the applied bias point due to electronics or charge noise combined with external inhomogeneous B-field effects, addressed with dynamically coupled gates. A full configuration interaction (CI) method is used to compute the exchange energy as a function of dot shape and detuning voltage in order to identify the more robust operations. In particular the CI calculation provides significantly better accuracy for the (2,0) configuration of the DQD system, which is a potentially important low noise operating regime. This work was supported by the Laboratory Directed Research and Development program at Sandia National Laboratories. Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94AL85000.

Erik Nielsen
Sandia National Laboratories

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