Abstract Submitted for the MAR12 Meeting of The American Physical Society

Quantum gates between non-neighboring spin qubits¹ JIANJIA FEI, YUN-PIL SHIM, University of Wisconsin-Madison, SANGCHUL OH, XUEDONG HU, University at Buffalo, SUNY, MARK FRIESEN, University of Wisconsin-Madison — In quantum circuits involving many qubits, we usually need to perform gates such as CNOT between qubits that are not proximal. For spin qubits, this requires intermediate gate operations because the exchange interaction is very short ranged. Here, we consider three quantum dots in a linear array. We explore the effective coupling between the two outer spins mediated by the central spin. By using the central spin as a "bus", we show how to efficiently perform gates such as CNOT between the outer spins. We find that arbitrary two-qubit gates can be achieved by applying the bus operations repetitively, with additional single-qubit rotations.

¹Work supported by DARPA-QuEST

Jianjia Fei University of Wisconsin-Madison

Date submitted: 11 Nov 2011

Electronic form version 1.4