Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Long-range entanglement and coherent qubit coupling via spin transport: implications for scalability JACOB TAYLOR, Harvard University, WOLFGANG DÜR, University of Innsbruck, GEZA GIEDKE, ETH Zrich, CHARLES MARCUS, Harvard University, PETER ZOLLER, University of Innsbruck, ATAC IMAMOGLU, ETH Zrich, MIKHAIL LUKIN, Harvard University — Solid state approaches to quantum computation offer intriguing prospects for large scale integration and long term stability. Most of the current approaches restrict the computation to nearest-neighbors interactions. This condition generally decreases thresholds for fault tolerant computation. We explore the prospects for improving the scalability of quantum dot-based quantum computation schemes via long range transport of electron spin entangled pairs. Specifically we investigate dominant sources of errors in such a transport and study techniques to purify and correct these errors. Finally, we discuss several approaches for long-lived storage of electronic spin qubits and investigate novel architectures that utilize these resources for scalable quantum computation.

Jacob Taylor
Harvard University

Date submitted: 21 Dec 2004 Electronic form version 1.4