Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Entanglement Purification with the Exchange Interaction
ADRIAN AUER, GUIDO BURKARD, Department of Physics, University of Konstanz, Germany — Entanglement purification techniques provide means to create qubit pairs of arbitrary high fidelity with respect to a maximally entangled state, consuming a larger number of low fidelity pairs. So-called recurrence protocols act iteratively on two or more qubit pairs to produce one pair with higher fidelity, using local unitary operations, measurements, and communication of the measurement results. In this talk, we present a purification protocol that works with two input pairs and solely uses a single pulsed Heisenberg-type qubit interaction, therefore being especially suitable for spin qubits in tunnel-coupled quantum dots. In contrast to previously known protocols, we allow for asymmetric bilateral operations where the two communication parties operate differently on their qubits. In the most efficient version of our protocol, the local two-qubit interactions correspond to the $\sqrt{\text{SWAP}}$ gate and its inverse, which are the natural entangling gates generated from a Heisenberg-type interaction. Furthermore, we show how the same fidelity gain can be reached using XY-type interactions.

Adrian Auer
Department of Physics, University of Konstanz, Germany

Date submitted: 24 Oct 2013 Electronic form version 1.4