Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Entangling Qubits in a One-Dimensional Harmonic Oscillator EDMUND OWEN, MATTHEW DEAN, CRISPIN BARNES, University of Cambridge — We present a method for generating entanglement between qubits associated with a pair of particles interacting in a one-dimensional harmonic potential. By considering the effect of the interaction on the energy spectrum of the system, we show that, under certain approximations, a "power-of-SWAP" operation is performed on the initial two-qubit quantum state without requiring any time-dependent control. Initialization errors and deviations from our approximation are shown to have a negligible effect on the final state. Using a GPU-accelerated iteration scheme to find numerical solutions to the two-particle time-dependent Schrödinger equation, we demonstrate that it is possible to generate maximally entangled Bell states between the two qubits with high fidelity for a range of possible interaction potentials.

Edmund Owen
University of Cambridge

Date submitted: 11 Nov 2011 Electronic form version 1.4