Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Measurement of the nonadiabatically-induced coherent time evolution of a single-electron wavefunction in a surface acoustic wave dynamic quantum dot ADAM THORN, MASAYA KATAOKA, MICHAEL ASTLEY, University of Cambridge, UK, DANIEL OI, University of Strathclyde, UK, CRISPIN BARNES, CHRIS FORD, DAVE ANDERSON, GEB JONES, IAN FARRER, DAVE RITCHIE, MICHAEL PEPPER, University of Cambridge, UK — Observation of coherent single-electron dynamics is severely limited by experimental bandwidth. We present a method to overcome this using moving quantum dots defined by surface acoustic waves. Each dot holds a single electron, and travels through a static potential landscape. When the dot moves abruptly between regions of different confinement, the electron is excited into a superposition of states, and oscillates unitarily from side to side. These oscillations are measured almost non-invasively, by allowing a small amount of tunnelling out of the dot each time the wavefunction approaches a tunnel barrier. We have modelled this in detail by solving the single-particle time-dependent Schrödinger equation for a realistic potential, and find good agreement between the measurements and the simulations.

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Date submitted: 21 Nov 2008 Electronic form version 1.4