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Electron transfer between distant quantum dots by surface acoustic waves R.P.G. MCNEIL, M. KATAOKA, C.J.B. FORD, C.H.W. BARNES, D. ANDERSON, G.A.C. JONES, I. FARRER, D.A. RITCHIE, Cavendish Laboratory, University of Cambridge, UK — Quantum dots (QDs) provide a useful system for manipulating and storing quantum information. Tunneling of electrons between double dots has been demonstrated but over larger distances a tunnel barrier is inadequate. We show such long range transfer of single electrons between QDs through a depleted 1D channel using a surface acoustic wave (SAW) pulse. Surface gates define two QDs (RQD & LQD) connected by a 4μm channel. Electrons trapped in RQD are raised above the Fermi energy by a gate sequence. Having set RQD to be "full" and LQD "empty" a SAW pulse is sent through the RQD towards the LQD. The SAW potential lifts and carries any electrons from RQD to LQD where they are trapped by a large exit gate voltage (transfer reliability 70%.) Changes in QD occupation are monitored by 1D charge detectors. We have demonstrated the transfer of electrons between static and dynamic QDs. This technique may allow the movement of quantum information (spin) between processor and storage, or to a region of holes for conversion to photon qubits.

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