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Coherent manipulation of a single charge in an isolated double quantum dot K. D. PETERSSON, J. R. PETTA, Department of Physics, Princeton University, H. LU, A. C. GOSSARD, Materials Department, University of California, Santa Barbara — The key requirement that a quantum computer needs to be scalable has motivated recent work demonstrating coherent control of two-level systems in semiconductor devices.[1] One very simple semiconductor two-level system is the 'charge qubit' in which a single excess electron occupies either the left or right dot of a tunnel-coupled double quantum dot.[2] In this work we establish coherent control of an isolated and tunable double dot containing a single electron. The qubit is manipulated by applying non-adiabatic voltage pulses to the surface gate electrodes. State readout is then performed non-invasively using a proximal quantum point contact charge detector.[3] We also perform microwave spectroscopy to verify that the frequency of the observed oscillations is consistent with the tunnel coupling strength. This isolated qubit provides a very fundamental system with which to study quantum coherence in semiconductor devices.

[1]J. R. Petta et al., Science 309, 2180 (2005).
[2]T. Hayashi et al., Phys Rev. Lett. 91, 226804 (2003).
[3]M. Field et al., Phys Rev. Lett. 70, 1311 (1993).

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