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Top-gated Quantum Dots in Silicon / Silicon-Germanium Two-Dimensional Electron Gases KEITH A. SLINKER, K.L.M. LEWIS, C.C. HASELBY, SRIJIT GOSWAMI, L.J. KLEIN, J.L. TRUITT, D.E. SAVAGE, University of Wisconsin-Madison, J.O. CHU, IBM Research Division, T. J. Watson Center, D.W. VAN DER WEIDE, S.N. COPPERSMITH, University of Wisconsin-Madison, P.M. MOONEY, IBM Research Division, T. J. Watson Center, MARK ERIKSSON, University of Wisconsin-Madison — Electrons in silicon/silicon-germanium two-dimensional electron gas quantum dots are a promising architecture for spin based quantum computation. Top gated quantum dots allow precise tuning of electron shape and interdot coupling. We report the observation of Coulomb blockade in Si/SiGe quantum dots defined by a combination of etching and metal top gating. A narrow channel or mesa is fabricated by electron beam lithography and subsequent reactive ion etching. Metal gates are deposited across the channel to define the leads of the dot. The sides of dot are defined by surface depletion from the etched sidewalls. Low temperature measurements (250mK) show a single electron charging energy of about 0.8meV. We use an etch- defined side gate to vary the potential in the dot, observing several conductance oscillations as the blockade is lifted, with a period of 280mV.

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