Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

The effect of donors on lateral gated quantum-devices in Si/SiGe heterostructures[1] XI LIN, JINGSHI HU, A. LAI, MIT, Z. ZHANG, UCLA, K. MACLEAN, MIT, Y.H. XIE, UCLA, M.A. KASTNER, MIT — Much activity has focused on the development of quantum dots in Si/SiGe because of its potentially very long decoherence times (T2). However, to fabricate well-controlled quantum dots in Si/SiGe heterostructures, one must overcome complications that do not arise in GaAs/AlGaAs heterostructures. We demonstrate that switching charge noise and donor-layer conduction can lead to instability and cross-coupling among the tunnel barriers, thus making it difficult to achieve highly stable and tunable quantum devices in a Si/SiGe heterostructure. In particular, we have used an integrated charge-sensing quantum point contact to investigate the charge motion that originates from the excess donors, and present a systematic capacitance measurement to show how the donor layer affects device function in devices with large ($\sim$100 μm^2) gates as well as nanometer-size ones.

[1]This work has been supported by the Nanoscale Science and Engineering Center program of NSF (PHY-0117795), NSF (DMR-0701386).

Xi Lin
MIT

Date submitted: 17 Dec 2010 Electronic form version 1.4