Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Electron Spin Relaxation due to Charge Noise[1] PEIHAO HUANG, XUEDONG HU, University at Buffalo — It is widely accepted that for a single electron confined in a quantum dot, spin relaxation is dominated by spin-orbit interaction in combination with phonon emission. The effect of charge noise is usually considered to be small in the case of a single electron spin qubit, although it is never actually evaluated in a quantum dot. Here we examine the single-electron spin decoherence due to charge noise, mediated by the spin-orbit interaction. We find that at the lowest order, it is a relaxation channel, with $T_2 = 2T_1$, similar to the case of spin-orbit interaction and phonon scattering. The relaxation rate is linearly proportional to the applied magnetic field, in contrast to the 5th power magnetic field dependence in the phonon case. Our calculated spin relaxation time ranges from ms in GaAs to seconds in Si for 1 T field, making this relaxation channel at low field comparable or even more important than that due to phonon emission. The relaxation rate is inversely proportional to the 4th power of the dot confinement energy, so that increasing the confinement energy is an efficient way to suppress this relaxation channel.

[1]We thank support by US ARO and NSF PIF.

Xuedong Hu
University at Buffalo

Date submitted: 29 Nov 2012 Electronic form version 1.4