Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Effects of charge noise on a pulse-gated singlet-triplet $S - T_-$ qubit[1] ZHENYI QI, MARK FRIESEN, SUSAN COPPERSMITH, MAXIM VAVILOV, UW-Madison — We study the dynamics of a pulse-gated semiconductor double quantum dot qubit. In recent experiments on $S-T_-$ qubits, the coherence times are relatively long, but the visibility of the quantum oscillations is low. We argue that these observations are consistent with a theory that incorporates decoherence arising from charge noise that gives rise to detuning fluctuations of the double dot. Because effects from charge noise are largest near the singlet-triplet avoided level crossing, the visibility of the oscillations are low when the singlet-triplet avoided level crossing occurs in the vicinity of the charge degeneracy point crossed during the manipulation, but there is only modest dephasing at the large detuning value at which the quantum phase accumulates. This theory agrees well with experimental data and predicts that the visibility can be increased greatly by appropriate tuning of the interdot tunneling rate.

[1]Army Research Office Grant W911NF-12-0607 and W911NF-15-1-0248; National Science Foundation (NSF) Grants DMR-1206915, DMR-1121288 and PHY-1104660; the Office of Naval Research Award #N00014-15-1-0029; Department of Energy Grant DE-FG02-03ER46028;

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Date submitted: 11 Nov 2016 Electronic form version 1.4