

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Single-spin manipulation via exchange interaction in a double quantum dot with micromagnet STEFANO CHESI, YING-DAN WANG, Institute of Physical and Chemical Research (RIKEN), DANIEL LOSS, University of Basel — The manipulation of single spins in double quantum dots by making use of the exchange interaction and a highly inhomogeneous magnetic field was discussed in W. A. Coish and D. Loss, Phys. Rev. B 75, 161302 (2007). Given that such large inhomogeneity of the magnetic field is difficult to achieve, we examine an analogous scheme applicable to current double quantum dot setups in the presence of the stray field of a neighboring micromagnet. We estimate typical gate times realized at the singlet-triplet anticrossing induced by the micromagnet field, and discuss the optimization of the single-spin gates through suitable pulse shapes and orientation of the micromagnet magnetization. We also examine the effect of several decoherence sources, as in particular the Overhauser field induced by nuclear spins and charge noise from the electric gates, and characterize the corresponding decay of the Rabi oscillations. Our results suggest that this scheme is a promising approach for the realization of fast single-spin operations.

Stefano Chesi
Institute of Physical and Chemical Research (RIKEN)

Date submitted: 15 Nov 2013

Electronic form version 1.4