Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Sorting Category: 17.1.3 (C)

Pairwise control of exchange interaction between individual spins in a triple quantum dot G. GRANGER, SERGEI STUDENIKIN[1], G. AERS, A. KAM, P. ZAWADZKI, L. GAUDREAU, R. WASILEWSKI, National Research Council of Canada, M. PIORO-LADRIERE, University of Sherbrooke, A. SACHRAJDA, National Research Council of Canada — The original spin qubit proposal [1] suggested a linear array of spins for quantum computations and the exchange interaction for 2 qubit operations. An essential component of the proposal was the ability to control pairwise the exchange interaction between neighbouring pairs of spins. In this work we experimentally demonstrate such a pairwise control of the exchange interaction between three spins localized in a triple quantum dot (TQD) device. The TQD potential was formed using electrostatic lateral split-gate technology on a GaAs/GaAlAs heterostructure with a high-mobility two-dimensional electron gas [2]. We employ fast pulsing technique based on the Landau-Zener-Stuckelberg (LZS) approach for creating and manipulating coherent superpositions of three spin quantum states [3]. We show that we are able to maintain coherence when increasing the exchange coupling of one spin with another while simultaneously decreasing its coupling with the third.

[1] D. Loss, and D.P. DiVincenzo, Phys. Rev. A57, 120-126 (1998).
[2] L. Gaudreau , et al., Appl. Phys. Lett. v.95, 193101 (2009).
[3] J.R. Petta, H. Lu, and A.C. Gossard, Science v.327, 669-672 (2010).

[1]Presenting this work

[X] Prefer Oral Session
[ ] Prefer Poster Session

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Date submitted: 19 Dec 2011 Electronic form version 1.4