Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Negative spin exchange in a multielectron GaAs quantum dot[1]
FERDINAND KUEMMETH, F. MARTINS, F. K. MALINOWSKI, P. D. NISSEN, C. M. MARCUS, Center for Quantum Devices, Niels Bohr Institute, University of Copenhagen, Denmark., G. C. GARDNER, S. FALLAHI, M. J. MANFRA, Department of Physics and Astronomy, Birck Nanotechnology Center, and Station Q Purdue, Purdue University, USA, T. SMITH, A. C. DOHERTY, S. D. BARTLETT, Centre for Engineered Quantum Systems, School of Physics, The University of Sydney, Australia — We use a singlet-triplet qubit implemented in a GaAs double dot to probe the exchange interaction between one of its dots and a nearby multielectron dot. By applying fast gate voltage pulses, we first initialize the double dot in the singlet state, then allow tunneling between one of its dots and the multielectron dot for a short time, followed by singlet-triplet readout of the double dot. We find that the spin-exchange energy can have opposite sign compared to exchange between singly-occupied dots. This behavior occurs already at zero magnetic field and is not affected by in-plane magnetic fields. The exchange profile can, however, be changed by applying out-of-plane magnetic fields or by changing the occupancy of the multielectron dot. By coupling a second singlet-triplet qubit to the multielectron dot, we can map out different configurations that are relevant for non-nearest-neighbor coupling of semiconducting spin qubits.

[1]Support through LPS-MPO-CMTC, Army Research Office, the Danish National Research Foundation, and the Danish Innovation Fund is acknowledged.

Ferdinand Kuemmeth
Niels Bohr Institute, University of Copenhagen

Date submitted: 15 Nov 2016 Electronic form version 1.4