

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Anisotropic exchange coupling in a nanowire double quantum dot with strong spin-orbit coupling RUI LI, J.Q. YOU, Beijing Computational Science Research Center — A spin-orbit qubit is a hybrid qubit that contains both orbital and spin degrees of freedom of an electron in a quantum dot. Here we study the exchange coupling between two spin-orbit qubits in a nanowire double quantum dot (DQD) with strong spin-orbit coupling (SOC). We find that while the total tunneling in the DQD is irrelevant to the SOC, both the spin-conserved and spin-flipped tunnelings are SOC dependent and can compete with each other in the strong SOC regime. Moreover, the Coulomb repulsion between electrons can combine with the SOC-dependent tunnelings to yield an anisotropic exchange coupling between the two spin-orbit qubits. Also, we give an explicit physical mechanism for this anisotropic exchange coupling.

Rui Li
Beijing Computational Science Research Center

Date submitted: 14 Nov 2014

Electronic form version 1.4