Doublet blockade and spin dynamics in three quantum dot system

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We present theoretical studies on an artificial molecule constructed from three coherently coupled quantum dots in triangular geometry (TQD) which is connected to the electrodes. The symmetry of the TQD can be change by applying a local gate potential to each dot. We will analyzed the TQD with three spins in a doublet subspace (with total spin S=1/2). In calculation we use the Heisenberg Hamiltonian and the Master equation in Lindblad form. For specific configuration of the potentials one can observe the effect of blockade of the current flowing through TQD. The blockade occurs in the doublet subspace and is related with asymmetry of tunnel rates from source and drain electrodes to the TQD. We also investigate the dynamics of spins in TQD, taking into account relaxation and decoherence processes as well as leakage from the doublet subspace. Our studies are motivated to use TQD as a single qubit in the quantum computation [1]. *This work has been supported by the National Science Center under the contract DEC-2012/05/B/ST3/03208*

References:

[1] D. P. DiVincenzo, D. Bacon, J. Kempe, G. Burkard, and K. B. Whaley, Nature (London) **408**, 339 (2000).