NANOHOUR

Wednesday, October 3rd, 2007
3:00 PM
Beckman Institute - Room 3269

Exchange interaction and stability diagram in coupled elongated quantum dots

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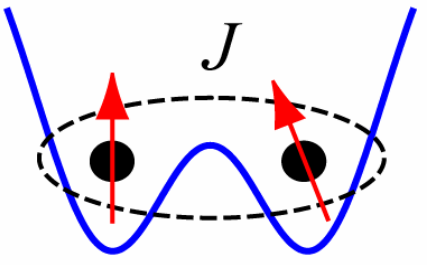
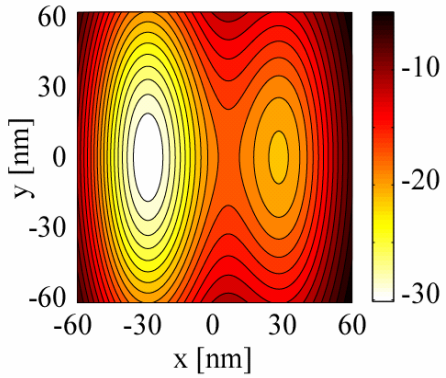
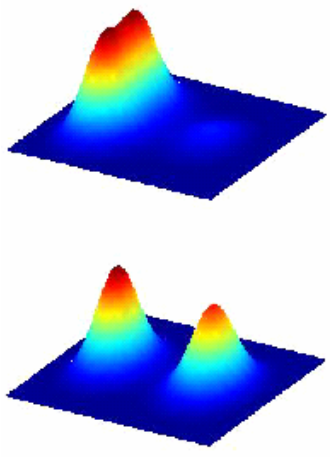
Coupled quantum dots with different aspect ratios containing up to two electrons are studied using a model confinement potential in the presence of magnetic fields. Single and two particle Schroedinger equations are solved using numerical exact diagonalization to obtain the exchange energy and chemical potentials. By investigating the charge stability diagram, we find the inter-dot coupling decreases with increasing inter-dot separations, increasing magnetic fields, and decreasing dot aspect ratios. The computed exchange energies are also found to be significantly smaller than the values estimated from the stability diagram.

As the ratio between the confinement strengths in directions perpendicular and parallel to the coupling direction of the double dots increases, the exchange energy at zero magnetic field increases, while the magnetic field at singlet-triplet transition decreases. With increasing inter-dot detuning, the absolute value of the exchange energy increases superlinearly followed by saturation. This behavior is attributed to the electron density differences between the singlet and triplet states in the asymmetric quantum dot systems.

* In collaboration with Dmitriy Melnikov and Jean-Pierre Leburton







Coffee and cookies will be served.

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