Coupled Quantum Dots and Other Solid State Physical Models for Quantum Computing.

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Abstract

In this work, the exchange of energy J for a system of two laterally-coupled quantum dots, each one with an electron, is calculated analytically and in a detailed form, considering them as hydrogen-like atoms, under the Heitler-London approach. The atomic orbital's, associated to each quantum dot, are obtained from translation relations, as functions of the Fock-Darwin status. Our results agree with the reported ones by Burkard, Loss and DiVincenzo in their model of quantum gates based on quantum dots, as well as with the recent experimental reports.

The other hand we have studied other models of quantum tunneling effects that including spin effect that are sources of the entanglement and, that based in solid state physics, contribute to the understanding and potential production of quantum mechanisms.