Simulations of spin control in quantum dots

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ABSTRACT

The talk covers simulations of coherent manipulation of confined electron spins. The studied procedures of spin control exploit the spin-orbit coupling (SOC) that translates the electron motion in space into an effective magnetic field acting on the carrier spin. Electrostatic devices for trapping a single electron [1] and operation on its spins [2] using the spin precession of moving electrons in the effective SOC field were proposed and a proof of concept was provided [1,2] with the time-dependent Schroedinger-Poisson calculations. The singlet-triplet spin transitions in electron systems confined in double quantum dots with the first (Rabi) and higher order transitions driven by AC voltages in the hyperfine [3] or SOC field [4] were described with the time-dependent configuration interaction approaches. The spin and valley transitions in semiconducting carbon nanotubes with time-dependent atomistic tight-binding calculations will also be presented [5] including ambipolar pairs of quantum dots [6].

References

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