Spin States and Spin correlation in Semiconductor Quantum Structures

Hongqi Xu
(Hongqi.Xu@ftf.lth.se)
Division of Solid State Physics, Lund University, Box 118, S-221 00 Lund, Sweden

I will report our recent studies of spin physics and spin-correlation phenomena in semiconductor quantum dots. The devices were fabricated from InGaAs/InP semiconductor heterostructures and from InSb semiconductor nanowires. Spin states, effective g-factors, spin-orbit interaction energy, and exchange energy were measured for the fabricated quantum dots. We also studied strong correlation phenomena in the fabricated quantum dot devices. In addition to both odd-number electron and even-number electron Kondo effects, we observed a new spin-correlation-induced phenomenon in InSb quantum dot devices, namely the conductance blockade at the degeneracy of two orbital states with the same spins. We attribute this conductance blockade to the effect of electron interference between two equivalent, strongly correlated, many-body states in the quantum dots.