Verhandlungen
der Deutschen Physikalischen Gesellschaft e.V.

Dresden 2014 – wissenschaftliches Programm

HL: Fachverband Halbleiterphysik

HL 16: Electron spin qubits in semiconductor quantum dots (Focus session with TT)

HL 16.7: Topical Talk

Montag, 31. März 2014, 17:15–17:45, POT 051

Auswahlstatus für diesen Beitrag: gemäß den Sitzungseinstellungen

Spin Hot Spots in Quantum Dots — •Peter Stano — RIKEN Center for Emergent Matter Science, 2-1 Hirosawa, Wako, Saitama 351-0198 Japan — Institute of Physics, Slovak Academy of Sciences, 845 11 Bratislava, Slovakia

Spin hot spots are points in parameter space which dominate spin relaxation in quantum dots. The relaxation proceeds through spin-orbit interactions and a phonon emission. In a spin hot spot the otherwise weak spin-orbit effects become non-perturbative and thus unusually strong.

The hot-spot dominance leads to a pronounced anisotropy of the relaxation rate as a function of the quantum dot and/or magnetic field orientation with respect to crystallographic axes. This behavior is very general, occurring for different electron occupations, quantum dot geometry and material composition. Of practical interest is the possibility to individually identify different types of spin-orbit interactions (e.g. Rashba vs Dresselhaus), and obtain their relative strengths in a given sample, from the relaxation rate anisotropy.[1]

The important influence that the spin hot-spots might imply on spin relaxation was first recognized in bulk metals and later in quantum dots. The theoretically predicted spin hot-spots were recently established experimentally in gated Si [2] and GaAs [3] quantum dots.

[1] P. Stano and J. Fabian, Phys. Rev. B 74, 045320 (2006).

[2] C. H. Yang, et al., Nature Comm. 4, 2069 (2013).

[3] V. Srinivasa, et al., Phys. Rev. Lett. 110, 196803 (2013).