Pauli Spin Blockade in Carbon Nanotube Double Quantum Dots

M.R. Buitelaar [1], J. Fransson [2], A.L. Cantone [1], C.G. Smith [1], D. Anderson [1], G.A.C. Jones [1], A. Ardavan [3], A.N. Khlobystov [4], A.A.R. Watt [4], G.W. Morley [4], K. Porfyrakis [4], and G.A.D. Briggs [4]

[1] Cavendish Laboratory, University of Cambridge, Cambridge CB3 0HE, UK
[2] Theoretical Division, Los Alamos National Laboratory, Los Alamos NM 87544, USA
[3] Clarendon Laboratory, Oxford University, Oxford OX1 3PU, UK
[4] Department of Materials, Oxford University, Oxford OX1 3PH, UK

We report Pauli spin blockade in a carbon nanotube double quantum dot. The measured differential conductance agrees well with a theoretical model of the device which allows us to estimate the occupation probabilities of the relevant singlet and triplet states. This work demonstrates that effective spin-to-charge conversion in nanotube quantum dots is feasible and opens the possibility of single-spin manipulation and read-out in a system that is not limited by hyperfine interaction with nuclear spins. The large energy scales observed here show that basic operations such as single-spin rotations should be possible at a much faster rate than in other semiconductor systems.