Spin splitting in open quantum dots

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We present results from a theoretical and experimental study of spin-splitting in small open lateral quantum dots (i.e. in the regime when the dot is connected to the reservoirs via leads that support one or more propagating modes) [1]. We demonstrate that the magnetoconductance shows a pronounced splitting of the conductance peaks (or dips) which persists over a wide range of magnetic fields (from zero field to the edge-state regime) and is virtually independent of magnetic field, see Fig. 1. A numerical analysis of the conductance and the dot eigenspectrum indicates that this feature is related to a lifting of the spin degeneracy in the corresponding closed dot associated with the interaction between electrons of opposite spin, see Fig. 2.

[1] M. Evaldsson, I. V. Zozoulenko, M. Ciorga, P. Zawadzki, and A. S. Sachrajda, "*Spin splitting in open quantum dots*", arXiv:cond-mat/0306327.

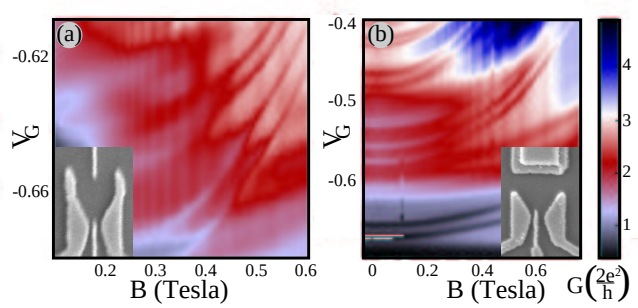

FIG. 1: Experimental conductance as a function of magnetic field B and gate voltage V_G obtained from different dots. The corresponding device layouts are shown in the insets. The lithographic size of the dots is ~ 450nm.

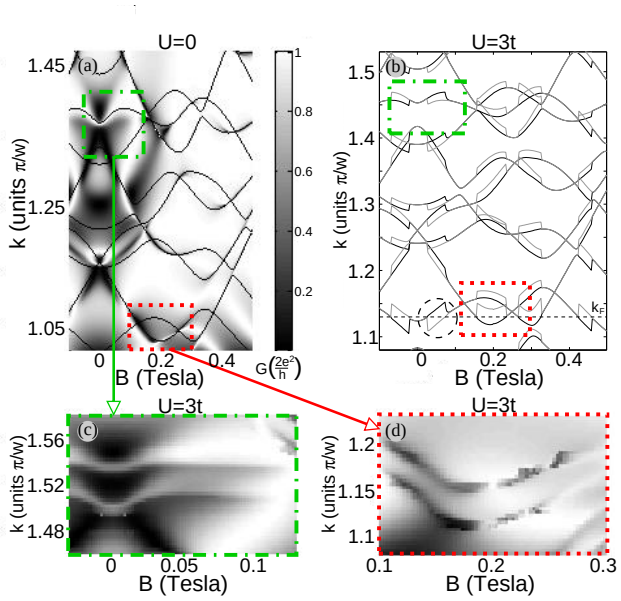

FIG. 2: (a) The calculated linear conductance $G = G(k_F, B)$ (without spin- and charging interaction; Hubbard $U = 0$). Solid lines depict the eigenspectrum of the corresponding closed dot. (b) The eigenspectrum of the corresponding closed dot where many-particle and spin effects are included by means of the tight-binding Hubbard Hamiltonian; the Hubbard $U = 3t$. Dotted line indicates k_F.(c),(d) The conductance $G = G(B, k_F)$ for the same strength of Hubbard $U = 3t$.