

EINLADUNG

zum Vortrag von

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über

Magnetic tuning of electronic states in carbon nanotube quantum dots

am

Dienstag, 14. Juni 2005, um 17.30 Uhr

im Großen Hörsaal des Instituts für Experimentalphysik der Universität Wien
1090 Wien, Strudlhofgasse 4 / Boltzmannngasse 5, 1. Stock

Abstract:

The recent observation of an orbital contribution to the magnetic moment of electrons in carbon nanotubes has triggered an enormous interest in the electronic properties of nanotubes placed in a parallel magnetic field. In this talk I will review the concepts of electronic structure of single wall carbon nanotubes and then apply these to our recent low-temperature electronic transport experiments in carbon nanotube quantum dots. In particular I will focus on the magnetic field transport spectroscopy of high quality quantum dots exhibiting four-fold shell structure in the addition energy. We measure the evolution of the Coulomb peaks' pattern with magnetic field and find a large splitting of the orbital states within each shell, demonstrating their opposite orbital magnetic moment. A fully consistent picture of the energy spectrum and the spin and orbital configuration of nanotube quantum dots will be presented. The magnetic field allows us to modify the energy spectrum of CNT QDs, such that we can tune two orbital states with equal spin polarization into degeneracy. This purely orbital degeneracy enables the observation of an orbital Kondo effect and shows that carbon nanotubes can potentially act as low-impedance spin filters. At zero magnetic field, we measure an enhanced Kondo effect due to the simultaneous spin and orbital degeneracy. The different spin and orbital magnetic field dependence of the energy states leads to a four-fold splitting of the Kondo peak, indicating a SU(4) symmetry for the Kondo effect.

References:

- [1] P. Jarillo-Herrero et al. Nature 434, 484 (2005)
- [2] P. Jarillo-Herrero et al. PRL 94, 156802 (2005)
- [3] P. Jarillo-Herrero et al. Nature 429, 389 (2004)

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