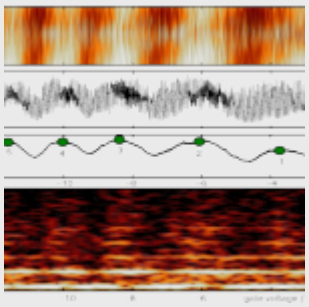
Unexpected Phenomena In The Quantum Transport Through Carbon Nanotubes



Title: Unexpected Phenomena In The Quantum Transport Through Carbon Nanotubes.
When: Tuesday, February 14, (2017), 12:30.
Place: Departamento de Física de la Materia Condensada, Facultad Ciencias, Module 3, Seminar Room (5th Floor).
Speaker: Christoph Strunk, Regensburg University, Germany.

Carbon nanotubes have reached a quality that allows for stringent tests of theory. Applying high magnetic fields we perform transport spectroscopy on the first excess electron above the band gap. The observed single particle spectra allow to quantitatively probe the fine structure corrections to the simple Dirac Hamiltonian. The results only super¬ficially agree with expectations based upon accepted models. In parti-cular, we find an unexpected orbital degeneracy of the ground state, and a mis¬match of the orbital magnetic moments extracted from low and high magnetic field regimes.
In addition, the line intensities strongly vary, if the magnetic field shifts the levels across the Dirac cone. This effect can be traced back to deviations from the standard ‘particle in a box’ boundary conditions that apply to the bipartite graphene lattice. The boundary conditions couple the longitudinal and radial parts of the electronic wave functions and drastically affect the transmission amplitude in magnetic field.
Finally, we trace the signatures of the trigonal warping of the Dirac cone at higher energies in the Fabry-Perot-like interference pattern at the highly transmissive hole side of the spectrum. These can be exploited to determine the tube’s chiral angle from transport measurements.
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