HL 49: Graphene

Time: Thursday 17:30–18:15 Location: H17

HL 49.1 Thu 17:30 H17

Fabry-Perot interference in graphene ribbons (SWITCHED WITH TT 27.3) — •Miriam del Valle[1], Carlos Tejedor[2], and Gianaurelio Cuniberti[1] — [1]Institut für Theoretische Physik, Universität Regensburg — [2]Universidad Autónoma de Madrid, Spain

Graphene is in the focus of intense studies, as it represents an archetypal system for investigating low-dimensional quantum phenomena. Moreover, its topology results in a peculiar electronic structure with a massless dispersion near the Fermi level. Here we present a theoretical study on the Fabry-Perot interference patterns of graphene ribbons well contacted to external electrodes and capacitively coupled to a back gate. Our main focus comprises the effects of the orbital mixing between s and p bands and the role of defects.

HL 49.2 Thu 17:45 H17

Spatially inhomogeneous states of charge carriers in graphene — Alexander Chaplik[1] and •Timur Tudorovskiy[2] — [1]Institute of Semiconductor Physics, 630090, Novosibirsk, Russia — [2]AG QChaos, FB Physik, Universität Marburg, Renthof 5, 35032 Marburg, Germany

Monatomic layers of carbon atoms, forming hexagonal lattice (graphene), are studied very intensively at present [1-2]. A “conical” dispersion law for free quasiparticles $E = \pm u|p|$ implies crucial distinctions of their dynamical characteristics from the corresponding characteristics of massive particles. We study an interaction of 2D quasiparticles with impurity potentials assuming that it can be described by the effective equation $u(\boldsymbol{\sigma}\hat{\boldsymbol{p}})\Psi + v(\mathbf{r})\Psi = E\Psi$, where $\boldsymbol{\sigma} = (\sigma_1, \sigma_2)$ are Pauli matrices, $\hat{\boldsymbol{p}} = -i\hbar\nabla$ is momentum operator, u is characteristic velocity and $v(\mathbf{r})$ is an impurity potential.

We consider some simple exactly solvable models of 1D and 2D potential wells from the viewpoint of possibility to localize quasiparticles. It is shown, that in quantum wires transversal (1D) localization is possible, whereas in quantum dots as well as for hydrogen-like donors or acceptors 2D localization is not possible. Scattering cross-sections of electrons (holes) of graphene by an axially symmetric potential well are obtained. It is shown that in the limit of infinitely large energies of incoming particles the cross-section tends to a constant. It is shown that the geometric potential for a curved quantum wire differs from the case of parabolic dispersion law, and cannot form 1D bound states.

[1] K. S. Novoselov et al., *Science*, **306**, 666 (2004).
[2] J. Milton Pereira et al., Phys. Rev. B **74**, 045424 (2006).

HL 49.3 Thu 18:00 H17

Effects of defects and disorder in graphene nanoribbons (SWITCHED WITH TT 27.6) — •Gabriel Niebler, Norbert Nemec, and Gianaurelio Cuniberti — Universität Regensburg

Nanostructured graphene is a promising candidate for future devices at the nanometer scale. Defects and disorder as well as irregular edges cannot be avoided in any realistic setup. We use a π-orbital model for a systematic study of the effects of various kinds of defects on the electronic transport properties of graphene nanoribbons and emphasize differences and similarities to the well known results for carbon nanotubes.