



PHYSIKALISCHES KOLLOQUIUM

des Fachbereichs Physik
der Johann Wolfgang Goethe-Universität Frankfurt

Mittwoch, den 13.06.2018, 16 Uhr c.t.
Großer Hörsaal, Raum _0.111,
Max-von-Laue-Str. 1



Prof. Dr. Vladimir Falko

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"Moiré superlattices and magnetic minibands in graphene heterostructures"

When graphene lattice is aligned with the hBN lattice, a long-wavelength periodic moiré pattern forms due to a weak incommensurability of the two lattice structures, leading to a long-range superlattice affecting properties of electrons in graphene, including formation of miniband spectra for Dirac electrons and reappearance of magnetic minibands at the rational values of magnetic field flux through the supercell area (in units of $\phi_0 = h/e$), also known as Hofstadter butterfly.

Here, we show that the quantum effect of the minibands formation in long-period moiré superlattices (mSL) in graphene/hBN heterostructures affect their transport measurements up to the room temperature. In relation to the low-field behavior, we find that the overall temperature dependence of resistivity displays the opening in a new scattering process: the umklapp electron-electron scattering in which two electrons coherently transfer the mSL Bragg momentum to the crystal. The formation magnetic minibands and their manifestation in magneto-oscillation of the diagonal conductivity tensor persist up to the room temperature, too, with full hierarchy of features that are attributed to the rational flux values $\phi = (p/q)\phi_0$, with $p=1, 2$ and up to 3 (and $7 < q < 1$), now, observed at the intermediate range of $50\text{K} < T < 200\text{K}$.

Die Dozenten der Physik

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