Strong magnetoresistance in a graphene Corbino disk at low magnetic fields [1]

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We have measured the magnetoresistance of suspended graphene in the Corbino geometry at magnetic fields up to B=0.15T, i.e., in a regime uninfluenced by Shubnikov-de Haas oscillations. The low-temperature relative magnetoresistance $[R(B)-R(0)]/R(0)$ approaches 100% at the highest magnetic field studied at the Dirac point with a quite weak temperature dependence below 30K. A decrease in the relative magnetoresistance by a factor of two is found when charge carrier density is increased to $|n| \simeq 3 \times 10^{-10}$ cm^{-2} . The gate dependence of the magnetoresistance allows us to characterize the role of scattering on long-range (Coulomb impurities, ripples) and short-range potential [2], as well as to separate the bulk resistance from the contact one. Furthermore, we find a shift in the position of the charge neutrality point with increasing magnetic field, which suggests that magnetic field changes the screening of Coulomb impurities around the Dirac point.

References

[1] M. Kamada, V. Gall, J. Sarkar, M. Kumar, A. Laitinen, I. Gornyi, P. Hakonen, Strong magnetoresistance in a graphene Corbino disk at low magnetic fields, arXiv:2105.03145 (2021)

[2] P. S. Alekseev, A. P. Dmitriev, I. V. Gornyi, and V. Y.Kachorovskii, Strong magnetoresistance of disordered graphene, Physical Review B87, 165432 (2013)

Figures

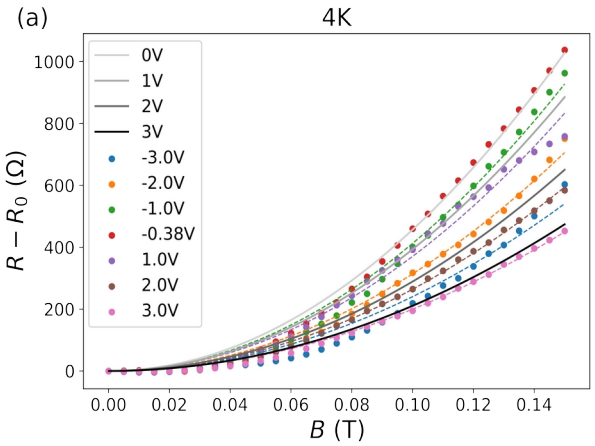

Figure 1: Non-normalized magnetoresistance R(B)-R(0) for 4K for various values of gate voltage. The dashed lines correspond to the function used for fitting and solid lines to theoretical zero-temperature magnetoresistance, calculated using the parameter from the fit. Figure taken from [1].