Fabry-Pérot resonances in a graphene/hBN Moiré superlattice

Clevin Handschin
Péter Makk, Peter Rickhaus, Ming-Hao Liu, K. Watanabe, T. Taniguchi, Klaus Richter, and Christian Schönenberger
Universität Basel, Klingelbergstrasse 82, 4056 Basel, Schweiz
clevin.handschin@unibas.ch

Graphene combines many interesting physical properties such as e.g. relativistic band-structure, ballistic electron transport up to several micrometers or the ability to dope it seamlessly from *n*- into *p*-doped region using electrostatic gates. In order to experimentally access the rich physics of graphene, one has to reduce extrinsic noise, e.g. by encapsulating the graphene in hexagonal boron nitride (hBN) [1]. While Fabry-Pérot [2] resonances and Moiré superlattices [3,4] are intensively studied in encapsulated graphene, the two effects have not been discussed in their coexistence. Here we investigate the FP oscillations in a ballistic *pnp*-junction in the presence and absence of a Moiré superlattice as shown in Fig. 1. First, we address the effect of the smoothness of the confining potential on the visibility of the FP resonances and carefully map the evolution of the FP cavity size as a function of densities inside and outside the cavity in the absence of a superlattice, when the cavity is bound by regular *pn*-junctions. Using a sample with a Moiré superlattice, we next show that a FP cavity can also be formed by interfaces that mimic a *pn*-junction, but are defined through a satellite Dirac point due to the superlattice, as shown in Fig. 2. We carefully analyse the FP resonances, which can provide insight into the band-reconstruction due to the superlattice.

References

[1] Dean *et al*., Nat. Nano, 5 (2010) 722
[2] Rickhaus *et al*., Nat. Commun., 4 (2013) 2342
[3] Woods *et al*., Nat. Phys., 10 (2014) 451
[4] Yankowitz *et al*., Nat. Phys. 8 (2012) 382

Figures

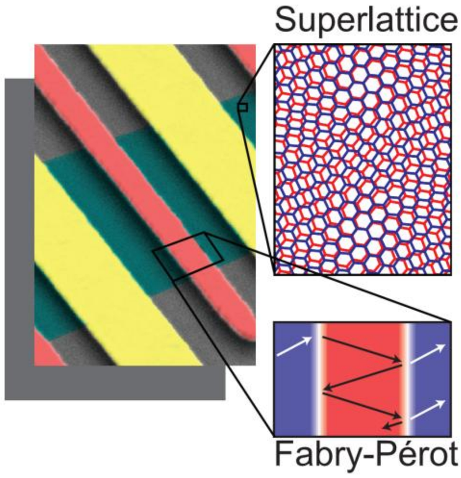

Figure 1: , False-color SEM image of the device where the leads are coloured in yellow, the top-gate in red and the hBN-graphen-hBN hetero-structure in cyan.

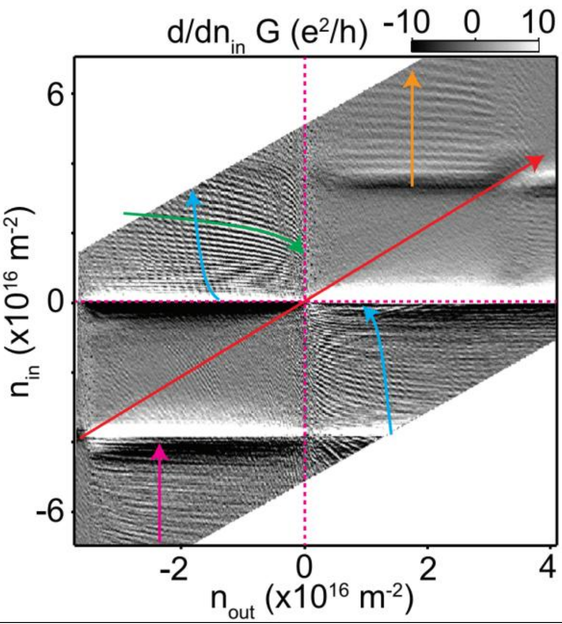

Figure 2: Numerical derivative of the conductance as a function of global back-gate and local top-gate. The various types of FP oscillations are indicated with the arrows having different colors.