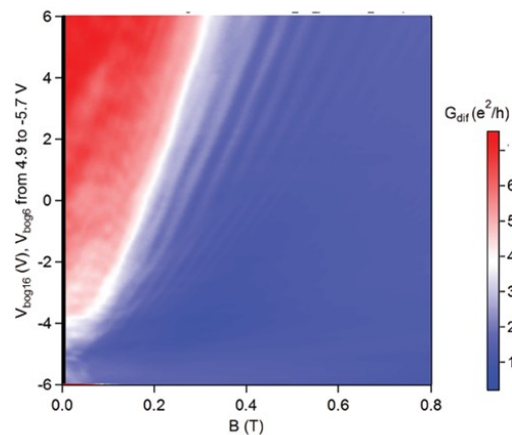
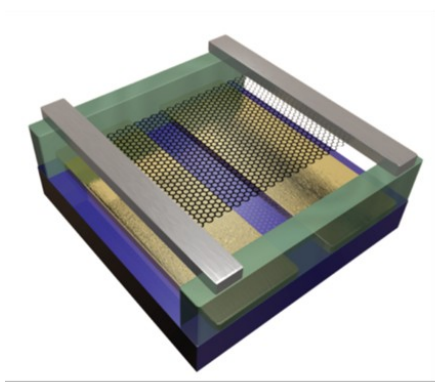


Ballistic graphene p-n junction : From Fabry-Pérot interferences to Snake states

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We have fabricated suspended monolayer graphene devices on organic lift-off resist. We have extended this technology, which was introduced by N. Tombros et al. in 2011 [1], allowing to add a multitude of bottom and top gates. Using in-situ current annealing, we show that exceptional high mobility can be obtained in these devices, approaching values of $100 \text{ m}^2/\text{Vs}$. Specifically, we have studied the two terminal transport of ultraclean monolayer graphene whose electrostatic potential can be tuned by two gates acting respectively on the left and on the right half of the graphene. The device can then be operated in the unipolar n-n' and p-p' or in the bipolar n-p' and p-n' regimes. In all these regimes we observed a striking beating pattern, which can be traced back to Fabry-Pérot oscillations originating from cavities that are either localized in one half of the sample (left and/or right) or even extend over the whole sample. Taking all geometrical parameters of the experiment into account, a remarkable good correspondence between theory and measurement could be reached in this Fabry-Pérot regime[2]. On the other hand, when one applies magnetic field, the unipolar and bipolar regimes become completely different. In the unipolar regime, quantum hall plateaus of $2, 6, 10 \dots e^2/h$ are visible. On the contrary, in the bipolar regime the conductance shows magneto-oscillations at moderate field, and saturates at higher field to a value smaller than $2e^2/h$. By comparisons to numerical simulations and semi-classical considerations we will show that these magneto-oscillations are linked to the commensurability between the width of the graphene flake and the period of the snake states present at the p-n interface in the bipolar regime.

References

- [1] N. Tombros et al. Journal of Applied Physics 109, 093702 (2011).
- [2] P. Rickhaus et al. Nature Communications 4, 2342 (2013).

A coffee break will be served at 11h00. The seminar will be given in English.