Ballistic interferences in suspended graphene: Theoretical modeling from contact to contact

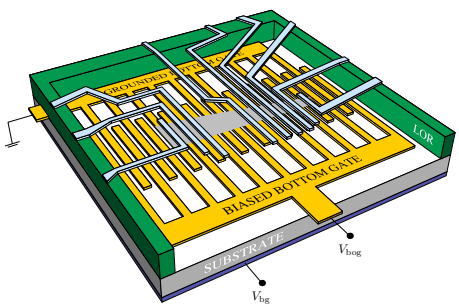
Peter Rickhaus[1], Romain Maurand[1], Markus Weiss[1], Christian Schönenberger[1], Ming-Hao Liu[2], and Klaus Richter[2]

[1]*Department of Physics, University of Basel, Klingelbergstrasse 82, CH-4056 Basel, Switzerland*

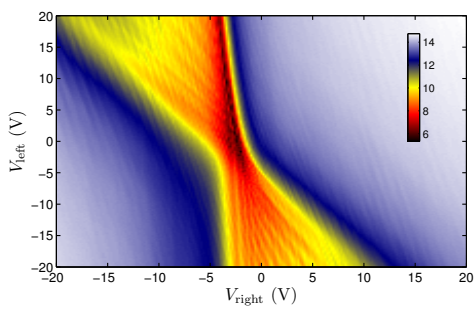
[2]*Institut für Theoretische Physik, Universität Regensburg, D-93040 Regensburg, Germany*

Ballistic interferences in ultra-clean suspended graphene has been recently observed [Figs. 1(a)–1(b)], with transport simulation qualitatively agreeing with the experimental measurement also reported [Figs. 1(c)–1(d)]; see [1]. The interference stems from the Fabry-Pérot resonance within the cavities formed by the electrically induced pn junctions as well as by the graphene-contact interfaces, which are separated to each other longer than 1 micron in the experiment. In this presentation, full theoretical modeling of the ballistic transport, from one contact to the other through the suspended graphene, is illustrated. In qualitatively reproducing the experimentally measured conductance map, the transport simulation confirms the ballistic origin of the measured interferences and reveals the role played by the metal contacts.

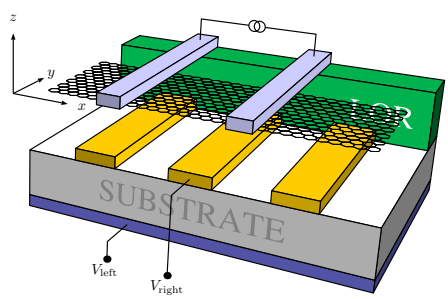
[1] P. Rickhaus, R. Maurand, M.-H. Liu, M. Weiss, K. Richter, C. Schönenberger, arXiv:1304.6590.



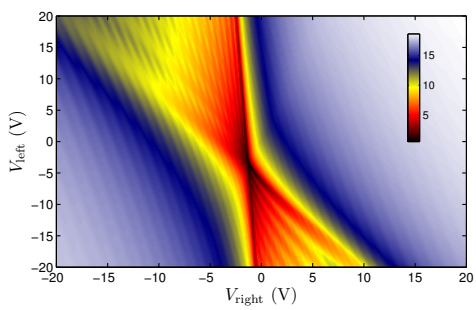
(a) Sketch of the suspended graphene device.



(b) Experimentally measured conductance map.



(c) Simplied sketch of the device for modeling.



(d) Theoretically calculated conductance map.

Figure 1: Ballistic interferences measured and calculated in a two-terminal device with ultra-clean suspended graphene.