Mapping Local Resistance of Sidewall Graphene Nanoribbons

A. De Cecco[1,2], V. Prudkovskiy[2], D. Deniz[3], Y. Hu[3], Y. Hu[3], J.-P. Turmaud[3], J. Gigliotti[3], L. Ma[4], C. Berger[2,3], W. A. de Heer[3,4], H. Courtois[1,2], C. B. Winkelmann[1,2]

[1] *Université Grenoble Alpes, Institut Néel, 25 Avenue des Martyrs, 38042 Grenoble, France*
[2] *CNRS, Institut Néel, 25 Avenue des Martyrs, 38042 Grenoble, France*
[3] *School of Physics, Georgia Institute of Technology, Atlanta, USA*
[4] *TICNN, Tianjin University, China*

Epitaxial graphene on SiC represents one of the most promising candidates for large-scale integration of graphene-based electronics. In particular, epitaxial graphene sidewall nanoribbons (GNRs) are nanostructures of fundamental interest which can provide direct and controllable access to charge neutral graphene [1]. High-temperature epitaxial growth methods can provide exceptionally homogeneous and pure GNRs samples [2]. Due to quantum confinement effects, exceptional ballistic transport at room temperature was recently observed in these systems [3]. Ballistic transport in graphene close to the Dirac point has been the subject of several theoretical studies, but its fundamental aspects are not yet fully understood.
Using a cryogenic combined AFM/STM setup, we measure the local resistance and potential of GNR-based devices with nm-scale spatial resolution and μV-scale voltage resolution. Local potential and resistance, measured at room temperature both in the invasive and non-invasive probe regimes, show plateaus and non-constant slopes which provide clear indication of non-diffusive transport.

References:

[1] Palacio *et al.*, *Nano Lett.* **15** (1), pp. 182–189 (2014)
[2] Sprinkle *et al.*, *Nature Nanotechnology* **5**, pp. 727–731 (2010)
[3] Baringhaus *et al.*, *Nature* **506**, pp. 349–354 (2014)

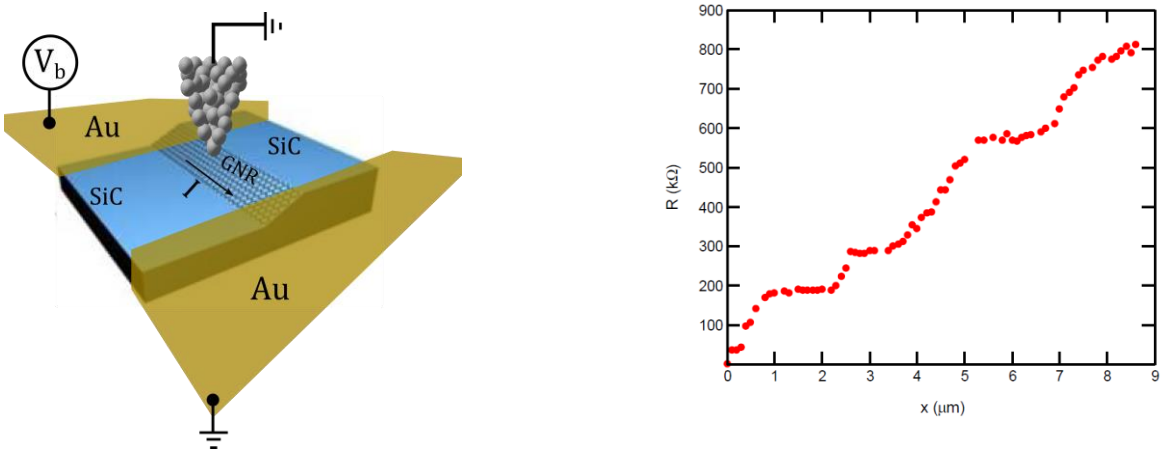

Fig. (*left*) Schematic representation of a sidewall GNR between two metallic contacts explored by a scanning probe tip. (*right*) Local resistance to nearest contact as a function of distance showing plateaus and varying slopes.