Resonant tunnelling through a finite-width potential barrier in graphene nanoribbons

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The tunnelling of relativistic particles through a finite-width potential barrier in graphene has recently been studied by Katsnelson *et al*. [1] soon after its discovery [2], showing the relation between this phenomenon and the Klein paradox. Following the same approach, we calculate the transmission probabilities of Dirac particles through a graphene nanoribbon (GNR) with a barrier-like potential in the geometry of Fig. 1. It is well known that electronic properties of GNRs depends strongly on its size geometry and edge details [3]. Using the Dirac equation with a continuity condition for wave functions at the interfaces between regions with and without a barrier, it was calculated the mode-dependent transmission probability for both semiconducting and metallic armchair-edge graphene nanoribbons (AGNRs) and we verified that the transmission is an oscillating function of the height and width of the barrier for both AGNRs, as showed by Klymenko [4]. In Fig. 2 we have a density plot of transmission probability for electrons in the normal incidence. In conclusion, we can have verified that, different from those for an infinite plane of graphene system, the transport properties of AGNRs depends sensitively on their widths and edge details and these effects may helpful possible nanodevices applications.

References

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[3] L. Brey and H. A. Fertig, Phys. Rev. B, **73** (2006) 235411.
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Figures

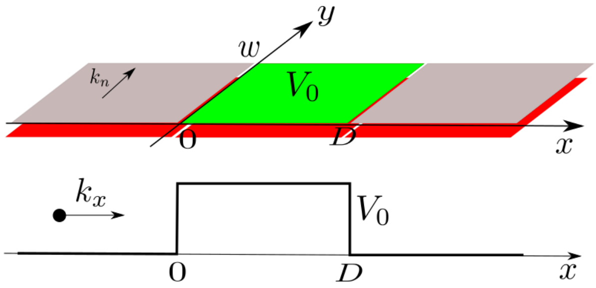

Figure 1: Upper part: An armchair graphene ribbon with a barrier-like profile V_0. Lower part: a finite-width potential barrier.

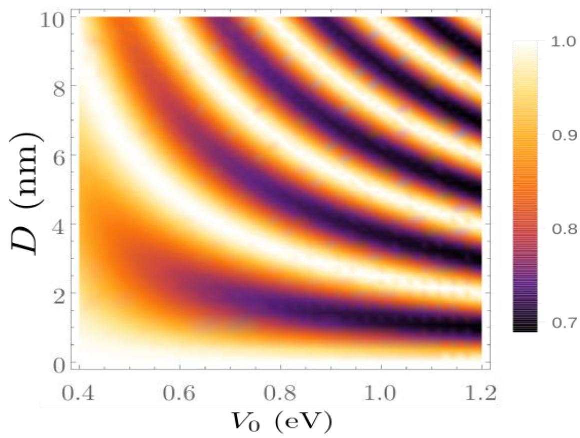

Figure 2: Density plot of transmission probability through the barrier. The parameters are *E*=0.15 eV (electron energy for normal incidence), w=22.386 nm.

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