AIP | Applied Physics Letters

Comment on "Chiral tunneling in trilayer graphene" [Appl. Phys. Lett. 100, 163102 (2012)]

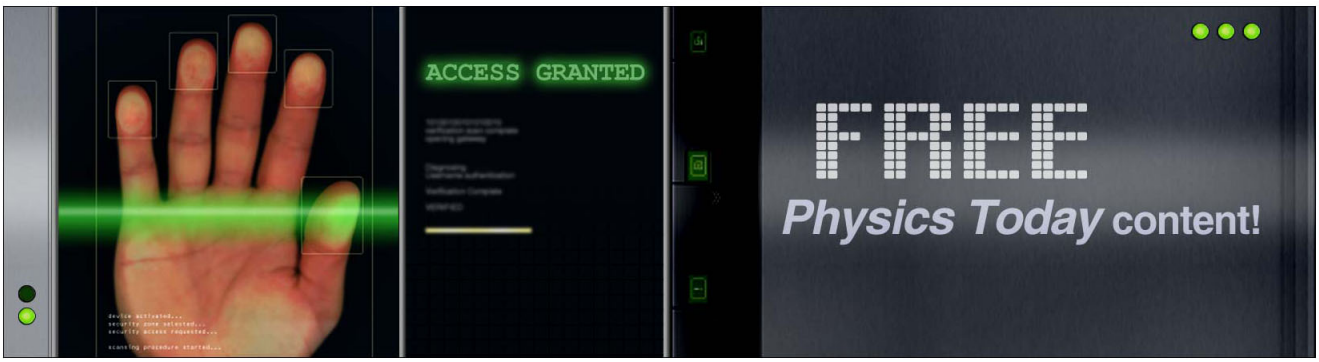
B. Van Duppen and F. M. Peeters

Citation: Appl. Phys. Lett. **101**, 226101 (2012); doi: 10.1063/1.4767221
View online: http://dx.doi.org/10.1063/1.4767221
View Table of Contents: http://apl.aip.org/resource/1/APPLAB/v101/i22
Published by the AIP Publishing LLC.

Additional information on Appl. Phys. Lett.

Journal Homepage: http://apl.aip.org/
Journal Information: http://apl.aip.org/about/about_the_journal
Top downloads: http://apl.aip.org/features/most_downloaded
Information for Authors: http://apl.aip.org/authors

ADVERTISEMENT



Downloaded 25 Jun 2013 to 146.175.11.111. This article is copyrighted as indicated in the abstract. Reuse of AIP content is subject to the terms at: http://apl.aip.org/about/rights_and_permissions

Comment on "Chiral tunneling in trilayer graphene" [Appl. Phys. Lett. 100, 163102 (2012)]

B. Van Duppen[a] and F. M. Peeters
Department of Physics, University of Antwerp, Groenenborgerlaan 171, B-2020 Antwerp, Belgium

(Received 25 July 2012; accepted 29 October 2012; published online 29 November 2012)

[http://dx.doi.org/10.1063/1.4767221]

In a recent letter, Kumar and Guo[1] presented results for the transmission probability across PN- and PNP-junctions in single layer, bilayer, and trilayer graphene. Starting from the tight-binding Hamiltonian of these systems, they derived plane wave solutions and obtained the transmission probability as function of incident angle similar to the treatment in Ref. 2. Here, we point out that the results shown in Fig. 4 of Ref. 1 are erroneous. Although the situation under consideration is symmetric with respect to normal incidence on the rectangular potential barrier, the results presented in Fig. 4 of Ref. 1 are asymmetric. Furthermore, the transmission probability is non zero in the limit of parallel incidence and exceeds unity in Fig. 4(d).

Following the approach outlined in Ref. 1, we have calculated numerically the transmission probability $T(\theta)$ and show the results in Fig. 1 using the same parameters as given in Ref. 1. As compared to Fig. 4 of Ref. 1, we found the following differences: (1) Fig. 1 exhibits the correct symmetry: $T(\theta) = T(-\theta)$; (2) $T(\theta) \leq 1$ for all systems; (3) $T(\theta = \pm 90^\circ) = 0$; and (4) Fig. 1(c) exhibits very narrow resonances with $T = 1$. These are absent in Fig. 4(c) of Ref. 1.

For the ABA trilayer, the behaviour of the electrons mimics that of single layer or bilayer electrons and therefore it is not possible to define a unique angle of incidence for both modes of propagation. The angular dependence of the transmission depends entirely on the mode of propagation (single layer like or bilayer like) and thus combining them to a single transmission probability results in an unphysical plot with a $T(\theta) > 1$ for some values of θ.

This work was supported by the Flemish Science Foundation (FWO-Vl).

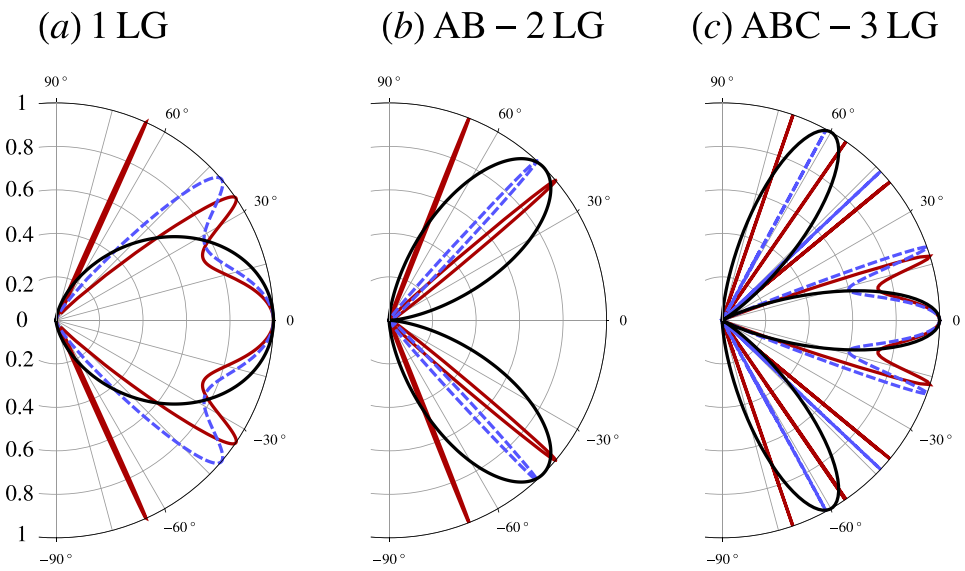


FIG. 1. Dependence of the transmission on the electron injection angle for (a) single layer, (b) bilayer, and (c) trilayer ABC stacked graphene. The thick black curves are the transmission across a PN-junction with $E_F/U_0 = 0.5$. The thin curves are transmission probabilities across a 100 nm wide rectangular PNP-barrier for electron energy (a) $E_F = 50$ meV and ((b) and (c)) $E_F = 25$ meV. The barrier heights are: (a) 100 and ((b) and (c)) 65 meV (solid red curves); and (a) 120 and ((b) and (c)) 80 meV (dotted blue curves). These parameters are the same as those given in Ref. 1.

[1]S. B. Kumar and J. Guo, Appl. Phys. Lett. **100**, 163102 (2012).
[2]M. I. Katsnelson, K. S. Novoselov, and A. K. Geim, Nat. Phys. **2**, 620 (2006).

[a]Electronic mail: ben.vanduppen@ua.ac.be.

 © 2012 American Institute of Physics

Downloaded 25 Jun 2013 to 146.175.11.111. This article is copyrighted as indicated in the abstract. Reuse of AIP content is subject to the terms at: http://apl.aip.org/about/rights_and_permissions