Two-dimensional strained Dirac materials under multi-step Fermi velocity barrier

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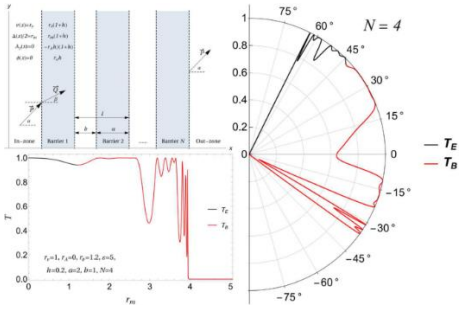
Abstract

In recent years, graphene and other two-dimensional Dirac materials like silicene, germanene, etc. have been studied from different points of view: from mathematical physics, condensed matter physics to high energy physics. In one of our previous study [1], supersymmetric quantum mechanics (SUSY-QM) has been used to examine the bound states of Dirac electron when applying electromagnetic fields on the strained two-dimensional Dirac materials. In this study [2], electronic transport in two-dimensional Dirac materials under the influences of multi-step deformation as well as multi-step Fermi velocity barrier is also investigated by utilizing both supersymmetric quantum mechanics (SUSY-QM) and transfer matrix method (TTM). The effects of multi-step effective mass and multi-step applied fields are also taken into account in our investigation. Results show the possibility of modulating the Klein tunneling of Dirac electron using strain or electric field.

Figure abstract



References

[1] Anh-Luan Phan, **Dai-Nam Le ***, Van-Hoang Le and Pinaki Roy * (2020), "Electronic spectrum in 2D Dirac materials under strain", *Physica E: Low-dimensional Systems and Nanostructures* **121**, 114084.

[2] Anh-Luan Phan and **Dai-Nam Le ***(2021), "Electronic transport in two-dimensional strained Dirac materials under multi-step Fermi velocity barrier: transfer matrix method for supersymmetric systems", *European Physical Journal B* **94**, 165. Arxiv e-print: https://arxiv.org/abs/2106.10902.