Direct imaging of topological edge states at a bilayer graphene domain wall

Lin He

Center for Advanced Quantum Studies, Department of Physics, Beijing Normal University, Beijing, 100875, People's Republic of China
helin@bnu.edu.cn

Abstract (Arial 10) Looking for systems where topological edge states persist in the absence of external magnetic fields boosts rapid developments in condensed matter physics in the past few years. The AB-BA domain wall in gapped graphene bilayers is a rare naked structure that is believed to host one-dimensional topological electronic states. Here we show, for the first time, direct imaging of its topological edge states by using scanning tunneling microscope (STM) [1-3]. The simultaneously obtained atomic-resolution images of the domain wall provide us unprecedented opportunities to measure the spatially-varying edge states within it. The one-dimensional conducting channels are observed to be mainly located around the two edges of the domain wall, which is reproduced quite well by our theoretical calculations. Our experiment further demonstrates that the one-dimensional topological states are quite robust even in the presence of high magnetic fields, raising hopes of graphene-based electronics with ultra-low dissipation.

References

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Figures