Twisting the strain lattice in periodically strained graphene

Leo-Malik Benneka[1]
T. Rhouma[2], C. Winkelmann[1], G. Trambly de Laissardiere[2], V. T. Renard[1]
[1]Université Grenoble Alpes, CEA-IRIG-PHELIQS-LaTEQS, 38000 Grenoble, France
[2]CRNS-Laboratoire de Physique Théorique et Modélisation, CY Cergy Paris Université, 95302 Cergy-Pontoise, France
leo-malik.benneka@cea.fr; vincent.renard@cea.fr

Extensive efforts have focused on engineering flat bands in twisted bilayer graphene, resulting in the emergence of a variety of correlated phases. [1]. An alternative route to realizing similar flat bands involves monolayer graphene strained by a periodic triangular superlattice induced by a corrugated substrate [2]. The height modulation h and the superlattice periodicity L serve as tuning parameters for controlling band flattening and the Fermi velocity v_F near the Dirac cones [3, 4] Fig1-(a). In this work, we used tight-binding calculations to account for relative rotations between the graphene lattice and the superlattice, as it would occur in an experimental device [5]. These calculations reveal that the renormalization of the Fermi velocity v_F strongly depends on the relative lattice orientation Fig1-(b). This dependence indicates a large spread of the velocity renormalization as the superlattice rotates which will play an essential role in the design of experimental devices aimed at engineering flat bands.

References

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Figures

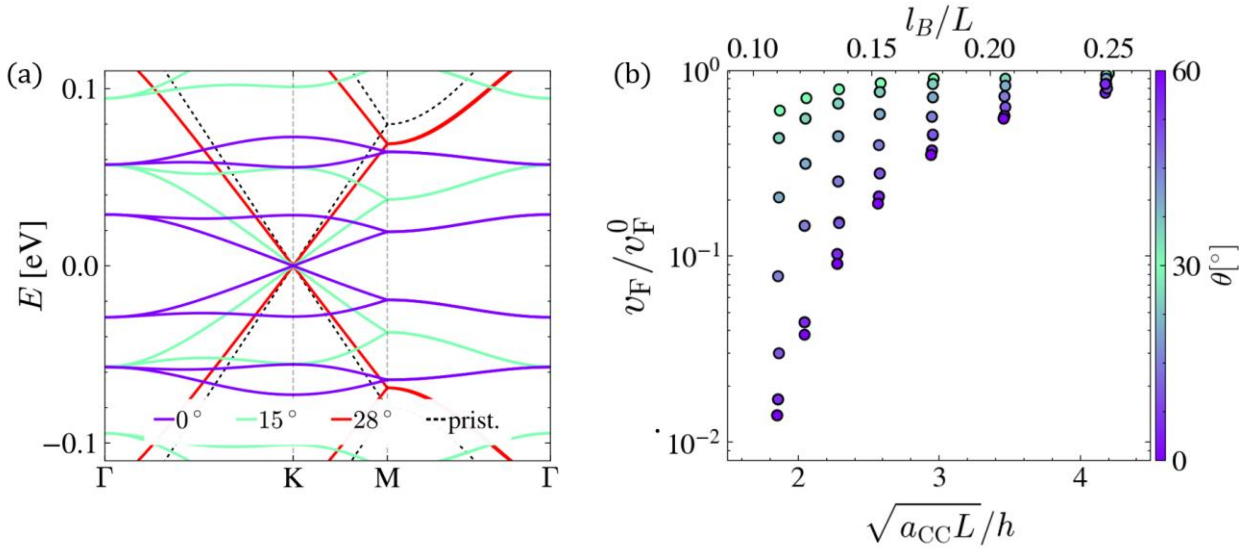

Figure 1: (a) Band structure of periodically strained graphene for h = 0,51 nm and L = 15 nm and (b) the velocity renormalization over the strain induced magnetic length ratio l_B/L ($\propto \sqrt{a_{cc}}L/h$) and its superlattice rotation dependence.