

Effective theory for electronic structures of twist bilayer graphene with highly incommensurate ordering

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When two-dimensional atomic layers are stacked incommensurately, the interference between the two lattice arrangement leads to new order to the system [1].

When the in-plane rotation angle between the layers is small, the physical properties of the atomic layers are well described by the moiré interference period (aka moiré superlattice) [2-9].

However, very little is known about atomic layers stacked at much higher incommensurate angles. In this talk, we will introduce an innovative theoretical model that enables us to investigate the physics of incommensurate atomic layers which cannot be fully described by moiré periodicity [10]. And we will show the exotic properties emerging in this system.

References

- [1] C. Berger et al., Science 312 (2006), 1191
- [2] J. M. B. Lopes dos Santos, Phys. Rev. Lett. 99 (2007), 256802
- [3] P. Moon and M. Koshino, Phys. Rev. B 85 (2012), 195458
- [4] P. Moon and M. Koshino, Phys. Rev. B 87 (2013), 205404
- [5] M. Koshino, P. Moon, and Y.-W. Son, Phys. Rev. B 91 (2015), 035405
- [6] C. R. Dean et al., Nature 497 (2013), 598
- [7] B. Hunt et al., Science 340 (2013), 1427
- [8] Y. Kim et al., Nano Lett. 16 (2016), 5053

- [9] G. Chen et al., Nano Lett. 17 (2017), 3576
- [10] S. J. Ahn et al., submitted (2018)

Figures

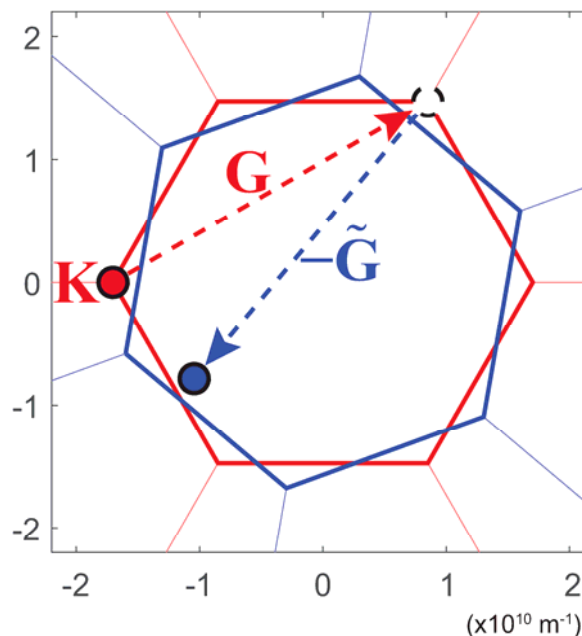


Figure 1: Example of the single Umklapp scattering process between two graphene layers stacked at arbitrary configuration. The hexagon with a thick red (blue) line shows the first Brillouin zone of the upper (lower) graphene layer.