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AA bilayer coupler

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Two non-interacting graphene sheets are deformed in a localized region where they form AA bilayer graphene. This theoretical model is called AA bilayer coupler. We show that the Hamiltonian of this system can be elegantly block-diagonalized. On the coupler, the scattering properties of Dirac fermions in two dimensions are analyzed through a partial wave decomposition. The differential and partial cross sections reveal us some interesting phenomena such as pouring particles from one layer to the other, filtering Dirac fermions with a given value of angular momentum or the formation of quasi-bound states. The coupler is further enhanced by electric and magnetic fields which provide an ability to manipulate the direction of scattered particles.

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