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Spectral gaps of Dirac operators describing graphene quantum dots

Abstract:

Low energy electronic excitations in graphene, a two-dimensional lattice of carbon atoms, are described effectively by a two–dimensional Dirac operator. For a bounded flake of graphene (a quantum dot), the choice of boundary conditions determines various properties of the spectrum. These properties, in turn, influence the transport of electrons through the dot, so it is interesting to study them. For a simply connected flake and a family of local boundary conditions, we obtain an explicit lower bound on the spectral gap around zero. This is joint work with Rafael Benguria, Søren Fournais and Edgardo Stockmeyer.