Universidad de Valladolid

Q-CAYLE COMUNICACIONES CUÁNTICAS

# Dirac-Weyl Electron Under Periodic Magnetic Fields: Darboux Transformation as a Generator of Deformed Magnetic Fields


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**Abstract:** Graphene is a two-dimensional material consisting of a hexagonal arrangement of carbon atoms. This material was isolated at room temperature in 2004, although its existence has been known since 1947. The theoretical structure of graphene is studied through the tight-binding model. However, a low-energy approximation leads to the Dirac-Weyl equation, which describes the behavior of charge carriers in a graphene layer. When an external magnetic field is applied to a graphene layer, the energy spectrum of the system is discretized, while in the presence of a periodic magnetic field, energy bands are observed. Here, we will use the Darboux transformation to introduce defects in the periodic magnetic field, resulting in an additional bound state in the system spectrum. We will show that this new system exhibits interesting properties distinct from the original system, which lacks bound states.


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