On the Geometric Phases in One Dimensional Systems

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Plasmons can be supported on graphene sheets as the Dirac electrons oscillate collectively. A tight-binding model for graphene plasmons is a good description as the field confinement in the normal direction is strong. With this model, topological properties of plasmonic bands in multilayer graphene systems are investigated. The Zak phases for periodical graphene arrays are discussed in different configurations. Analogous to Su-Schrieffer-Heeger (SSH) model in electronic systems, topological edge plasmon modes emerge when two periodic graphene sheet arrays with different Zak phases are connected. Interestingly, the dispersion of these topological edge modes is the same as that in the monolayer graphene and is invariant as geometric parameters of the structures such as the separation and period changes. These plasmonic edge states can be further demonstrated in microwave regime by employing spoof surface plasmons.