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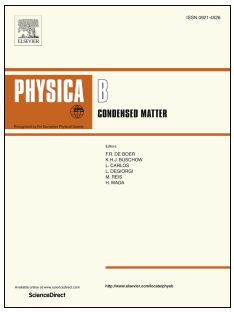

Dynamical spin dependent susceptibility of graphene like structure

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Dynamical spin dependent susceptibility of graphene like structure

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Abstract

Spin dependent susceptibility of gapped graphene is calculated using Hubbard model. We found that by increasing the electron density, energy gap and repulsive coulomb interaction the imaginary part of the susceptibility peaks will be shifted towards higher frequencies and by increasing the magnetization the imaginary part of the susceptibility peaks will be shifted towards lower frequencies. It means that plasmonic frequency depends on electrons band filling, electronic coulomb repulsion, magnetization and graphene initial energy gap.

1. Introduction

Graphene is a single-layer graphite sheet which is a two-dimensional system with many outstanding mechanical and electronic properties [1]. Therefore there has been a great deal of interest in the electronic properties of graphene both experimentally [2, 3] and theoretically [4-10].

To understand the electronic properties of graphene, it often suffices to investigate the charge susceptibility. Static susceptibility determines transport properties through screened Coulomb carrier scattering by charged impurities. For example, the static susceptibility at k_F gives the Thomas-Fermi screening length. Dynamical susceptibility determines the elementary excitation spectra and the collective modes of the electron system. Dynamical susceptibility at zero-wave number can explain the phonon softening at the Gama-point. It is also used for understanding the structural inhomogeneity in graphene, so-called ripples [11] and the van der Waals interaction between graphene layers [12].

For neutral graphene, the susceptibility at zero temperature was first calculated in ref [13]. The effect of temperature on the susceptibility was investigated in ref [14] and vertex corrections were discussed in ref [15]. All these results were obtained with the Dirac cone approximation in which the energy dispersion of the honeycomb lattice is linearized around one of the two Dirac points, where the valence and conduction band touch.We now that this approximation is good for low energy regime and it's not suitable for high energy regime. In ref [19] Dynamical