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Influence of Magnetic Field at 30^0 on Density of States

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We investigate external magnetic field at 30^0 on Dirac materials. The peak structure of density of states (DOS) at 30^0 angle give clear view of photon energy tuning. This gives indications that whenever electron posses reasonable energy for its transition it jumps to other energy level.

I. INTRODUCTION

Low axial Dirac models as graphene and topological insulators have arrested the attention of researchers owning to their unique features and greater applications. Graphene is a relativisitic Dirac material that has six cornered honeycomb lattice (HCL) which is a result of the unique Berry phase of π found in graphene. [1]. Firstly, it has been prepared in 2004 by Novoselov and Geim and won a Nobel Prize for their contributions on Graphene. In the external magnetic field graphene exhibit half-integer anomalous Hall effect [2–5]. Graphene is a transparent material, absorbing approximately 2 percent of light, yet is non-penetrate able to gasses, even hydrogen and helium [6, 7]. An example of a relativistic condensed matter models are the electrons in graphene behave like quasiparticles.

II. DOS AT 30^0

DOS has clear advantages in kinetic theory of solids. The DOS can be defined by

$$D(\omega) = \frac{1}{\Omega} \sum_{n,\alpha,s} \delta(\hbar\omega - E_n) \qquad (1)$$

with, $\Omega = L_x \times L_y$ is the area of the model. For plotting peaks we suppose Gaussian broadening terns Eq. 1 into;

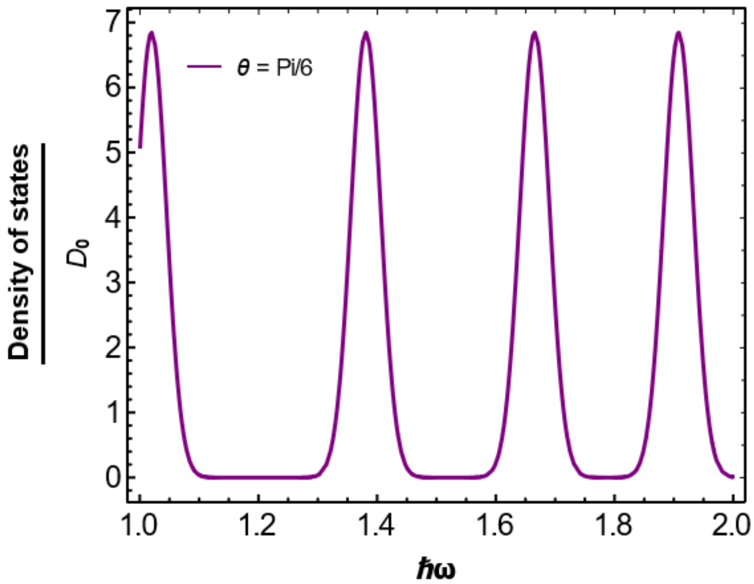

FIG. 1: The DOS in magnetic field at angle 30^0 corresponding to photonic energy $\hbar\omega$

$$D(\omega) = \frac{D_0}{\Gamma\sqrt{2\pi}} \sum_{n,\alpha,s} \exp[\frac{\hbar\omega - E_n}{2\Gamma^2}] \qquad (2)$$

Γ is the broadening of LL and $D_0 = 1/2\pi l_b$. Broadening in two dimensional materials induced by impurity has direct relation to $\sqrt{B}$ [3, 8] In Fig.1 we plot DOS in units of D_0 with respect to $\hbar\omega$ in the presence of external magnetic field at angle 30^0. We find DOS peaks at varying intervals but equal in amplitude. It means whenever electrons possess energy equal to discrete energy level a peak appears. In this way we get the knowledge of DOS of graphene.

III. CONCLUSION

Graphene, a relativisitic Dirac material appears as six cornered honeycomb lattice (HCL). In this paper DOS has been plotted against photonic energy $\hbar\omega$ at angle 30^0. The peaks shows transitions at different intervals but their amplitude remained same.

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