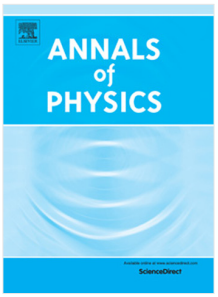
Accepted Manuscript



Pseudo Landau levels and quantum oscillations in strained Weyl semimetals

Z.Z. Alisultanov

PII: S0003-4916(18)30062-9
DOI: https://doi.org/10.1016/j.aop.2018.03.006
Reference: YAPHY 67613

To appear in: *Annals of Physics*

Received date : 30 October 2017
Accepted date : 5 March 2018

Please cite this article as: Z.Z. Alisultanov, Pseudo Landau levels and quantum oscillations in strained Weyl semimetals, *Annals of Physics* (2018), https://doi.org/10.1016/j.aop.2018.03.006

Pseudo Landau Levels and Quantum Oscillations in Strained Weyl Semimetals

Z.Z. Alisultanov
*) *Amirkhanov institute of physics, Dagestan Scientific Centre, Russian Academy of Sciences, Makhachkala, M-Yaragskogo street 94, 367003, Russia and*
†) *Dagestan State University, Makhachkala, M-Gadjiev street 43-a, 367001, Russia*

The crystal lattice deformation in Weyl materials where the two chiralities are separated in momentum space leads to the appearance of gauge pseudo-fields. We investigated the pseudo-magnetic field induced quantum oscillations in strained Weyl semimetal (WSM). In contrast to all previous works on this problem, we use here a more general tilted Hamiltonian. Such Hamiltonian, seems to be is more suitable for a strained WSMs. We have shown that a pseudo-magnetic field induced magnetization of strained WSM is nonzero due to the fact that electric field (gradient of the deformation potential) is induced simultaneously with the pseudo-magnetic field. This related with fact that the pseudo Landau levels (LLs) in strained WSM are differ in vicinities of different WPs due to the presence of tilt in spectrum. Such violation of the equivalence between Weyl points (WPs) leads to modulation of quantum oscillations. We also showed that magnetization magnitude can be changed by application of an external electric field. In particular, it can be reduced to zero. The possibility of controlling of the magnetization by an electric field is interesting both from a fundamental point of view (a new type of magneto-electric effect) and application point of view (additional possibility to control diamagnetism of deformed WSMs). Finally, a coexitance of type-I and type-II Weyl fermions is possible in the system under investigation. Such phase is absolutely new for physics of topological systems.