Abstract Submitted
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Interaction phenomena at topological transitions in strongly anisotropic Dirac materials[1] VALERI KOTOV, University of Vermont — It is known that a topological (Lifshitz) transition can take place in graphene, strained uniaxially in the zig-zag direction. At such a transition the spectrum becomes semi-Dirac like, with linear, ultrarelativistic dispersion in one direction, and quadratic momentum dependence in the other. This type of transition also occurs in other materials [1] as well as in artificial graphene lattices [2]. We have found that long-range Coulomb interactions can lead to profound effects at such topological transitions. In particular, an unusually strong log squared renormalization behavior was found in the effective fermion mass, ultimately leading to very strong changes in the shape of the critical fermion spectrum. We also study the stability of such exotic spectrum towards spontaneous gap formation (excitonic transition). Ultimately we find that the interaction effects are much stronger at topological transitions in strongly anisotropic Dirac materials, compared to "conventional" isotropic graphene.

[1] G. Montambaux et al, A universal Hamiltonian for the motion and the merging of Dirac cones in a two-dimensional crystal, Eur. Phys. J. B 72, 509 (2009).
[2] M. Bellec et al, Topological transition of Dirac points in a microwave experiment, Phys. Rev. Lett. 110, 033902 (2013).

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