Interaction Induced Quantum Valley Hall Effect in Graphene[1]

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We use Pseudo Quantum Electrodynamics (PQED) in order to describe the full electromagnetic interaction of the electrons in graphene in a consistent 2D formulation. We first consider the effect of this interaction in the vacuum polarization tensor or, equivalently, in the current correlator to evaluate the Kubo's formula. Thereby, we obtain the usual expression for the minimal conductivity plus corrections due to the interaction. We then predict the onset of an interaction-driven spontaneous Quantum Valley Hall effect by solving the Schwinger-Dyson equation. The obtained Valley-Hall conductivity is exact and universal [1]. [1] E. C. Marino, Leandro O. Nascimento, V. S. Alves, and C. Morais Smith, Phys. Rev. X **5**, 011040 (2015).

[2]first abstract submitted too large

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Date submitted: 17 Dec 2015   Electronic form version 1.4