Abstract Submitted
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Is graphene on the edge of being a topological insulator? JOSE GONZALEZ, Instituto de Estructura de la Materia (CSIC), Madrid, Spain — We show that, at sufficiently large strength of the long-range Coulomb interaction, a mass term breaking parity (so-called Haldane mass) is dynamically generated in the many-body theory of Dirac fermions describing the graphene layer. While the tendency towards a conventional excitonic instability is stronger than for the dynamical breakdown of parity at spatial dimension D greater than 2, we find that the situation is reversed at D = 2. The need to regularize the many-body theory in a gauge-invariant manner (taking the limit D = 2 from below) is what leads to the dominance of the parity-breaking pattern in graphene. We compute the critical coupling for the generation of a parity-breaking mass from the finite radius of convergence of the ladder series supplemented with electron self-energy corrections, finding a value quite close to the effective interaction strength for graphene in vacuum after including Fermi velocity renormalization and static RPA screening of the Coulomb interaction.

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