Abstract Submitted
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Effective Time Reversal Symmetry Breaking and Energy Spectra of Graphene Armchair Rings[1] H.A. FERTIG, TIANHUAN LUO, A.P. IYENGAR, Indiana University, LUIS BREY, Instituto de Ciencia de Materiales de Madrid (CSIC) — Under certain circumstances, the low-energy electronic states of graphene are well-described by a Dirac equation with a valley-dependent gauge field. This can lead to phenomena reflecting "effective broken time reversal symmetry" (EBTRS). We study the energy spectra and wavefunctions of graphene rings formed from metallic armchair ribbons, near zero energy, to search for such properties. Appropriately chosen corner junctions [1] are shown to impose phase shifts in the wavefunctions that at low energies have the same effect as flux tubes passing near the ribbon surface. Closing the ribbon into a ring captures this flux and yields properties that may be understood as signatures of EBTRS [2]. These include a gap in the spectrum around zero energy, which can be removed by the application of real magnetic flux through the ring. The stability of the spectra to various perturbations is examined.
[1] A. Iyengar, T. Luo, H.A. Fertig, L. Brey, Phys. Rev. B **78**, 235411 (2008).
[2] T. Luo, A.P. Iyengar, H.A. Fertig, and L. Brey, Phys. Rev. B **80**, 165310 (2009).

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