Abstract Submitted
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Collective Bulk and Edge Modes through the Quantum Phase Transition in Graphene at $\nu = 0$[1] GANPATHY MURTHY, University of Kentucky, EFRAT SHIMSHONI, Bar-Ilan University, Israel, HERBERT FERTIG, Indiana University, Bloomington — Undoped graphene in a strong, tilted magnetic field exhibits a radical change in conduction upon changing the tilt-angle, which can be attributed to a quantum phase transition[1] from a canted antiferromagnetic (CAF) to a ferromagnetic (FM) bulk state at filling factor $\nu = 0$. This behavior signifies a change in the nature of the collective ground state and excitations across the transition. Using the time-dependent Hartree-Fock approximation, we study the collective neutral (particle-hole) excitations in the two phases, both in the bulk and on the edge of the system[2]. The CAF has gapless neutral modes in the bulk, whereas the FM state supports only gapped modes in its bulk. At the edge, however, only the FM state supports gapless charge-carrying states. Linear response functions are computed to elucidate their sensitivity to the various modes. The response functions demonstrate that the two phases can be distinguished by the evolution of a local charge pulse at the edge[3]. 1. M. Kharitonov, Phys. Rev. B **85**, 155439 (2012). 2. G. Murthy, E. Shimshoni, and H. A. Fertig, Phys. Rev. B **90**, 241410(R) (2014). 3. G. Murthy, E. Shimshoni, and H. A. Fertig, arxiv:1510.04255 (2015).

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Ganpathy Murthy
University of Kentucky

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