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Electron-electron and spin-orbit interactions in graphene¹ MEHDI ZAREA, NANCY SANDLER, Ohio university — Electron-electron and spin-orbit interactions in graphene nanoribbons. Narrow graphene ribbons with armchair edges exhibit insulating or metallic behavior depending on the ratio of the ribbon width to the lattice constant. Metallic behavior arises from the presence of non-degenerate localized boundary states with a linear dispersion relation. [1,2] Furthermore, in the presence of spin-orbit interactions, the edge states become spin-filtered states. [3,4] In this work, we studied a Dirac model for armchair ribbons with an effective low-energy Hamiltonian for the edge states that contains intrinsic spin-orbit and Coulomb interactions. By using the bosonization technique we obtain the phase diagram and correlation functions of the model and present a detailed comparison with results derived for armchair nanotubes. We also address the stability of the edge states in the presence of electron-electron interactions. Extensions for zigzag ribbons are discussed. [1] M.Fujita et al J.Phys.Soc.Jpn 65, 1920 (1996) [2] L. Brey and H. A. Fertig, Phys. Rev. B 73, 235411 (2006) [3] C. L. Kane and E. J. Mele, Phys. Rev. Lett. 95, 226801 (2005) [4] K. Sengupta, R. Roy, and M. Maiti, Phys. Rev. B 74, 094505(2006)

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