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Zigzag graphene ribbons with intrinsic spin-orbit and electron-electron interactions.[1] MAHDI ZAREA, CARLOS BÜSSER, NANCY SANDLER, Dept. of Physics and Astronomy, Ohio University, Athens OH 45701 USA — The effects of intrinsic spin-orbit (I-SO) and Coulomb interactions on low-energy properties of finite width graphene zigzag ribbons are studied by means of tight-binding Hamiltonian. We derive analytic expressions for eigenstates and energies in the presence of the I-SO interaction in the hard-wall boundary limit. A detailed study of the spatial dependence of spin-filtered edge states [1] shows different edge localizations as the Dirac point is reached. Tight-binding numerical calculations reproduce exactly the analytic expression obtained for the band-structure. Coulomb interactions are included and treated within the bosonization approximation. We find that small momentum transfer scattering terms open a charge-gap in neutral ribbons, while keeping the spin sector gapless. Our numerical results suggest an exponentially vanishing gap in terms of the ribbon width for large values of the I-SO coupling constant, in clear contrast with results found for armchair ribbons [2]. [1] C.L. Kane and E.J. Mele, Phys. Rev. Lett. **95**, 226801 (2005). [2] M. Zarea and N. Sandler, Phys. Rev. Lett. Dec (2007)

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