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Quantum Hall Edge States in Bilayer Graphene Ribbons[1] HERBERT FERTIG, Indiana University, VICTORIA MAZO, EFRAT SHIMSHONI, Bar-Ilan University — We study the low energy edge states of bilayer graphene ribbons subject to a strong perpendicular magnetic field B, and show that they can be described within a continuum model (the Dirac equation). We are mainly interested in investigating the energy- band structure of ribbons with a zigzag termination. At the zero Landau Level there are eight degenerate bands, whose degeneracy can be broken and controlled by an external inter- layer voltage bias V. This leads to the opening of a gap in the bulk. On the edges, due to a mixture of hole- and particle- like bands (from the same valley), an avoided crossing occurs which can be understood within a perturbative expansion in the inter-layer hopping. On the other hand, edge states from different valleys are protected from mixing by a long-range disorder potential. Hence, hole- and particle-like states can cross without mixing, and the system has properties of a topological insulator. In the presence of interactions, the rich behavior of crossing single-electron edge states may lead to a variety of collective edge-modes, whose properties dominate the transport behavior of this system.

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