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Confining potential and Landau level edge states in graphene[1]
GUOHONG LI, ADINA LUICAN-MAYER, EVA Y. ANDREI, Department of Physics and Astronomy, Rutgers University — Two-dimensional electron systems in the Quantum-Hall (QH) regime host gapless one-dimensional chiral edge states which are responsible for the quantization of the Hall conductivity. In the regime of the fractional QH effect the edge states form a chiral Luttinger liquid which presents unusual quantum properties such as fractionally charged excitations and interference patterns that could serve as building blocks for QH qubits. Observing and exploiting these properties requires precise control of the edges, but in semiconductor-based 2DES were edge states were studied thus far, achieving the necessary control was difficult. This is because the smooth confinement potential in these systems imposes a length scale which is much larger than the magnetic length leading to incompressible strips and to non-universal behavior. We will show that this limitation is not present in graphene. Using scanning-tunneling-microscopy and spectroscopy to follow the spatial evolution of Landau levels toward an edge, we demonstrated that in graphene it is possible to control the edge states by varying the distance to the screening plane and by controlling the confinement geometry.

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