Abstract Submitted
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Quantum Hall effect of massless Dirac fermions in a vanishing magnetic field KENTARO NOMURA, Tohoku University, SHINSEI RYU, The University of California, Berkeley, MIKITO KOSHINO, Tokyo Institute of Technology, CHRISTOPHER MUDRY, Paul Scherrer Institute , AKIRA FURUSAKI, RIKEN — Graphene displays an unconventional quantization of the Hall conductivity when subjected to a magnetic field. The Hall conductivity is measured to be a half-integer in units of 4 times the conductance quantum. We have undertaken a numerical study of the quantum Hall effect of massless Dirac fermions in two-dimensions, and found the following remarkable effect. A negative and a positive quantized Hall plateaus survive even in the limit of vanishing magnetic fields provided inter-valley scattering is negligible. This conclusion is based on our finding that all but one critical states between the different quantized Hall plateaus float away from the charge neutral point as the Landau level mixing becomes stronger. The exception is the state at the neutral point that remains critical whatever the disorder strength is, or equivalently no matter how weak the magnetic field is. K. Nomura, S. Ryu, M. Koshino, C. Mudry, A. Furusaki, Phys. Rev. Lett. 100, 246806 (2008).

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