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Field-Induced Kosterlitz-Thouless Transition in the N=0 Landau Level of Graphene KENTARO NOMURA, Tohoku University, SHINSEI RYU, DUNG-HAI LEE, UC Berkeley — 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. In the presence of a strong magnetic field, graphene's 4 fold degeneracy is lifted by the exchange Coulomb interaction. Recent experiments indicate that high quality graphene samples exhibit a very unusual high-resistance metallic state and a transition to a complete insulating phase at the charge neutral point. We propose that the current carriers in this state are charged vortices of the XY valley-pseudospin order parameter, a situation which is dual to a conventional thin superconducting film. We study energetic and the stability of this phase in the presence of disorder. A phase diagram as a function of magnetic fields and the sample mobility is determined. K. Nomura, S. Ryu, D.-H. Lee, arXiv:0906.0159 (to appear in Phys. Rev. Lett).

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