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High Field Magnetoresistance of Graphene at the Dirac Point[1]
JOSEPH CHECKELSKY, LU LI, N. P. ONG, Princeton University — The longitudinal and Hall resistance of graphene near the charge neutral point have been studied down to low temperature (20 mK) in high magnetic field (20 T). At issue is the nature of the ground state in the vicinity of the Dirac point in high magnetic fields. In samples in which the offset voltage is small, we observe a highly unusual approach to an insulating state as the field increases. In samples with $\mu > 0.5$ T^{-1} and $V_0 < 3$ V, the resistance at the Dirac point R0 increases divergently to MΩ in fields of 14-20 T at temperatures T < 2 K. This divergent behavior is suppressed in samples with large V_0. Surprisingly, this rise shows little temperature dependence below 2 K. The acute dependence on magnetic field and accompanying lack of activated behavior with temperature provides evidence for an unusual cross-over or transition to the insulating state. Implications for theoretical models including gapless edge modes and Quantum Hall Ferromagnetism will be discussed in the context of these results.

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Joseph Checkelsky
Princeton University

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