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Low Field Electronic Transport Properties and Scattering Mechanisms of Graphene Y.-W. TAN, Columbia Univ., Y. ZHANG, UC Berkeley, M. HAN, Columbia Univ., J. A. JASZCZAK, Michigan Technological Univ., P. KIM, Columbia Univ., H. L. STORMER, Columbia Univ. and Bell Labs, Lucent Technology — We report low magnetic field transport properties of fourteen graphene devices with a wide spread of mobilities. The minimum conductivity at the Dirac point lies in the range $2 - 12e^2/h$ with an average of $\sim 8e^2/h$. When comparing the conductivity versus density (n) curves with theoretical models, we find that high mobility samples show the features characteristic of short range scattering and low mobility samples show the features characteristic of long range scatterering. Samples exhibiting different scattering mechanisms also show different weak localization behaviors. Samples having short range disorders show total suppression of weak localization (WL), whereas samples with long range scatterering show the conventional WL peak with a reduction in amplitude. Devices in between these two limits have a sharp, narrow WL peak. Under moderate disorder scattering, we find inelastic electron-electron scattering to be the major cause of phase decoherence, and the phase coherence length has a $n^{1/4}$ dependence.

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