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Intraband Landau level transitions in monolayer graphene ZHI-GANG JIANG, Columbia University/NHMFL, E.A. HENRIKSEN, Columbia University, L.C. TUNG, NHMFL, M.E. SCHWARTZ, M. TAKITA, Columbia University, Y.-J. WANG, NHMFL, P. KIM, Columbia University, H.L. STORMER, Columbia University/Bell Labs — We study the cyclotron resonance of electrons and holes in monolayer graphene, via infrared transmission measurements in a magnetic field, B, up to 18 T. We find that, instead of having a single resonance energy as in a traditional two-dimensional system, a wide range of transitions between different sets of Landau levels (LLs) can be uniquely distinguished in monolayer graphene. We have observed intraband transitions between neighboring LLs up to $n = 7$, where n is the LL index. As expected from the unusual linear dispersion of the low-energy electronic band of monolayer graphene, we show that the corresponding energies of all observed LL transitions are proportional to $\sqrt{B}$. In addition, beyond such a simple linear dispersion, we find that the measured band velocity near the charge-neutral Dirac point ($E = 0$) is ~12% larger than that at higher energies. The LL transitions in the electron and hole bands of monolayer graphene show a considerable asymmetric behavior.

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