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Cyclotron resonance in bilayer graphene ERIK HENRIKSEN, Columbia University, ZHIGANG JIANG, LI-CHUN TUNG, NHMFL, MOLLIE SCHWARTZ, Columbia University, MAIKA TAKITA, Barnard College, YONG-JIE WANG, NHMFL, PHILIP KIM, HORST STORMER, Columbia University —

The hyperbolic dispersion of bilayer graphene leads to a Landau level (LL) spectrum that is linear in the magnetic field, B, at low energies but shifts to a $\sqrt{\mathrm{B}}$ dependence with increasing energy. Here we present the first infrared transmission measurements of the unique B-field dependence of LL transitions in bilayer graphene, in a gated $400\mu\mathrm{m}^2$ sample in fields up to B = 18 T. Eight intraband transitions are observed among LL indices $|n| \leq 4$, including the unusual zero-energy $n = 0$ level, and are found to follow a selection rule of $\Delta n = +1$. We find the change in field dependence is plainly visible between the behavior of the transition energies for $n = -1 \rightarrow 0$ and $n = 0 \rightarrow +1$, which are close to linear in B, as compared with all other transitions which display a clear $\sqrt{\mathrm{B}}$ behavior. However, the shift in field dependence occurs at energies well below where it is expected based on nearest-neighbor tight-binding calculations, and a single set of fitting parameters within this theory fails to describe our results.

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