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Electron-electron interaction induced effective mass suppression in bilayer graphene JING LI, KE ZOU, ADAM STABILE, DONALD SEIWELL, JUN ZHU, Department of Physics, The Pennsylvania State University — The effective mass of carriers m* captures fundamental properties of a material. In a two-dimensional electron system, the electron-electron (e-e) interaction manifests in the renormalization of m*. Extending previous studies[1] to lower carrier densities, where the interaction effect is expected to be stronger, we present precision measurements of the electron and hole effective mass m_e* and m_h* in high-quality (μ ~30,000cm^2/Vs) hexagonal boron nitride supported bilayer graphene using temperature-dependent Shubnikov-de Hass oscillations. Our measurements probe carrier densities down to 2×10^{11}/cm^2. Comparison to tight-binding bands and previous data shows excellent agreement at carrier densities above 5×10^{11}/cm^2, where m_e* and m_h* can be well described by a renormalized Fermi velocity of v_F= 1.11×10^6m/s. At lower carrier densities, m_h*continuously decreases from the tight-binding band value, reaching m_h*=0.0234m_e at n= 2×10^{11}/cm^2. This corresponds to a suppression of 30% and an increased v_F=1.37×10^6m/s. The deviation is much smaller for electrons. We compare our results with theory and discuss its implications. [1] K. Zou, X. Hong, and J. Zhu, Phys. Rev. B 84, 085408 (2011).

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