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Landau Level Lifetimes and Residual Disorder in Single Layer Graphene on Boron-Nitride Substrates JUNGSEOK CHAE, SUYONG JUNG, NIKOLAI B. ZHITENEV, JOSEPH A. STROSCIO, National Institute of Science and Technology, ANDREA YOUNG, CORI DEAN, LEI WANG, JAMES C. HONE, KEN L. SHEPARD, PHILIP KIM, Columbia University, NIST COLLABORATION, COLUMBIA UNIVERSITY COLLABORATION — Realization of the intrinsic electronic properties of graphene devices has been limited by charge scattering and surface roughness found when graphene is placed on SiO2 substrates. Recently, graphene devices fabricated on hexagonal boron-nitride (h-BN) dielectrics have shown superior device performance compared with graphene placed directly on SiO2 substrates. We have performed scanning tunneling microscopy / spectroscopy (STM / STS) measurements to investigate the local electronic structure of graphene devices on h-BN substrates as a function of charge density and magnetic field. The disorder potential is significantly reduced compared with graphene in direct contact with SiO2. Correspondingly, the widths of Landau levels (LLs) are much narrower becoming comparable to those measured in epitaxial graphene on SiC. The energy and the spatial dispersion of LLs is used to analyze the Fermi velocity of the Dirac particles at different charge densities, an electron-hole asymmetry, and discrete splittings of LLs due to residual spatially varying disorder potential.

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