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Scanning Tunneling Microscopy and Landau Level Spectroscopy of twisted graphene double layers on SiO_2 and hBN substrates CHIH-PIN LU, Rutgers Univ, EVA ANDREI, GUOHONG LI, ADINA LUICAN, Department of Physics and Astronomy, Rutgers University, T. TANIGUCHI, K. WATANABE, Advanced Materials Laboratory, National Institute for Materials Science, Japan, EVA ANDREI'S LAB, RUTGERS TEAM, ADVANCED MATERIALS LAB, JAPAN COLLABORATION — Electrons in Graphene, being confined within a one-atom thick crystal, are very sensitive to environmental disturbances. This makes it possible to engineer vertical heterostructures with designer electronic properties by stacking graphene together with other thin layers. In particular superposing two graphene layers twisted away from Bernal stacking mitigates the effect of substrate-induced random potential fluctuations and provides access to the intrinsic electronic properties near the Dirac point. We studied samples consisting of two stacked Graphene layers deposited on SiO_2 or BN and configured in a device geometry which allows varying the carrier density by gating across a 300nm layer of SiO_2. Using low temperature high-field Scanning Tunneling Microscopy and Landau level spectroscopy, we demonstrated that the random potential is significantly weakened compared to the case of single layer graphene deposited on the same substrate. As a result we were able to observe high quality Landau level spectra, comparable to those seen in graphene on graphite, starting at fields as low as 1T. We will report on the effect of isolated impurities on the Landau level spectra and on the evolution of Landau levels into edge states. Supported by DOE-FG02-99ER45742 and NSF DMR 1207108.

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