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Electron Tunneling Spectroscopy of Single and Bilayer Graphene with Hexagonal Boron Nitride Tunneling Barrier SUYONG JUNG, JAE-SUNG PARK, CHANYONG HWANG, DONGHAN HA, Korea Research Institute of Standards and Science, KENJI WATANABE, TAKASHI TANIGUCHI, National Institute for Materials Science, PILKYUNG MOON, New York University Shanghai, YOUNG-WOO SON, Korea Institute for Advanced Study — We have performed electron tunneling spectroscopy measurements on gated single and bilayer graphene devices with thin hexagonal boron nitride (h-BN) as a tunneling barrier. We can directly probe electronic structures of graphene devices by varying charge density and tunneling bias voltage. The evolution of bilayer energy gap identified as dI/dV dip in tunneling spectra is observed as the electric field between bottom gate and top tunneling probe varies. In addition, we can identify several spectra features which are in good agreement with the vibrational excitations; phonons of graphene and h-BN and a signature of local plasmonic excitation. Upon increasing external magnetic field, the development of Landau levels (LL) is observed as early as 0.2 T and we are able to discern individual LL as many as 20 as an index for both filled and empty states, which is unprecedented in previous tunneling spectroscopy studies on graphene devices.

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