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Accessing high energy sub-bands in bilayer graphene - a transport study DMITRI K. EFETOV, PATRICK MAHER, SIMAS GLINSKIS, PHILIP KIM, Columbia University — In contrast to single layer graphene sheets with its two distinct valence and conduction bands merging at the Dirac Point, multilayer graphene sheets are known to have additional sub-bands at higher energies. Whereas the low energy sub-bands in these systems are well studied, the higher energy sub-bands could so far not be accessed in a transport measurement of graphene samples sitting on typical SiO_2/Si back gates. Employing a poly(ethylene)oxide-$CsClO_4$ solid polymer electrolyte gate we demonstrate the filling up of the high energy sub-bands in bilayer graphene samples at carrier densities above $\sim 2.7\text{x}10^{13}$ cm^{-2} . The onset of these sub-bands is defined by a slight increase of the resistivity and the onset of Shubnikov de Haas (SdH) oscillations. Measurements of the magneto-resistance, the SdH oscillations and the Hall Effect enable us to deduce the carrier densities and mobilities for both, the high and low energy bands simultaneously. In addition, we find that the onset energy of these sub-bands can be tuned by varying the bilayer interlayer asymmetry.

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