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Screening properties of graphene layers studied by Kelvin Probe Force Microscopy and Landau Level Spectroscopy[1] JOHN VETICK, CHIH-PIN LU, MICHAEL ALTVATER, JUNXI DUAN, GUOHONG LI, EVA Y. ANDREI, Rutgers University, Department of Physics and Astronomy, 136 Frelinghuysen Road, Piscataway, NJ 08855 USA — Graphene is one of the best conductors known, but due to its two dimensional structure and the need to support it on insulating substrates, its electronic properties are often masked by substrate-induced random potential fluctuations. In order to realize graphene's full potential for electronic application it is therefore important to understand its screening properties and to find ways to minimize substrate invasiveness. We employed Kelvin Probe Force microscopy (KPFM) to investigate the screening properties of CVD grown graphene crystals as a function of layer number and substrate material using a gated device geometry. The KPFM study was complemented by low temperature scanning tunneling microscopy and Landau level spectroscopy in similar samples and device configurations. Measurements were carried out on single layer, bilayer, trilayer and twisted bilayer samples deposited on SiO_2 and hBN substrates. Our findings show that twisted graphene layers provide superior screening of charged impurities and random potentials while at the same time preserving the unique electronic band structure of single layer graphene.

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