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Tuning the Infrared Absorption of a Bilayer Graphene Field-Effect Transistor CHUN HUNG LUI, KIN FAI MAK, MATTHEW SFEIR, JAMES MISEWICH, TONY HEINZ, COLUMBIA UNIVERSITY, NEW YORK, NY 10027 COLLABORATION, BROOKHAVEN NATIONAL LABORATORY, UPTON, NY 11973 COLLABORATION — Bilayers of graphene have attracted intense interest because of the possibility of tuning of their band gap by the application of a perpendicular electric field [Taisuke Ohta et al. Science 313, 951 (2006)]. Indeed, such gate electric fields induce both 1) tuning of the chemical potential and 2) modification of the bilayer electronic structure by the development of potential difference across the two layers. These effects have significant consequences for the infrared absorption, which probes the interband transitions, of bilayer samples. We have examined these issues by measuring the evolution of the optical conductivity (for photon energies of 0.2 - 0.8 eV) of graphene bilayer field-effect transistors constructed with a transparent top gate. The infrared absorption shows a significant and reproducible variation with gate voltage. The behavior for positive and negative gate voltages reveals an electron/hole asymmetry, reflecting corresponding differences in the band structure. The role of the development of a band gap in these structures and the effect of electrostatic screening will be discussed.

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