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Probing the Band Structure of Mono-, Bi- and Tri-layer Graphene by Infrared Absorption Spectroscopy KIN FAI MAK, Columbia University, MATTHEW SFEIR, Brookhaven National Laboratory, YANG WU, CHUN HUNG LUI, JANINA MAULTZSCH, SAMI ROSENBLATT, Columbia University, MARK HYBERTSEN, Brookhaven National Laboratory, TONY HEINZ, Columbia University — Absorption spectra in the infrared range (0.3 – 1 eV) were measured for large-area, single-crystal mono-, bi- and tri-layer graphene samples produced by mechanical exfoliation of graphite. A constant absorption independent of photon energy was observed for monolayer samples. For the bi-layer, a strong absorption peak was seen at 0.37eV. The absorption spectrum of tri-layer graphene was found to be well represented by the sum of those of a mono- and a bi-layer, with the latter spectrum scaled by $2^{1/2}$ in photon energy. These observations can be explained qualitatively within a tight-binding band structure picture and yield an accurate determination of the nearest-layer hopping constant (γ_1). Explicit calculations of the absorption spectra show that an optimal fit to experiment requires a shift of the Fermi energy of approximately 100 meV from the Dirac point and an empirical broadening of tens of meV.

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