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Experimental Evidence of Many-Body Interactions in the Optical Spectra of Graphene KIN FAI MAK, JIE SHAN, TONY HEINZ — Excitonic effects are usually considered to be unimportant in the optical response of metals because of strong carrier screening. Recent studies have, however, shown that such screening is significantly reduced in metallic systems of lowered dimensionality, such as carbon nanotubes [F. Wang et al., PRL 99, 227401 (2007)]. Excitonic effects have also been predicted to be present for interband transitions in graphene, a model 2-dimensional semimetal [L. Yang et al., PRL 103, 186802 (2009)]. We report here an experimental determination of the absorption spectrum of high-quality exfoliated graphene for a photon energies of 0.2 - 5.5 eV. A pronounced absorption peak is observed at 4.6 eV, with a gradual rise in absorbance from the universal value of $\pi\alpha$ on the low-energy side and a sharp decrease on the high-energy side. While increased absorption is expected to occur in the UV because of trigonal warping of the graphene band structure, both the position and the shape of the observed absorption peak provide evidence of pronounced excitonic effects in graphene.

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