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Novel Excitonic Effects in Graphene and Bilayer Graphene[1] LI YANG, Department of Physics, Washington University in St. Louis — Through first-principles calculations with many-body effects included, we have revealed unique excitonic effects in the high-frequency regime (10 $\sim$ 20 eV) of optical spectra of graphene and bilayer graphene (BLG). Despite their different symmetries, the parallel σ and π^* bands result in enhanced excitonic effects in such two-dimensional semimetals; one narrow resonant exciton is discovered to form an isolated peak below the prominent absorption continuum with a surprisingly large binding energy, 270 meV in graphene and 80 meV in BLG. Moreover, because of its extremely weak resonant character, this exciton exhibits a bound electron-hole wave function.

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