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Title:Giant two-photon absorption in bilayer graphene
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Abstract: We present a quantum perturbation theory on two-photon absorption (2PA) in monolayer and bilayer graphene which is Bernal-stacked. The theory shows that 2PA is significantly greater in bilayer graphene than monolayer graphene in the visible and infrared spectrum (up to 3 μm) with a resonant 2PA coefficient of up to ~0.2 cm/W located at half of the bandgap energy, $\gamma 1$ = 0.4 eV. In the visible and terahertz region, 2PA exhibits a light frequency dependence of ω–3 in bilayer graphene, while it is proportional to ω–4 for monolayer graphene at all photon energies. Within the same order of magnitude, the 2PA theory is in agreement with our Z-scan measurements on high-quality epitaxial bilayer graphene deposited on SiC substrate at light wavelength of 780 and 1100 nm.