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Hot Carrier-Assisted Intrinsic Photoresponse in Graphene
NATHANIEL GABOR, Massachusetts Institute of Technology Physics, JUSTIN SONG, SEAS Harvard University, QIONG MA, NITYAN NAIR, Massachusetts Institute of Technology Physics, THITI TAYCHATANAPAT, Harvard University Physics, KENJI WATANABE, TAKASHI TANIGUCHI, National Institute for Materials Science Japan, LEONID LEVITOV, PABLO JARILLO-HERRERO, Massachusetts Institute of Technology Physics — Graphene is considered an excellent candidate for photodetection and energy harvesting applications due to its broadband optical response and high internal quantum efficiency, yet measurements have not clearly determined the photocurrent generation mechanism. Here, we report on the intrinsic photoresponse of dual-gated monolayer and bilayer graphene p-n junction devices. Local laser excitation of wavelength 850 nm at the p-n interface leads to striking six-fold photovoltage patterns as a function of bottom- and top-gate voltages. These patterns, together with the measured spatial and density dependence of the photoresponse, provide strong evidence that non-local hot carrier transport, rather than the photovoltaic effect, dominates the intrinsic photoresponse in graphene [1,2] The hot carrier regime manifests as a strong photo-thermoelectric effect in which the photogenerated carrier population remains hot while the lattice stays cool. [1] Science v. 334, p. 648-652 (2011). [2] Nano Lett. ASAP 10.1021/nl202318u (2011).

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