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Temperature dependence of hot carrier-assisted photoresponse in graphene QIONG MA, NATHANIEL GABOR, NITYAN NAIR, Department of Physics, Massachusetts Institute of Technology, Cambridge, MA 02139, USA, KENJI WATANABE, TAKASHI TANIGUCHI, National Institute for Materials Science, Namiki 1-1, Tsukuba, Ibaraki 305-0044, Japan, PABLO JARILLO-HERRERO, Department of Physics, Massachusetts Institute of Technology, Cambridge, MA 02139, USA — We report on temperature dependent photocurrent measurements of high-quality dual-gated monolayer graphene p-n junction devices. Over temperatures ranging from 5 K to 300 K, we find that the photocurrent at the p-n interface peaks at an intermediate temperature, and decreases at higher and lower temperatures. Spatial photocurrent microscopy (at wavelength 850 nanometers) shows that the photocurrent measured as a function of distance away from the p-n interface also varies with temperature. We consider various electronic cooling processes in graphene to explain the photocurrent temperature dependence. Our measurements may reveal novel energy loss processes that reduce the electronic temperature of photoexcited charge carriers in graphene, and give additional insight into hot carrier photoresponse.

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