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Heat Confinement in Graphene Devices Using Superconducting Contacts[1] CHRIS MCKITTERICK, Yale University, Department of Physics, HELI VORA, XU DU, Stony Brook University, Department of Physics, BORIS KARASIK, Jet Propulsion Laboratory, California Institute of Technology, DANIEL PROBER, Yale University, Department of Physics — Many groups have proposed the use of graphene as a photon detector due to its very small heat capacity and thermal conductivity. We describe predictions of device performance taking into account the effect of device heating from incident photons using reported results [1]. To test the achievability of these predictions, we performed Johnson noise thermometry measurements of graphene samples fabricated at Stony Brook University. These measurements probe the electron-phonon behavior of graphene on SiO_2 at very low temperatures. Because the electron-phonon coupling is weak in graphene, this requires the use of superconducting contacts to confine the hot electrons and prevent their outdiffusion. To that end, NbN leads with a $T_c \approx 11$ K are used to contact the graphene. The large energy gap present in these contacts prevents diffusive cooling for low electron temperatures. We present thermal conductivity measurements of these devices.

[1] C.B. McKitterick, B.S. Karasik, D.E. Prober, arXiv:1210.5495.

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