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Johnson noise thermometry of optically excited hot electrons in hBN encapsulated graphene DMITRI EFETOV, MIT, YUANDA GAO, Columbia University, REN-JYE SHIUE, EVAN D. WALSH, GABRIELE GROSSO, CHENG PENG, MIT, CHENG TAN, Columbia University, PHILIP KIM, Harvard University, JAMES HONE, Columbia University, KIN CHUNG FONG, BBN Raytheon, DIRK ENGLUND, MIT, HARVARD UNIVERSITY COLLABORATION, COLUMBIA UNIVERSITY COLLABORATION, BBN RAYTHEON COLLABORATION, MIT TEAM — Hot electrons in graphene have unique thermal properties. Owed to graphene's unique combination of an exceedingly low electronic heat capacity and a strongly suppressed electron-phonon thermal conductivity G_{th}, the electronic and phononic temperatures can be highly decoupled. Through space and time resolved laser excitation and a Johnson noise read out we can directly measure the spatial and time dependence of G_{th} and estimate the electronic heat capacity of graphene $C_e = \tau G_{th}$. We use these insights to design a photonic crystal integrated graphene bolometer with a NEP ˜1pW/Hz$^{1/2}$, a response time of ˜1ps and a high operation temperature of 20K.

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