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Infrared two-wave mixing technique for characterization of graphene THz plasmonic devices[1] DENNIS DREW, MOHAMMAD JADIDI, ANDREI SUSHKOV, XINGHAN CAI, RYAN SUESS, MARTIN MITTENDORFF, THOMAS MURPHY, University of Maryland, College Park, MD 20742, MICHAEL FUHRER, Monash University, Australia, KEVIN DANIELS, KURT GASKILL, U.S. Naval Research Laboratory, Washington, DC 20375 — We have studied the heterodyne mixing of two beams from infrared lasers on graphene plasmonic devices and detectors. The nonlinear thermal response of graphene allows us to measure a DC photovoltage that depends on the heterodyne difference frequency and gate voltage. The inversion symmetry of the graphene device is broken by using dissimilar metal contacts to allow a net photo-thermoelectric signal. The power, frequency, and temperature dependence of the photoresponse are used to probe the graphene hot-electron cooling rates and mechanisms. We will discuss the use of photothermal effects in graphene to excite surface plasmons at the difference frequency. The high mobility of the free carriers in graphene is important for this experiment. We have measured exfoliated graphene on SiO2/Si substrate detector and we are working on BN graphene and intercalated SiC graphene devices.

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