Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Plasmon-enhanced terahertz photodetection in graphene[1] XINGHAN CAI, ANDREI SUSHKOV, CNAM, University of Maryland, College Park, MOHAMMAD JADIDI, IREAP, University of Maryland, College Park, R.L. MYERS-WARD, A.K. BOYD, K.M. DANIELS, D. KURT GASKILL, U.S. Naval Research Laboratory, Washington, DC, THOMAS MURPHY, IREAP, University of Maryland, College Park, H. DENNIS DREW, CNAM, University of Maryland, College Park, MICHAEL FUHRER, School of Physics, Monash University, Victoria, Australia — Graphene is a promising material for high speed room-temperature terahertz photodetection. However, the limited absorption in monolayer graphene remains a key challenge. We present here a large area terahertz detector that utilizes a plasmonic resonance in sub-wavelength graphene micro-ribbons to increase the absorption efficiency, and exploits the hot-electron photothermoelectric effect for detection. Through Fourier transform infrared spectroscopy we show that by tailoring the orientation of the graphene ribbons with respect to an array of sub-wavelength bimetallic electrodes, the plasmonic resonance can be efficiently excited, with a gate-tunable resonance frequency in the terahertz range. Polarization-dependent photoresponse measurements show an enhanced photothermal voltage between the outermost electrodes due to the plasmonically enhanced absorption.

[1]This work was sponsored by the US ONR (N000140911064, N000141310712 and N000141310865), the US NSF (ECCS 1309750), IARPA, and the Australian Research Council.

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Date submitted: 14 Nov 2014 Electronic form version 1.4