

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Carrier Cooling in Graphene Measured by THz Time-Domain Spectroscopy JARED STRAIT, HAINING WANG, SHRIRAM SHIVARAMAN, VIRGIL SHIELDS, CARLOS RUIZ-VARGAS, JIWOONG PARK, MICHAEL SPENCER, FARHAN RANA, Cornell University — We present results on the ultrafast relaxation dynamics of photoexcited electrons and holes in graphene using optical-pump terahertz-probe spectroscopy. Measurements done at different temperatures show that the measured differential transmission as a function of the probe delay decays on time scales that become very long at low temperatures with decay times exceeding ~ 150 ps at temperatures lower than ~ 50 K. We interpret these transients as carrier cooling due to a combination of electron-optical phonon and electron-acoustic phonon scattering. When the carrier temperature goes below ~ 250 K, optical-phonon scattering ceases to effectively cool the carriers given the large optical phonon energies in graphene. Since acoustic phonon scattering is not efficient in removing the heat from the carriers, the carrier distribution cools very slowly. Our data is in agreement with the theoretical predictions [1].

[1] Phys. Rev. B 79, 235406 (2009) and Phys. Rev. Lett., 102, 206410 (2009).

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Date submitted: 30 Dec 2010

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