Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

SU(4) symmetry breaking revealed by magneto-optical spectroscopy in epitaxial graphene[1] LIANG Z TAN, Univ of California - Berkeley, MILAN ORLITA, MAREK POTEMSKI, LNCMI, CNRS, MIKE SPRINKLE, CLAIRE BERGER, WALTER DE HEER, Georgia Institute of Technology, STEVEN LOUIE, University of California - Berkeley, GERARD MARTINEZ, LNCMI, CNRS — Electron-electron and electron-phonon interactions break the spin and valley degeneracies of the lowest Landau level (LL) in graphene. Multiple theoretical models have been proposed for the broken symmetry ground state. Previous tilted magnetic field transport experiments have obtained partial information on the ground state by probing the spin degree of freedom. In this work, we show that, via the valley-dependent electron-phonon interaction, symmetry breaking of the valley degree of freedom can be detected in infra-red transmission signatures close to magneto-phonon resonances. We have performed infra-red magneto-transmission experiments on multi-layer epitaxial graphene samples in magnetic fields up to 35 T. Following the main optical transition involving the lowest LL, we observe a new absorption transition increasing in intensity with magnetic fields greater than 26 T. Our theoretical calculations quantitatively explain these features, and unambiguously identify the charge density wave as the ground state in our samples.

[1]This work was supported by National Science Foundation Grant No. DMR10-1006184, the U.S. Department of Energy under Contract No. DE-AC02-05CH11231. Computational resources have been provided by the NSF through XSEDE resources at NICS.

Liang Z Tan
Univ of California - Berkeley

Date submitted: 12 Nov 2014 Electronic form version 1.4