Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Ultrafast Dynamics of Correlated Electronic States in Layered Cu_xTiSe_2[1] D.B. LIOI, G. KARAPETROV, Dept. of Physics, Drexel University, Philadelphia, PA 19104, R.D. SCHALLER, G.P. WIEDERRECHT, Center for Nanoscale Materials, Argonne National Laboratory, Argonne, Illinois 60439 — We investigate the transient optical response of electronic states in Cu_xTiSe_2 as a function of temperature and Cu doping from x=0 (semimetal and commensurate charge density wave phases) to x=0.08 (metallic and superconducting phases). We find that the cooperative driving mechanisms for the CDW, the excitonic insulator mechanism and the soft L_1^- phonon mode, decouple at x=0.04, where fluctuations of a quantum critical point were observed in the folded Se-4p band. We also demonstrate a loss of coherence in the A_{1g} phonon signal with increased Cu intercalation of the parent lattice, indicating a loss of long-range lattice order. These findings provide compelling evidence that $TiSe_2$ undergoes a quantum phase transition upon Cu intercalation from a state of commensurate charge order without superconductivity to a state with a different symmetry in which new charge order coexists with the superconducting phase.

[1]This work was supported by the NSF under Grant No. ECCS-1408151. The use of CNM, an Office of Science user facility, was supported by the U.S. DOE, Office of Science, Office of Basic Energy Sciences, under Contract No. DE-AC02-06CH11357.

David Lioi
Drexel University

Date submitted: 11 Nov 2016 Electronic form version 1.4