Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Transient reflectance of photoexcited electrons and holes in cadmium arsenide[1] CHRIS WEBER, BRYAN BERGGREN, Department of Physics, Santa Clara University, ERNEST ARUSHANOV, Institute of Applied Physics, Academy of Sciences of Moldova, TAHEREH HOSSEINI, NIKOLAI KOUKLIN, Departments of Electrical Engineering and Computer Science, University of Wisconsin-Milwaukee — We report ultrafast transient-grating measurements of crystals of the three-dimensional Dirac semimetal cadmium arsenide, Cd_3As_2, at both room temperature and 80 K. After photoexcitation with 1.5-eV photons, charge-carriers relax by two processes, one of sub-picosecond duration and the other of duration 3 ps. By measuring the complex phase of the change in reflectance, we determine that the faster signal corresponds to an increase in phase velocity, and the slower signal to a decrease in absorption, at the probe energy. We assign the fast signal to free-carrier absorption from photoexcited electron and hole populations, which relax by recombination, and the slower signal to phase-space filling by thermally excited electrons. The proposed processes closely mirror the response of graphene to photoexcitation. We also present evidence that both the electrons and the lattice are strongly heated.

[1]This work was supported by the National Science Foundation Grant No. DMR-1105553

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Date submitted: 13 Nov 2014 Electronic form version 1.4