Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Buckled Graphene-like Materials in Ultrafast and Superstrong Optical Fields HAMED KOOCHAKI KELARDEH, VADYM APALKOV, MARK STOCKMAN, Georgia State University — We discuss the theoretical investigation of buckled Dirac materials (silicene and germanene) interacting with ultrashort and ultrastrong optical pulses. Highly intensive few-cycle fields strongly modify the electronic and optical properties of these two dimensional materials. The strong nonlinearity of the system for the fields applied (V/Å), will cause the violation of the charge (C) and parity (P) and time reversal symmetries. Such symmetry violations are related to the electron transfer between the sublattices produced by the normal field component and result in nonreciprocity, optical rectification and the appearance of a cross current. We also note a direct resemblance between silicene and field-effect transistors (FET). In FETs, the (perpendicular) gate field changes the carrier concentration and thereby, controls its conductance. Analogously, in silicene, the normal field component of the pulse, transfers carriers between two sublattices, and consequently modulates the response function of silicene to the in-plane field. **Reference:** H. K. Kelardeh, V. Apalkov, and M. I. Stockman, *Ultrafast field control of symmetry, reciprocity, and reversibility in buckled graphene-like materials*, Phys. Rev. B **92** (4), 045413 (2015).

Hamed Koochaki Kelardeh
Georgia State University

Date submitted: 02 Nov 2015 Electronic form version 1.4