Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Nonlocal Electron Coherence in MoS_2 Flakes Correlated through Spatial Self Phase Modulation[1] YANLING WU, QIONG WU, FEI SUN, YICHAO TIAN, Institute of Physics, Chinese Academy of Sciences, XU ZUO, Nankai University, China, SHENG MENG, JIMIN ZHAO, Institute of Physics, Chinese Academy of Sciences — Electron coherence among different flake domains of MoS_2 has been generated using ultrafast or continuous wave laser beams. Such electron coherence generates characteristic far-field diffraction patterns through a purely coherent nonlinear optical effect—spatial self-phase modulation (SSPM). A wind-chime model is developed to describe the establishment of the electron coherence through correlating the photo-excited electrons among different flakes using coherent light. Owing to its finite gap band structure, we find different mechanisms, including two-photon processes, might be responsible for the SSPM in MoS_2 [with a large nonlinear dielectric susceptibility $\chi^{(3)} = 1.6 \times 10^{-9}$ e.s.u. (SI: 2.23×10^{-17} m^2/V^2) per layer]. Finally, we realized all optical switching based on SSPM, demonstrating that the electron coherence generation we report here is a ubiquitous property of layered quantum materials, by which novel optical applications are accessible.

[1]National Natural Science Foundation of China (11274372)

Jimin Zhao
Institute of Physics, Chinese Academy of Sciences

Date submitted: 13 Nov 2014 Electronic form version 1.4