

CORE-CM SEMINAR

Michigan State University

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Strong-field response of solids – From designing microscopes to photo-induced phase transitions

It is well known that the coupling of strong EM fields and electrons in gases or solids leads to new effects such as dressed states, multiphoton excitation, photo-dissociation etc. In the solid state, strong (or intermediate) fields can also be used to produce effects such as Floquet ladders, laser-induced topological phases and photo-induced phase transitions (PIPT). Many PIPTs have been experimentally observed including: insulator to metal [1,2], metal to superconductor, and paramagnet to ferromagnet transitions. Three ongoing projects in my group will be described: Generating and controlling ultrafast electron bunches [3,4]; electronic structure and the PIPT of TaS₂; a method for controlling ultrafast electronic response within tight-binding models.

1. Z.S. Tao, T.R.T. Han, S.D. Mahanti, P.M. Duxbury, F. Yuan, C.Y. Ruan, K. Wang, J.Q. Wu, “Decoupling of structural and electronic phase transitions in VO₂” Phys. Rev. Lett. 109 (166406), pages 1-5 (2012)
2. T.T. Han, F. Zhou, C.D. Malliakas, P.M. Duxbury, S.D. Mahanti, M.G. Kanatzidis, C.-Y. Ruan. “Exploration of metastability and hidden phases in correlated electron crystals visualized by femtosecond optical doping and electron crystallography”. Science Advances 1 (5), e1400173 (2015).
3. J. Portman, H. Zhang, Z. Tao, K. Makino, M. Berz, P.M. Duxbury and C.Y. Ruan. “Computational and experimental characterization of high-brightness beams for femtosecond electron imaging and spectroscopy, Applied Physics Letters 103, 253115 (2013)
4. J. Portman, H. Zhang, K. Makino, C.Y. Ruan, M. Berz and P.M. Duxbury, “Untangling the contributions of image charge and laser profile for optimal photoemission of high-brightness electron beams”, J. Appl. Phys. 116, 174302 (2014).

Thursday, April 21, 2016
12:00 NOON
Room 1400 – Biomedical & Physical Sciences