MAR14-2013-008860

Abstract for an Invited Paper
for the MAR14 Meeting of
the American Physical Society

A two-dimensional view of electron dynamics and coherent coupling in semiconductors[1]

XIAOQIN (ELAINE) LI, University of Texas-Austin

Understanding coherent interaction among multiple electronic states is a prerequisite to controlling material properties at the level of electrons and is a challenge that is ubiquitous in material science. Specifically, the presence or absence of coherent coupling among excitons significantly influence energy transfer, photon emission statistics, and even quantum-logic operations in semiconductor heterostructures such as quantum wells, quantum wires, and quantum dots. This problem is also relevant for a broader range of materials including natural/artificial photosynthetic systems and conjugated polymers. We have investigated coherent coupling among exciton resonances in disordered quantum wells. We articulate how strong coherent coupling occurs between certain types of excitons but is missing between other types of excitons using a powerful spectroscopy tools known as the electronic two-dimensional Fourier transform spectroscopy. In simple terms, the distinctive nature of excitons results in different spatial overlap and different coupling strength. If time permits, we will also present our most recent results on monolayer transition metal dichalcogenides.

[1] Yuri Glinka, Zheng Sun, Mikhail Erementchouk, Michael Leuenberger, Alan Bristow, Alan Bracker, **Xiaoqin Li** "Coherent Coupling among Exciton Resonances Governed by Disorder Potentials," Phys. Rev. B, 88, 075316, 2013.
[2] Yuri Glinka, Mikhail Erementchouk, Chandriker K. Dass, Michael N. Leuenberger, Alan Bristow, Alan Bracker, **Xiaoqin Li** "Nonlocal Coherent Coupling Between Excitons in a Disordered Quantum Well," New Journal of Physics, 15, 075026, 2013.

[1]We gratefully acknowledge financial support from ARO, NSF, and the Welch Foundation.