CMP Seminar
Michigan State University

Ziliang Ye
Stanford University

Valley exciton in 2D semiconductor: from experimental observation to coherent manipulation

Following the success of graphene, the transition metal dichalcogenide (TMDC) family of the form MX2 (M = Mo, W; X = S, Se, Te) has attracted significant attention as a two-dimensional semiconductor. While maintaining the advantageous flexibility and tunability found in graphene, TMDCs possess a band gap that transitions from the indirect to direct type at the monolayer limit, giving rise to an extraordinarily strong light-matter interaction. In this talk, I will discuss our effort to understand and control the electronic structure of TMDCs using ultrafast light. We will present our discovery of a strong and anomalous excitonic effect in the TMDC monolayer, where the room-temperature stable exciton emerges from an unscreened Coulomb interaction in the two-dimensional space [1]. In addition, we will report our recent successful coherent manipulation of the valley polarization, a degree of freedom analogous to spin but exists only in the momentum space of the electron [2]. The ability to control the valley degree of freedom potentially can enable a new platform for quantum information applications.

[1] Z. Ye et al. Nature 513, 214 (2014)
[2] Z. Ye et al. Nature Physics (2016) doi:10.1038/nphys3891

Thursday, February 16, 2016
10:00 a.m.
BPS 1400
Prof. Chong-Yu Ruan - Host