Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Microscopic theory of two-dimensional spatially-indirect-exciton condensates and exciton-polariton condensates[1] FEI XUE, FENG CHENG WU, ALLAN MACDONALD, Univ of Texas, Austin — BEC of excitons and polaritons have drawn attention in recent years because of the demonstration of their ability to host macroscopic quantum phenomena and because of their promise for applications. We study the case of a system containing two TMD monolayers that are separated and surrounded by h-BN. Under appropriate conditions this system is expected to support a spatially indirect thermal equilibrium exciton condensate. We combine a microscopic mean-field calculation and a weakly interacting boson model to explore the bilayer exciton condensates phase diagram. By varying the layer separation and exciton density, we find a phase transition occurs between states containing one and two condensate flavors. We also use a microscopic time-dependent mean-field theory to address condensate collective mode spectra and quantum fluctuations. Next we study the case of exciton-polariton formed by strong coupling between quantum well excitons and confined photon modes when the system is placed in a vertical microcavity. We build a microscopic mean-field theory starting from electrons and holes, and account for their coupling to coherent light field. We compare our model with the normal weakly interacting boson model that starts from weakly interacting excitons that are coupled to photons.

[1]This work was supported by the SRC and NIST under the Nanoelectronic Research Initiative (NRI) and SWAN, by the Welch Foundation under Grant No. F1473, and by the ARO Grant No. 26-3508-81.

Fei Xue
Univ of Texas, Austin

Date submitted: 24 Nov 2015 Electronic form version 1.4