



THE CHINESE UNIVERSITY OF HONG KONG
Department of Physics
SEMINAR

Manipulating Excitonic Excitations in Inorganic/Organic Semiconductors

by

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ALL INTERESTED ARE WELCOME

Abstract

Single semiconductor quantum dots and organic dye molecules are ideal test beds for quantum optics experiments. The exploratory research of these nanostructures in combination with photonic devices/circuits pave the way towards the so-called photonic quantum technologies. First I will review our very recent advances on controlling the excitonic emissions from single InGaAs/GaAs quantum dots. By using a piezoelectric-actuator based technique we studied with unprecedented detail the effects produced by “stretching” or “squeezing” the excitons confined in single quantum dots. We are able to control the bright exciton fine structure splitting and to reach the color coincidence of exciton and biexciton emissions. These are important steps towards controlled single photon source and entangled photon pairs source. With the same technique we manipulated the Raman excitations in graphene and revealed the fundamental Grüneisen parameters of single layer graphene. In the second part I will discuss the observation and electrical tuning of excitonic Aharonov-Bohm interference effect in a single InAs quantum ring. The third part of my talk is about the realization of room temperature exciton-polariton in a hybrid organic dye/microcavity system. This semi-classical cavity quantum electrodynamics system offers robust platform for the development of ultralow threshold polariton lasers, optical switches, etc.