

# Joint CQSE and CASTS Seminar

2019  
May 31, Friday

TIME May 31, 2019, 14:30 ~ 15:30  
TITLE General Theory of Resonance Energy Transfer and  
Fluorescence Coupled with Plasmon Polaritons  
SPEAKER Dr. Liang-Yan Hsu  
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PLACE Rm716, CCMS & New Physics Building, NTU

## Abstract

Fluorescence and resonance energy transfer (RET) between two chromophores in the presence of nanostructures is a fundamental subject in chemical physics, material sciences, and nanotechnology. My talk includes five parts. First, I would like to give a brief overview of Förster resonance energy transfer and macroscopic quantum electrodynamics (quantization of electromagnetic fields in dielectrics). In the framework of macroscopic quantum electrodynamics, we develop a general theory of RET and establish the concepts of a generalized spectral overlap as well as a coupling factor. Second, we study RET around a metallic nanoparticle and explore the origin of the peaks and the dips of a coupling factor using the general theory we developed. Third, we analyze the mechanisms of RET on a metallic thin film and investigate the distance dependence of RET enhancements. Our theoretical analysis shows that the mechanisms of RET can be separated into mirror dipoles, surface plasmons, and retardation. Fourth, we explore the gap dependence of fluorescence enhancements based on macroscopic quantum electrodynamics and demonstrate the competition between Fluorescence and RET. Fifth, I will show my recent results about quantum dynamics of a molecular emitter strongly coupled with surface plasmon polaritons.

