

The Hong Kong Polytechnic University
Department of Applied Mathematics

Colloquium

**Multiscale Analysis and Algorithms Based on
Semi-quantum Electromagnetic Models**

By

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Abstract

In this talk, we will introduce our recent advances in the multiscale analysis and algorithms based on semi-quantum electromagnetic models. First, we will briefly talk about the fundamental physical questions and the mathematical models from the classical electrodynamics to the semi-quantum models, then to the quantum electrodynamics (QED) and the quantum chromodynamics (QCD). Meanwhile, we will introduce some important studies about the multiscale methods for the classical Maxwell's equations and for the semi-quantum models. Second, we will present a mathematical proof of the principle of "nearsightedness" in quantum mechanics and its applications in novel materials such as graphene with point defects. Third, we will focus on discussing the multiscale asymptotic methods for the semi-quantum models such as Schrödinger-Poisson system and Maxwell-Dirac system with rapidly oscillating discontinuous coefficients, respectively. They originate from the interaction of the matter field and the electromagnetic field in materials science. Finally, some numerical results and typical applications in novel materials are advanced. This talk is based on the joint work with Lei Zhang, Yaoyao Fu and Tianshu Jiang.

Date : August 20, 2019 (Tuesday)

Time : 2:30pm – 3:30pm

Venue : TU801, The Hong Kong Polytechnic University

*** * * ALL ARE WELCOME * * ***