



THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

## **PHD STUDENT SEMINAR**

# **A Gas-Kinetic Scheme for the Maxwell Equations**

By

**Mr. Zhigang PU**

### Abstract

A gas-kinetic scheme is constructed to solve Maxwell equations. Based on the finite-volume method, the numerical flux is calculated by the integral solution of the Boltzmann equation on the interface. Due to the asymmetry of the Jacobian of the Maxwell equations, a vector-valued pure abstracted distribution function is introduced for the system. The BGK operator is used to approximate the collision operator in the Boltzmann equation. The equilibrium distribution is discretized by a series of beams, replacing the continuous Maxwellian distribution function to the discrete Kronick delta functions. Compared to the classical Godunov-type solver, the kinetic formulation offers the advantage of straightforward implementation for multidimensionality. Moreover, it exhibits consistency when combined with gas-kinetic schemes for fluid to investigate problems involving the coupling of fluid dynamics and electrodynamics. Higher order schemes can be achieved through nonlinear reconstruction in space and multistage methods in time. A series of test cases are used to validate the proposed scheme.

**Date : 9 May 2024 (Thursday)**

**Time : 9:00am**

**Venue : Room 3598 (Lifts 27-28)**

*All are Welcome!*