报告七 题目：Monte Carlo Simulations on Frustrated Spin Systems

报　告　人：香港大学 **黄春炯** 博士

报 告 摘 要：

Frustrated spin systems are systems in a situation where a spin cannot fully satisfy all the interactions with its neighbour spins simultaneously due to “frustration”. Such simple mechanics induces many exotic phenomenons, like the gauge structure, topological excitations, and more. In our works, we have explored both quantum and classical frustrated spin systems. We have investigated the dynamic properties of the XXZ model whose low-temperature phase is a quantum spin ice. In this low-temperature phase, we first obtain the quantitative spectra of the gauge photon and the spinon pair by large-scale quantum Monte Carlo simulations and the stochastic analytic continuation. Further, we present the temperature-evolution of these spectra in the classical spin ice region and the high-temperature disorder state. Additionally, we have explored the XYZ model, proposed as a model for rare-earth phrochlore materials with “dipole-octupole” doublets, and obtained the phase diagram. We find that in this model, besides the quantum spin ice, there may be another spin liquid phase, the Z_2 spin liquid, which requires further investigation. We have also conducted research on classical systems, especially spiral spin liquids. In the J_1-J_2 model, we find that there is always a spiral spin liquid for both the Heisenberg and XY spin, and for the Ising spin, there will be a persistent reciprocal kagome structure at low temperatures when the exchange coupling J_2 is larger than a critical value.