中央大學物理學系

Department of Physics, National Central University

Colloquium

Magnetic Structure Determination and Its Applications : Exploring Piezomagnetic and Magnetoelectric Effects

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Abstract : Quantum magnetic materials have attracted significant attention in both fundamental physics and applied science due to their peculiar physical properties. Understanding the microscopic magnetic structure in these materials remains a crucial challenge in current condensed matter physics and material science research. Among the available analytical techniques, neutron scattering stands out as the only method capable of directly probing magnetic properties, particularly magnetic structures. It allows for the precise determination of magnetic structure, providing key insights into the nature of quantum magnetic materials. Analyzing magnetic structures is a key step in understanding the physical properties of quantum magnetic materials, such as magnetic symmetry analysis, which enables the prediction of phenomena like the magnetoelectric or piezomagnetic responses. This analysis helps us uncover fundamental physical characteristics and provides valuable guidance in designing novel materials and advancing the development of spintronics. During my 3.5-year stay in Japan, I performed various neutron scattering experiments at the Japan Research Reactor-3 (JRR-3) and the Japan Proton Accelerator Research Complex (JPARC) on selected quantum magnetic materials, with a particular focus on simple spin-1/2 systems involving Cu2+, Ce3+, and Yb3+ ions. Additionally, I served as an adjunct beamline scientist at the General-Purpose Triple-Axis Spectrometer located at JRR-3 for over three years. In my talk, I will share my experiences and insights gained from neutron scattering research in Japan.