

Electron Spin Resonance as a Spectroscopic Probe of Low-Energy Spin Phenomena in Quantum Magnets

Changhyun Koo

Quantum magnets constitute a versatile platform for exploring emergent quantum phenomena in strongly correlated spin systems. In particular, spin superposition, entanglement, and collective spin dynamics provide key insights into the microscopic mechanisms governing quantum coherence and many-body interactions in magnetic materials. Understanding these phenomena is essential not only from a fundamental perspective but also for the development of spin-based quantum technologies.

Electron spin resonance (ESR) is a highly sensitive spectroscopic probe that directly accesses spin excitations at the characteristic energy scale of exchange interactions and magnetic anisotropy. By resolving the resonance condition, linewidth, and g-factor anisotropy, ESR provides microscopic information on spin dynamics, magnetic correlations, and low-energy excitations.

In this seminar, I will introduce the fundamental principles of ESR and discuss its application to representative quantum magnetic systems, including single-molecule magnets and frustrated Kagome Heisenberg antiferromagnets, highlighting how ESR reveals their distinctive quantum spin dynamics and correlation effects