CONDENSED MATTER SCIENCES SEMINAR

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Host

Dr Irinel Chiorescu

Title

Defects in Spin Chains: Electron Paramagnetic Resonance of an Unconventional Qubit

Thursday, July 10th, 2025

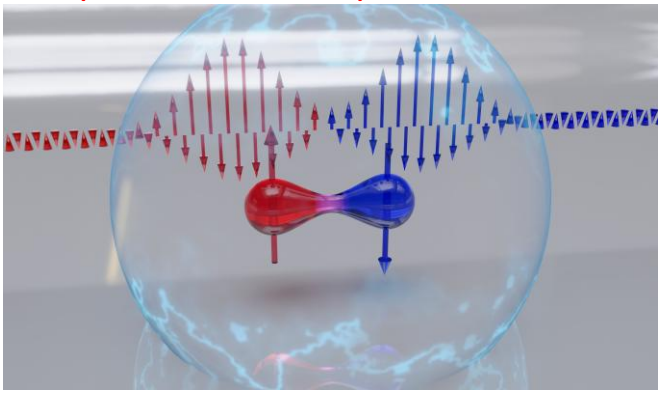
1st Floor – B101

15:00-16:00

Abstract

The study of quantum coherence has become a major issue for the realization of qubits (the fundamental building block of a quantum computer). Generally, the quantum coherence of electronic spins is related to the dilution of these spins in a non-magnetic matrix. However, another approach is possible. Instead of limiting de-coherent interactions, it is possible to utilize the strong correlations present in a chain of isotropic spins. By breaking the translation symmetry with a non-magnetic defect (such as a chain end or stacking fault), this defect polarizes many spins around it, forming a cluster of N spins whose ground state is S=1/2. This object possesses both the dynamic properties of a spin S=1/2 (and thus a qubit), but its coherence is largely controlled by the exchange interaction of the chain.

In this presentation, I will show how electron paramagnetic resonance has allowed us to study the coherence of this object and how the strong exchange coupling significantly reduces the effect of spin baths (nuclear and electronic) on the coherence of the defect.



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