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Quantum bits and entanglement: a neutron scattering view

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Molecular nanomagnets are model systems to study the spin dynamics and magnetic correlations in low dimensional magnets. The advances in the chemical engineering of magnetic molecules have allowed the synthesis of tailor-made systems which provide promising architectures for the realization of quantum computers.
Molecular nanomagnet can display relatively long coherence time, can host entanglement states and they are scalable, making them very attractive from the quantum computation perspective.
Neutron scattering techniques have been intensively and successfully used to study the microscopic properties of molecular magnets and have enabled to reveal the signatures of their quantum behaviour.
I will show how inelastic neutron scattering (INS) experiments on single crystals of molecular magnets can be used to portray entanglement in weakly coupled molecular qubits [1]. Moreover, INS has been used to study phonons in a molecular qubit to investigate the origin of its decoherence [2].

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