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Non-Markovian Spin Dynamics due to Quantum Coherence in Fluorides

The F–μ–F state is observed in many fluorides via the quantum coherent oscillatory muon polarization resulting from entanglement between the spins of the muon and nearby fluorine nuclei [1,2,3]. The usual method to treat muon hopping in this system is to use the strong-collision approximation to dynamicize the standard F–μ–F relaxation function [4]. This approach neglects coherent effects that will result from the muon entanglement with a neighbouring spin to which it may still be coupled even after a hopping event, as well as the case when a muon subsequently hops back to its initial position. This issue is examined and addressed via simulations of the full quantum dynamics of these processes in order to assess the extent to which this is important in real experiments.

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