Defects in spin chains: a virtual molecular magnet with quantum coherence properties

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In a perfect dimerized spin chain, the ground state is non-magnetic. A defect, like an end-chain or a stacking fault, will break the translational symmetry and will polarize dozens of spins around it, forming a magnetic pinned soliton [1].

The microscopic structure of such objects is comparable to the SMM V15 : a ground state doublet separated to a quasi-continuum by a gap [2]. While the large number of spins involved should relax the quantum coherence, the strong exchange interaction strongly reduces the decoherence.

In this talk, I will present the quantum coherence of defects in the spin-Peierls chain (o-DMTTF)$_2$Br probed by pulsed electron spin resonance. I will show that the 1D nature of the chain allows the existence of pairs of solitons with a probability of 50% independent to the defect concentration [3].

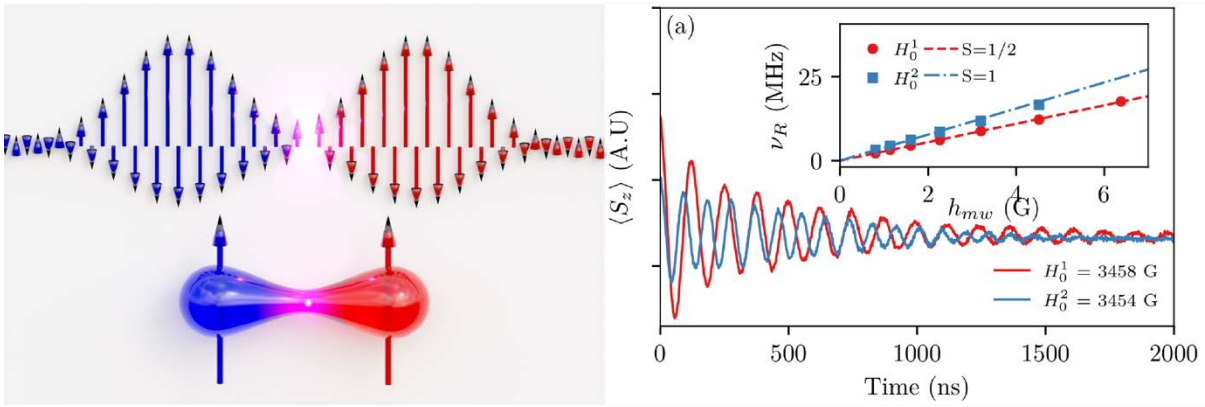

Figure 1: left) Schematic representation of a pair of magnetic solitons pined to the defect (middle). Right) Rabi oscillations of a single (red) and pair of solitons (blue).

References:

[1] S. Bertaina, et al., Phys. Rev. B (R) **90**, 060404 (2014).
[2] J. Zeisner, et al. Phys. Rev. B **100**, 224414 (2019).
[3] L. Soriano, et al., Phys. Rev. B **105**, 064434 (2022).