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Dynamic Correlations in One-Dimensional Quantum Magnets at Finite Temperature B. FAUSEWEH, G. S. UHRIG, TU Dortmund University — In our contribution we investigate the anomalous decoherence effects found previously in theory and experiment of several quantum magnets. A diagrammatic perturbative approach is developed and applied, which incorporates the hard-core bosonic nature of spin excitations. We will discuss in detail, how poles at infinite energy in the approach leaves traces at finite energies. This is important to obtain the correct sum rule for the quasi-particle response.
The key result of our contribution is the investigation of two quantum magnets: $BaCu_2V_2O_8$ and $Cu(NO_3)_2 \cdot 2.5\ D_2O$. The agreement between the experimental data, measured in the time and frequency domain, and the theoretical prediction are exceptional. As a consequence, the anomalous decoherence observed can be traced back to non-trivial scattering processes of the hard-core bosonic excitations. This indicates, that quantum coherence plays a significant role in describing dynamical correlations, even at finite temperature.

Benedikt Fauseweh
TU Dortmund University

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