DYNAMICS OF SPIN- $\frac{1}{2}$ XY CHAIN WITH SYMMETRIC AND ANTISYMMETRIC ANISOTROPIES

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The quantum spin- $\frac{1}{2}$ XY chain can be mapped onto the noninteracting spinless fermions and as a result its thermodynamic and dynamic spin correlation functions can be examined rigorously. We consider the model with the (antisymmetric) Dzyaloshinskii-Moriya interaction which is present in many low-dimensional magnetic compounds. In the case of anisotropic XY chain this interaction cannot be eliminated by a unitary transformation in contrast to the case of isotropic XY chain and therefore some peculiarities in the dynamic properties may be expected. We study the effects of the Dzyaloshinskii-Moriya interaction on the two-fermion excitations which entirely determine the zz-dynamic structure factor. Moreover, we obtain the closed-form expression for the zz-dynamic structure factor analytically. We also study the xx- and yy-dynamic structure factors numerically for chains of up to 400 spins and analyze the changes caused by the Dzyaloshinskii-Moriya interaction. We compare and contrast different dynamic structure factors. We discuss how the Dzyaloshinskii-Moriya interaction manifests itself in scattering and resonance experiments.

-13.4 cm -

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 $9.7~\mathrm{cm}$