

THEORETISCH PHYSIKALISCHES KOLLOQUIUM

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On singularities of dynamic response functions in the massless regime of the XXZ chain: an exact approach

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Dynamic response functions correspond to space and time Fourier transforms of dynamical two-point functions and are thus functions of the momentum k and energy ω . By building on various features related to the integrability of the XXZ spin-1/2 chain, I have been able to construct an exact series of multiple integrals representing the dynamic response functions in the massless regime of the chain.

In this talk, I will describe a rigorous technique allowing one to analyse and fully describe the behaviour, in the (k, ω) plane, of the series. In particular, the method unravels the presence of singularities in the (k, ω) plane along certain curves $\omega = \varepsilon(k)$.

This analysis confirms the predictions for the singular structure of the response functions that were argued earlier by means of a heuristic approach based on putting the model in correspondence with a non-linear Luttinger Liquid. It also stresses the importance of the role played by collective, equal velocity, excitations on the mechanism which generates the singularity curves and the associated edge exponents. Finally, this analysis sets a very simple picture allowing one to reduce the manifestation of universal features characteristic of the Luttinger Liquid universality class to the presence of certain singularities in the large-volume behaviour of matrix elements of local operators and to consequences of a classical asymptotic analysis of multiple integrals.

Gäste sind herzlich willkommen.

Die Dozenten der Theoretischen Physik