KAROL KOZLOWSKI, ENS de Lyon and CNRS

Singularities of dynamic response functions in the massless regime of the XXZ chain

Dynamic response function correspond to space and time Fourier transforms of dynamical two-point functions and are thus functions of the momentum k and energy ω. Starting from the large-volume behaviour of the form factors of local operators and building on certain hypotheses relative to the existence of thermodynamic limits, I have constructed a series of multiple integrals representing the dynamic response functions in the massless regime of the spin-$1/2$ XXZ chain.

In this talk, I will describe a rigorous technique allowing to analyse and fully describe the behaviour, in the (k, ω) plane, of each multiple integral building up the mentioned series of multiple integrals. In particular, the method unravels the presence of singularities in the (k, ω) plane along certain curves $\omega = \mathfrak{e}(k)$.

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 generating mechanism of 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 form factors of local operators and to consequences of a classical asymptotic analysis of multiple integrals.