Integrability, defects and boundaries

Two dimensional integrable models have consistently attracted a great deal of research interest in recent years primarily because their study provides exact results, without recourse to perturbation theory or other approximation schemes as is the case when studying most physical problems. The main challenge when investigating a physical system is to develop exact, non-perturbative means in order to tackle physically relevant questions in the most indubitable manner possible. Integrability offers such an exact framework, and this is one of its great appeals. Beyond their physical significance, such models are also of great mathematical interest since their investigations entail the development of intriguing algebraic and geometric structures, whose study has increasingly grown over the last decades.

Within the integrability frame we plan to further investigate integrable models in the presence of defects (impurities). In a series of recent papers [1]-[4], various types of defects within the spin chain context have been treated with the use of the Bethe ansatz framework, and the relevant physical transmission amplitudes were derived. The situation therefore within the spin chain frame is more or less well understood and controlled. Moreover, the findings of these investigations may be mapped in a straightforward manner to integrable quantum field theories, such as the sine Gordon model, the Gross-Neveu model or the Principal Chiral model (PCM), given that both discrete integrable models and integrable field theories share the same algebraic content. A particularly interesting direction to pursue would be the study of integrable defects in connection with dynamical algebras. The first step towards this direction would be the identification of the associated defect matrices that is classification of generic representations of the dynamical algebras. A direct connection with 2D statistical modes such as the SOS/RSOS models would be then possible via the face-vertex transformation providing results of great physical as well as algebraic meaning.

Furthermore, we plan to investigate integrable boundary field theories in connection with the so called augmented 1-Onsager algebra. More precisely, it has been suggested by P. Baseilhac that the boundary ATFT hamiltonians built in [5] with the specific boundary-dependent terms, may be seen as classical limit of a quantum representation of the augmented q-Onsager algebra. We plan to systematically investigate this possible connection.

References

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