Talks and Abstracts at IQSCA
Varna, 11-18.08.2024

Changrim Ahn
New integrable RG flows with parafermions

We consider irrelevant deformations of massless $RSOS$ scattering theories by an infinite number of higher $T\bar{T}_{s+1}$operators which introduce extra non-trivial CDD factors. It is shown that the resulting theories can be UV complete after bypassing typical Hagedorn-like singularities if the coefficients of the deformations are fine-tuned. In this way, we have discovered that two new UV complete $QFTs$ are associated with a M_p (p=3,4,…) minimal CFT based on the integrable structure of the $RSOS$ scattering theory. One is the massless Z_{p-1} parafermionic sinh-Gordon models ($PShG$) with a self-dual coupling constant. This correspondence is confirmed by showing that the scale-dependent vacuum energies computed by the thermodynamic Bethe ansatz based on the S-matrices match those from the quantization conditions for the $PShG$ models using the reflection amplitudes. The other UV QFT is reached from M_p by following the roaming trajectory of the Z_{p-1} parafermionic minimal series.

Hrachya Babujian
Asymptotic factorization of n-particle SU(N) form factors

We investigate the high energy behavior of the SU(N) chiral Gross-Neveu model in 1 + 1 dimensions. The model is integrable and matrix elements of several local operators (form factors) are known exactly. The form factors show rapidity space clustering, which means factorization, if a group of rapidities is shifted to infinity. We analyze this phenomenon for the SU(N) model. For several operators the factorization formulas are presented explicitly.

Nikolay Bobev
A compendium of logarithmic corrections in AdS/CFT

I will discuss logarithmic corrections to various CFT partition functions in the context of the AdS_4/CFT_3 correspondence for theories arising on the worldvolume of M2-branes. I will use four-dimensional gauged supergravity and heat kernel methods to derive general expressions for the logarithmic corrections to the gravitational on-shell action or black hole entropy for a number of different supergravity backgrounds. I will outline several subtleties and puzzles in these calculations and will show how they provide non-trivial precision tests of the AdS/CFT correspondence. These results have important implications for the existence of scale separated AdS vacua in string theory and for effective field theory in AdS more generally.

Simon Ekhammar
Strongly Coupled N=4 SYM via Integrability

N=4 Super Yang-Mills remarkably exhibits integrability in the planar limit. In particular, the full non-perturbative spectrum is encapsulated in the integrability-based Quantum Spectral Curve (QSC). An exciting regime is the strong coupling limit which, through the AdS/CFT-correspondence, is related to free strings on AdS5*S5. However, while the QSC can be readily solved at weak coupling, strong coupling has proved much more challenging. In this talk I will discuss recent progress in solving it at strong coupling and present new results for the spectrum of strongly coupled N=4 SYM. (Based on 2406.02698 with Nikolay Gromov and Paul Ryan)

Sascha Gehrmann
Scaling limit of the ground state Bethe roots for the inhomogeneous XXZ spin-1/2 chain

In this talk, we discuss the scaling limit of a certain critical spin chain which is a multiparametric integrable generalization of the Heisenberg model. Evidence is presented that the scaled Bethe roots for the ground state are described by a class of second order differential equations, which are multi-parametric generalizations of the Schrödinger equation for the anharmonic oscillator. This remarkable relation is a manifestation of the ODE/IQFT correspondence which is reviewed in Kotousov's talk.

Alessandro Georgoudis
The O(N) monolith reloaded: sum rules and form factor bootstrap

In this talk I will present the S-matrix bootstrap program and its application to the study of 2d gapped and UV complete QFTs. In our work we extend the known results from pure S-matrix bootstrap by including into the set-up form factors and spectral functions of the stress energy tensor and conserved currents. I will explain how this extended set-up works and show how the associated sum rules allows us to put bounds on quantities like the central charge of the underlying conformal theories in the UV. In this context I will show how from our results a big portion of the boundary of the space of allowed theories can only flow from CFTs with infinite central charges. I will track this result down to a particular behaviour of the amplitudes in physical kinematics and discuss its physical implications. Based on arxiv:hep-th/2311.03031 in collaboration with L. Córdova, M. Correia and A. Vuignier.

Tamas Gombor
Exact overlaps for integrable boundary states of gl(N) symmetric spin chains

In recent years, there has been growing interest (both in statistical physics and in the AdS/CFT duality) in exact overlaps between boundary and Bethe states. Combining the algebraic Bethe Ansatz with the KT-relation (which is the defining equation of the integrable boundary states), a sum rule of off-shell overlaps can be derived. This sum rule is sufficient to express the on-shell overlaps in a determinant form. The results can be extended to the so-called integrable matrix product states.

Nikolay Gromov
Massless excitations from QSC: from N=4 BFKL to AdS3/CFT2

Jesper Jacobsen
Exact three and four-point correlation functions in the O(n) model

We obtain an exact expression for the three-point functions of operators in the O(n) loop model. These operators are of two types: diagonal operators which modify the weighting of loops surrounding the inserting point, and non-local operators which insert a number of defect loop strands. The corresponding results for four-point functions are not yet complete, but we report some remarkable observations hinting that also this problem are amenable to analytic progress.

Moritz Kade
Supersymmetric brick wall diagrams and the dynamical fishnet

I will introduce the superspace formulation of the double-scaled $/beta$-deformation of N=4 SYM, a dynamical fishnet χ-CFT. This superconformal QFT admits regular brick wall vacuum Feynman supergraphs in the planar limit. The superpropagators can be interpreted as lattice weights and the vacuum graphs as periodic partition functions, such that by the method of inversion relations the free energy in the thermodynamic limit is obtained. In the QFT context this quantity corresponds to its critical coupling.

Gleb Kotousov
Uncovering new integrable structures via the ODE/IQFT correspondence

The ODE/IQFT correspondence was originally discovered as a relation between the vacuum eigenvalues of the integrals of motion of the quantum KdV integrable structure and the spectral determinants of the radial Schordinger equation of the 3D quantum mechanical anharmonic oscillator. Its proof is based on the so-called quantum Wronskian relation, which for the spectral determinants is derived using a certain symmetry property of the ODE. In this talk we present a class of 2nd order differential equations, which are multi-parametric generalizations of the Schrodinger equation for the anharmonic oscillator. It is arranged such that the quantum Wronskian relation still holds true. We argue that the ODEs encode the vacuum eigenvalues of a new multiparametric integrable structure that appears in the scaling limit of the inhomogeneous six-vertex model at criticality.

Gabriel Lefundes
Wrapping the (twisted) pair of pants

Hexagonalization is a powerful method for computing observables in $N = 4\ SYM$, particularly 3-point functions (which can be regarded as a pair of pants). However, the re-summation of wrapping contributions in $N = 4\ SYM$ remains unclear in this language. In this talk, we will explain how hexagonalization can be used to study the wrapping effects in the 3-point function of three BPS operators in a twisted version of $N = 4\ SYM$. Our results will be compared with those obtained from localization.

Mustafa Mullahasanoglu
Lens partition functions and integrability properties

We study lens partitions functions for the three-dimensional N=2 supersymmetric gauge theories on S3b/Zr. We consider equalities as hyperbolic hypergeometric solutions to the star-triangle and the star-star relations via the gauge/YBE correspondence. The correspondence allows the construction of integrable lattice spin models of statistical mechanics by the use of integral identities.

Enrico Olivucci
Multi-point multi-loop conformal Feynman diagrams: new results

Vincent Pasquier
Time correlations in integrable finite temperature models

A notoriously difficult problem is the evaluation of time-dependent correlation functions in integrable models. This is already a challenge for the ground state and even more in a finite temperature state. Nevertheless, some techniques have made it possible to make some progress. I will present the case of density correlations in the Box ball model where the generated hydrodynamics allows to make a simple prediction. Spin correlations in integrable spin chains are much more difficult. The paradigmatic case is the Landau Lifshits (LL) model. Numerical simulations of several groups suggest that they follow the physics of KPZ. I will present a discretization of LL mimicking the Boxball model hoping that this will trigger progress.

Balázs Pozsgai
Exact computations with free fermions in disguise

Recently a new family of spin chain models was discussed, which can be solved by free fermionic operators. The solution is different from the Jordan-Wigner transformation, and the fermionic operators are more complicated expressions of local operators. We review this topic and we present recent results about computing real time evolution in these models.

Radoslav Rashkov
On holographic complexity: warped CFT

The holographic duality of asymptotic 3D/2D CFT is supposed to be integrable on both sides in many instances. In this short note we will discuss the complexity of the dual CFT of warped 3D backgrounds in the context of holographic correspondence. The main focus will be Krylov complexity approach and its relations to Nielsen complexity. Some additional (and unexpected) relations will be briefly
discussed.

Ana Retore
Two perspectives on elliptic deformations of AdS3xS3 S-matrices

The presence of integrability in the context of AdS/CFT led to enormous progress in the understanding of this gauge/gravity duality, while at the same time advancing integrability itself. Since then, integrable deformations of the original worksheet S-matrices were constructed both in AdS5 and in lower dimensional AdS backgrounds and led to interesting developments in both classical and quantum integrability. This talk will be dedicated to two new integrable elliptic deformations of the AdS3 S-matrix. The first is an exact deformation obtained from a purely integrability point of view, via the Boost automorphism mechanism. The second is the tree-level worldsheet S-matrix of an elliptically-deformed bosonic sigma model on AdS3xS3, computed in an attempt to give meaning to the first one. In this talk, we will explain the construction and the known properties of these two objects, and whether they are or not connected.

Didina Serban
Correlation functions in the N=2 twisted orbifold SYM theory

I will present a work in progress concerning the computation of the three point function for BPS twisted operators from integrability, and the comparison with the results from localisation.

Alexander Tumanov
Bootstrapping form factors through six loops and beyond

I will present the latest developments within the perturbative bootstrap program for form factors in N=4 SYM theory. Perturbative bootstrap approach aims at evaluating different types of scattering-related observables at high loop orders without relying on Feynman integral calculations. Instead, it utilizes various constraints inspired by integrability, cluster algebras, and general analytic properties of the amplitudes. I will give a general overview of the program, as well as the underlying integrability description that it relies on, and present the newly obtained results for the three-point form factor of Tr{phi^3}

Milen Yakimov
Finite generation and representation theory of quantum cluster algebras at roots of unity

We will address two problems on quantum cluster algebras. The first is about transferring finite generation from classical to quantum cluster algebras and back. We will describe an if and only if result, based on techniques from Cayley-Hamilton algebras. The second problem is about the classification of irreducible representations of quantum cluster algebras at roots of unity. We will describe those of maximal dimension, i.e., the so called Azumaya loci. The talk is based on joint works with Shengnan Huang, Thang Le, Greg Muller, Bach Nguyen and Kurt Trampel.

Konstantin Zarembo
Chiral symmetry restoration in Gross-Neveu model

The GN model features a non-trivial phase diagram at finite temperature and density that has been extensively studied in the large-N (mean-field) approximation. Which in particular predicts a crystalline phase at high densities. At the same time the models is integrable and can be solved by Bethe Ansatz. This can be used to elucidate the true nature of the high-density state.