MP 13: Quantum Field Theory III

Time: Thursday 15:40–17:00 Location: HL 001

MP 13.1 Thu 15:40 HL 001

An Oscillator Construction for 4d CFT — •Katharina Wölfl — Theoretisch-Physikalisches-Institut, FSU Jena

Conformal blocks are the building blocks of correlation functions, which encode the dynamical properties of a CFT, thus solving it. They are completely determined by conformal symmetry, however the calculations often prove to be rather tedious and restricted to special cases. I will therefore present an oscillator construction for the four-dimensional Euclidean Conformal Field Theory, which can be used to calculate lower point correlation functions and promises results for higher-point conformal blocks.

MP 13.2 Thu 16:00 HL 001

Analytic bootstrap for conformal defects — •Davide Bonomi[1], Lorenzo Bianchi[2], Elia de Sabbata[2], Aleix Gimenez-Grau[3], and Valentina Forini[4] — [1]City, University of London — [2]Università di Torino — [3]Institut des Hautes Études Scientifiques — [4]Humboldt Universitat zu Berlin

I will discuss line defects from the point of view of the analytic conformal bootstrap. These defects can represent magnetic impurities in condensed matter systems, such as quantum antiferromagnets. After reviewing a recently derived conformal dispersion relation, I will apply it to compute the two-point functions of bulk operators in presence of a localized magnetic field or a spin impurity in the critical O(N) model. I will discuss the defect and bulk CFT data that one can extract from it. Finally, I will present another dispersion relation that allows to compute the four-point function of defect operators.

MP 13.3 Thu 16:20 HL 001

Obstructions to higher-dimensional second-order superintegrability — •Andreas Vollmer — Universität Hamburg, Deutschland

Superintegrable systems are crucial models in Physics, such as the harmonic oscillator and the Kepler-Coulomb system. The talk will focus on second-order (maximally) superintegrable systems (of a special non-degenerate type) on the cotangent space of a Riemannian manifold. The classification of such systems is an ongoing problem, and to date only achieved in low dimension.

A novel geometric framework will be outlined, which is manageable for arbitrary dimension (encoding a superintegrable system via a (0,3)-tensor field) and is naturally adapted to conformal rescalings (replacing Stäckel transformations / coupling constant metamorphosis).

The main part of the talk will present concise algebraic obstructions for this type of superintegrability. These are relevant in dimensions starting from four, and they are not present in lower dimensions. In dimension four the obstruction condition leads to an algebraic variety isomorphic to a 10-dimensional spinor variety in a pseudo-Euclidean space with split signature.

Time permitting, affine hypersurfaces that are naturally associated to superintegrable systems will also be briefly discussed.

Joint projects with V. Cortés, H.-C. Graf v. Bothmer, J. Kress and K. Schöbel.

MP 13.4 Thu 16:40 HL 001

Verallgemeinerte Geometrie und Sigma-Modelle — •David Osten — IFT, Uniwersytet Wrocławski, Polen

Sigma-Modelle sind eine große Klasse an Theorien, omnipräsent in vielen Bereichen der Physik – von der Theorie der kondensierten Materien, über Teilchen- und Gravitationsphysik, bishin zu Stringtheorie. In diesem Vortrag möchte ich motivieren, wie ein mathematisches Werkzeug aus der Stringtheorie, namentlich Dualitätssymmetrien und deren mathematische Beschreibung durch sogenannte Verallgemeinerte Geometrie, benutzt werden kann, um neue Einblicke in Eigenschaften, Konstruktion und Interpretationen von Sigma-Modelle zu bekommen.

Ich werde die drei wichtigsten weiterführenden Resultate dieses Formalismus kurz skizzieren:

1.) Die Konstruktion neuer (klassisch) integrabler Feldtheorien und die Möglichkeit diese zu quantisieren.

2.) Für die Sigma-Modelle, die in String- und M-theorie auftachen, kann Dualitätssymmetrie als ein alternatives Symmetrieprinzip zu Super- oder konformer Symmetrie dienen.

3.) Sigma-Modelle können als Dynamik in nicht-kommutativen Raumzeiten verstanden werden.