MP 6: Nonperturbative QFT and Strong Fields

Zeit: Mittwoch 14:00–15:50 Raum: Z6 - SR 1.012

MP 6.1 Mi 14:00 Z6 - SR 1.012

Hamiltonian lattice gauge theory and Weyl quantization — •Alexander Stottmeister — Dipartimento di Matematica, Università degli Studi di Roma "Tor Vergata", Via della Ricerca Scientifica 1, 00133 Roma, Italia

Weyl quantization and an adapted pseudo-differential calculus may serve as powerful tool to discuss the semi-classical limit of quantum systems. We will present results regarding the construction of a Weyl quantization for Hamiltonian gauge theories defined on directed systems of (finite) graphs. Moreover, we will approach the problem of defining associated symbol spaces and their pseudo-differential calculus. Finally, we dicuss the construction of states and methods to control the type of the resulting observable algebras.

MP 6.2 Mi 14:20 Z6 - SR 1.012

Dualization of Four-Fermion Theories — •Julian Lenz, Björn Wellegehausen, and Andreas Wipf — Theoretisch-physikalisches Institut, FSU Jena, Germany

Four-fermion theories arise as effective theories in solid state physics (e.g. graphene, superconductors) and serve as a toy model for chiral symmetry breaking. They are perturbatively non-renormalizable and strongly coupled, such that non-pertubative methods are required to investigate their properties. Our method of choice are lattice simulations, which for these theories suffer from a fermion sign problem, making standard Monte-Carlo methods inefficient. In the talk we present a dualization of Gross-Neveu- and Thirring-like theories to tackle the sign problem and develop efficient algorithms for lattice simulations.

MP 6.3 Mi 14:40 Z6 - SR 1.012

A curvature bound from gravitational catalysis — •Riccardo Martini and Holger Gies — TPI, FSU Jena

Gravitational catalysis expresses an interplay between the curvature of the spacetime and fluctuation-induced mass generation of quantum matter. I will show how a scale-dependent analysis of this phenomenon on local AdS backgrounds allow us to identify bounds on the curvature of local patches of spacetime, based on the requirement of long-range chiral symmetry. The bound will be expressed in terms of the ratio between the local scalar curvature and the gauge-invariant coarse-graining scale, pointing out a dependence of the result on the relevant modes of the observed physics. I will also show some extensions of this result to higher-dimensional spacetimes.

10 min. break

MP 6.4 Mi 15:10 Z6 - SR 1.012

Nonperturbative QFT and the unstable quantum vacuum — •Ibrahim Akal[1] and Gudrid Moortgat-Pick[2] — [1]DESY, Hamburg, Germany — [2]University of Hamburg, Hamburg, Germany

In this talk, we will discuss vacuum instability in the presence of strong background gauge fields. More precisely, we will focus on certain nonperturbative techniques in QFT which are particularly advantageous in dealing with highly inhomogeneous backgrounds. Some explicit examples will be presented.

MP 6.5 Mi 15:30 Z6 - SR 1.012

Solving the Semiclassical Einstein Equation and a Moment Problem — •Daniel Siemssen — Universität Wuppertal, Wuppertal, Deutschland

I will present a novel approach towards solving the semiclassical Einstein equation in cosmological spacetimes. Different from previous approaches, this approach allows for arbitrary curvature coupling and full renormalization freedom. The method consists of two parts: 1) an infinite dimensional dynamical system, and 2) a moment problem.