MP 11: Noncommutative Geometry

Zeit: Donnerstag 9:30–10:20 Raum: JUR H

MP 11.1 Do 9:30 JUR H

Algebraic approach to quantum field theory on a class of noncommutative curved spacetimes — Thorsten Ohl and •Alexander Schenkel — Lehrstuhl für Theoretische Physik II, Universität Würzburg, 97074 Würzburg, Deutschland

In this talk (based on arXiv:0912.2252[hep-th]) we explain how to construct the quantum field theory of a free real scalar field on a class of noncommutative manifolds, obtained via deformation quantization using triangular Drinfel'd twists. We define action functionals in the framework of twist-deformed differential geometry, derive the associated equations of motion and solve them in terms of formal power series. In analogy to the commutative case, we can construct the Weyl algebra of field observables, which depends in general on the deformation of spacetime. We give an outlook to applications of our approach to noncommutative cosmology and black hole physics.

MP 11.2 Do 9:55 JUR H

Instantons in Noncommutative Gauge Theory in Four Dimensions on the Lattice — Arifa Ali Khan[1] and •Harald Markum[2] — [1]University of Taiz, Yemen — [2]Vienna University of Technology, Austria

Theories with noncommutative space-time coordinates represent alternative candidates of grand unified theories. We discuss U(1) gauge theory in 2 and 4 dimensions on a lattice with N sites. The mapping to a U(N) plaquette model in the sense of Eguchi and Kawai can be used for computer simulations. In 2D it turned out that the value of the topological charge is decreasing during a Monte Carlo history. This shows that the topological charge is in general supressed. The situation is similar to lattice QCD where gauge field configurations are topologically trivial and one needs to apply some cooling procedure on the gluons to unhide the integer number of the instantons. In 4D the definition of a monopole observable seems to be difficult. The analogy to commutative U(1) theory of summing up the phases of an elementary cube might need a projection on the abelian part of the U(N) theory in the matrix model. Concerning the topological charge it seems straightforward. One can transcribe the plaquette and hypercube formulation to the matrix theory. There are several possible choices of noncommutativity amoung the six planes in 4D. The simplest is to use two noncommutative coordinates. One has to modify the Monte Carlo update correspondingly. It will be interesing to measure the topological charge in the non/commutative plane and in the hypercube.