MP 11: Nichtkommutative Geometrie

Zeit: Donnerstag 14:00–15:20 Raum: M010

MP 11.1 Do 14:00 M010

Free quantum groups and their non-commutative geometry — •Andreas Thom — Mathematisches Institut der Georg-August Universität Göttingen, Bunsenstr. 3-5, 37073 Göttingen, Germany

We compute the Hochschild homology of the free orthogonal quantum group $A_o(n)$. We show that it satisfies Poincare duality and should be considered to be a 3-dimensional manifold. We study the Dirac operator related to the Casimir of the action of $O(n)$. In part, this extends work on the (more) classical q-deformations of $SU(2)$.

MP 11.2 Do 14:20 M010

Matrix Models, Noncommutative Gauge Theory and emergent Gravity — •Harold Steinacker — Fakultät für Physik, Universität Wien

Matrix Models of Yang-Mills type are studied with focus on the effective geometry. It is shown that SU(n) gauge fields and matter on general 4-dimensional noncommutative branes couple to an effective metric, leading to emergent gravity. The effective metric is reminiscent of the open string metric, and depends on the dynamical Poisson structure. Covariant equations of motion are derived, which are protected from quantum corrections due to an underlying Noether theorem. The quantization is discussed qualitatively, which singles out the IKKT model as a candidate for a quantum theory of gravity coupled to matter. UV/IR mixing plays a central role. A mechanism for avoiding the cosmological constant problem is exhibited.

MP 11.3 Do 14:40 M010

Noncommutative geometry and its application to the standard model — •Pierre Martinetti — Georg-August Universität, Göttingen

We shall give an overview of the description of the standard model of particle physics minimally coupled to gravity within the framework of noncommutative geometry. Especially we shall study in detail the metric structure of spacetime that emerges from the spectral triple recently proposed by Chamseddine, Connes and Marcolli.

Within this framework points of spacetime acquire an internal structure inherited from the gauge group of the standard model. A distance is defined on this generalized spacetime which is fully encoded by the Yang-Mills gauge fields together with the Higgs field.

We will focus on some explicit examples, underlying the link between this distance and other distances well known by physicst and mathematicians, such has the Carnot-Carathéodory horizontal distance or the Monge-Kantorovitch transport distance.

MP 11.4 Do 15:00 M010

Symmetry Reduction in Twisted Noncommutative Gravity with Applications to Cosmology and Black Holes — •Alexander Schenkel and Thorsten Ohl — Lehrstuhl für Theoretische Physik II, Universität Würzburg, 97074 Würzburg, Deutschland

Noncommutative Riemannian geometry is an attractive mathematical tool for constructing modifications of Einsteins theory of general relativity. One particular approach is to deform the symmetries of gravity, i.e. the diffeomorphisms, into a noncocommutative Hopf algebra and establish a gravity theory based on these deformed symmetries. Having such a deformed theory, it is of great importance to understand symmetry reduction in this framework in order to apply it to physical problems, like e.g. cosmology or black holes.

In this presentation we will focus on twisted noncommutative gravity theories constructed by abelian twists and discuss symmetry reduction in these models. We will apply the formalism to FRW cosmology and black holes and classify all possible models for this particular class of twists. As one result we obtain isotropic twists for FRW universes and twists of black holes, which are invariant under all classical black hole symmetries.