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One-loop order quantum properties for κ-Poincaré invariant scalar field thories with KMS weight.

It is widely believed that the classical notion of space-time is no longer adequate at the Planck scale to reconcile gravity with quantum mechanics. One possible attempt to reach this goal comprises to trade the continuous smooth manifold describing the space-time by a non-commutative space. In this spirit, κ-Minkowski appears to be one of the most studied (Lie algebra type) non-commutative space and is sometimes regarded as a promising candidate to be involved in the description of quantum gravity models.

Although the classical properties of κ-Minkowski have been extensively studied in the literature, almost nothing have been done in the study of its quantum properties.

I will talk about my latest results in that direction presenting the computation of the one-loop 2-point and 4-point functions for various classes of κ-Poincaré invariant scalar field theories with quartic interactions whose commutative limit coincides with the usual ϕ^4 theory. The computations are performed using a star product obtained from mere adaptation of the Weyl quantisation scheme. I will show that the κ-Poincaré invariance forces the integral involved in the action to be a twisted trace, thus defining a KMS weight for the non-commutative C^*-algebra modeling κ-Minkowski. In all the field theories, the twist generates different planar one-loop contributions to the 2-point function which are at most UV linearly diverging and the one-loop quantum corrections to the 4-point function appears to be finite. In other models, UV/IR mixing shows up in non-planar contributions at exceptional zero external momenta while staying finite otherwise.