

Gauge Theories on a Noncommutative Poisson Manifold as Spacetime

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Abstract

We construct a model of internal gauge theory defined on a noncommutative Poisson manifold considered as space-time. A covariant star product between Lie algebra valued differential forms is introduced in order to develop the gauge theory. The constraints imposed by the Poisson structure on the connection of the space-time are established and the property of associativity of the covariant star product is verified. As an example, we consider the $U(2)$ noncommutative gauge theory defined on a symplectic space-time manifold endowed only with torsion. It is concluded that the constraints imposed by the Poisson structure of the space-time and the associativity property of the covariant star product completely determine in this case the connection of the space-time. Some comments on the noncommutative gauge theory of gravitation are also made and possible generalizations are emphasized.