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22. Non Commutative Quantum Mechanics in Time-Dependent Backgrounds

Antony Streklas
Department of Mathematics, University of Patras, Patras 26500 Greece.

The idea of non commutative space - time was presented by Snyder in 1947, with respect to the need to regularize the divergence of the quantum field theory. The idea was suggested by Heisenberg in 1930. In the past few years there has been an increasing interest in the non commutative geometry. For a manifold parametrized by the space - time coordinates x^μ , the commutation relations can be written as

$$[x^\mu, x^\nu] = i\theta^{\mu\nu}, \quad \mu, \nu = 0, \dots, d$$

In this article we have found the exact propagator of a two dimensional harmonic oscillator in non commutative quantum mechanics, where the ordinary non commutative parameters $\theta^{\mu\nu}$ are time dependent. Non commutativity of the momenta means that there is a time dependent magnetic field present. The Hamiltonian of the system is a linear combination of two Caldirola - Kanai Hamiltonians with two distinct friction parameters. We find the exact propagator of the system.