Universidad de Burgos
Mathematical Physics Group

Q-CAYLE COMUNICACIONES CUÁNTICAS

Fundamental decoherence from quantum spacetime

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Abstract: The emergence of the classical macroscopic world from the microscopic quantum realm is a long-standing open problem. I will show that quantum properties of spacetime, encoded by noncommutativity at the Planck scale, lead to a generalized time evolution of quantum systems in which pure states can evolve into mixed states. Specifically, a Lindblad equation arises naturally as the evolution equation of quantum systems living in a noncommutative spacetime, where the symmetry generators are deformed and described by nontrivial Hopf algebras. This leads to a fundamental decoherence mechanism by which the density operator of a quantum system asymptotically approaches a maximally mixed state. By analysing the decoherence time for the evolution of a free particle I will also show that that the Planck mass is the maximum allowed mass for elementary quantum systems.

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