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The manifold of pure states in Quantum Field Theory on curved space-times

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SUMMARY

Quantum Field Theory (QFT) is the current paradigm under which particle physics has achieved, so far, the most astonishingly accurate predictions of a physical theory. Nonetheless, the current paradigm to describe gravity is General Relativity (GR), which is a classical theory that studies curvature on the space-time manifold. Our group is trying to generalize Hamiltonian hybrid quantum-classical theories developed for molecular models [1], to the framework of spacetime-fields, by considering a model of the classical gravitational field coupled to a quantum matter scalar field. The first step is to consider the theory over a Cauchy hypersurface (see [2]), which represents a slice of space detached from time. Then we should characterize geometically the Schrödinger picture of QFT [3], as a Hamiltonian vector field over the infinite dimensional manifold of pure states [4]. Such manifold is modelled over the Nuclear-Frechet (NF) space of Hida test functions. In this talk we motivate the use of Nuclear spaces as models of infinite dimensional geometry [5] and relate well known results of gaussian integration theory over strong duals of NF spaces with the particle interpretation of QFT [6, 7].

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