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Fall of Casimir energy in the non-commutative space-time.

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Non-commutative geometry as a possible paradigm to understand quantum gravity is gaining more attention in last decades. Non-commutativity of the space-time breaks the Lorentz invariance and one uses Hopf algebra structure to regain consistent particle interpretation. It is thus of importance to study the status of equivalence principle in the non-commutative space- time.

We examine how the Casimir energy in the κ-space-time falls under the action of gravity. This is done by calculating the scalar field in the background of κ-deformed space-time. We set up the Casimir plates in a gravitational field using κ-deformed Rindler coordinates and compute the total force acting on the Casimir apparatus in a weak gravitational field. We show that the Casimir energy, including the divergent part (self-energies of the plates), gravitates like a conventional mass. This result implies that the mass-energy equivalence principle is upheld in κ-deformed space-time, even with the incorporation of a fundamental length scale due to space-time non-commutativity.

Track type

Dark Energy and Modified Gravity

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