Loop Quantum Gravity Effects and Electromagnetic Properties of Charged Leptons

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Resumo

The efforts in this contribution consist in reassess a modified Dirac equation with a $\gamma^0\gamma_5$ Lorentz symmetry violating (LSV) term motivated by Loop Quantum Gravity (LQG). Originally, this equation was applied and understood as a good candidate for explaining a series of analyses on the flight time of cosmic photons and neutrinos which suggests that the speed of light in vacuum takes the energy-dependent form, e.g. $v(E) = 1 \pm E/E_{\text{LSV}}$ with $E_{\text{LSV}} \approx 6,5 \times 10^{17}$ GeV for neutrinos. Once LQG provides a viable way to understanding the aforementioned picture consistently, we present an analysis of the Dirac equation, encompassing various outcomes. These include the derivation of the modified fermionic propagator, exploration of the Gordon decomposition of the vector current with minimal coupling, investigation of form factors, examination of the non-relativistic limit of the equation, and evaluation of the impact of the modified Hamiltonian in this limit on the energy levels of the hydrogen atom.

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