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Probing Extended Gravity with Neutrinos

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We study neutrino oscillations within the framework of extended theories of gravity. Based on the covariant reformulation of Pontecorvo's formalism, we evaluate the oscillation probability of neutrinos propagating in static spacetimes described by gravitational actions quadratic in the curvature invariants. Calculations are carried out in the two-flavor approximation, for oscillations both in vacuum and matter. It is shown that the neutrino phase is sensitive to the violation of the strong equivalence principle. By way of illustration, we specialize our analysis to various extended models of gravity in order both to quantify such a violation and to understand how the characteristic free parameters of these models affect the neutrino phase. The possibility to fix new bounds on these parameters and to constrain extended theories of gravity is finally discussed.

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