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Neutrino physics in extended theories of gravity

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In this talk, I summarize the investigation revolving around neutrino physics within the framework of extended theories of gravity. By relying on the covariant reformulation of Pontecorvo's formalism, one can evaluate the oscillation probability of neutrinos propagating in static spacetimes described by gravitational actions quadratic in the curvature invariants. In particular, it is shown that neutrino oscillations are sensitive to the violation of the ***strong equivalence principle*** (SEP) in such a way that the aforesaid occurrence leads to phenomenologically testable implications. Indeed, it is possible to check that the parameter quantifying SEP directly appears in the expression of the oscillation phase, and as long as this correction is non-vanishing the flavor transition probability is different from the flat case.

By way of illustration, I specialize the above study to specific extended theories of gravity in order both to quantify SEP violation and to understand how the characteristic free parameters of these models affect the neutrino phase. In passing, the possibility to fix new bounds on these parameters (and hence to constrain extended theories of gravity) is also discussed.

Collaboration name

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