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A treatment to gravitational perturbations and Lorentz-violating effects with Lagrangian analysis

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Since the first direct detection to the gravitational wave (GW), i.e., the event GW150914, it has emerged as a blockbuster during the past decade within the realm of theoretical physics. Specially, it provides us with an unprecedented opportunity in testing theories of gravity that beyond the scope of general relativity (GR), especially in the strong-field regime. One common way for extracting physical information and observables encoded in a theory's Lagrangian is to execute the gravitational perturbations on it. Unfortunately, due to the sophisticated structure of, e.g., the Lorentz-violating (LV) theory, which predicts multiple horizons that beyond GR and plays an important role in constructing the quantum gravity, many attempts in this area are meeting a great challenge under the traditional treatment. To eliminate this challenge, here we will introduce a novel treatment for this sort of problems, which can be expediently referred as Lagrangian analysis. It can not only reveal the inherent stability of the theory but also lead us to the effective derivation process of the corresponding GWs. Hopefully, several research sub-branches, including the study of modified theories of gravity and their combinations with GW observations, will benefit from the development of this novel treatment to gravitational perturbations. More details will be given in the talk.

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