

A spectre is haunting the cosmos: Quantum stability of massive gravity with ghosts

Yashar Akrami
Institute for Theoretical Physics
University of Heidelberg
Germany

Many theories of modified gravity with higher order derivatives are usually ignored because of serious problems that appear due to an additional ghost degree of freedom. Most dangerously, it causes an immediate decay of the vacuum. However, breaking Lorentz invariance can cure such abominable behavior. By analyzing a model that describes a massive graviton together with a remaining Boulware-Deser ghost mode I will show that even ghostly theories of modified gravity can yield models that are viable at both classical and quantum levels and, therefore, they should not generally be ruled out. Furthermore, I will identify the most dangerous quantum scattering process that has the main impact on the decay time and find differences to simple theories that only describe an ordinary scalar field and a ghost. Additionally, constraints on the parameters of the theory including some upper bounds on the cutoff at which Lorentz invariance is broken, as well as their relevance to other theories of modified gravity, will be discussed.