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Extended Effective Field Theory of Dark Energy

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We continue our studies of the ghost condensate (GC) with sixth-order dispersion relation. Contrary to the GC with quartic dispersion relation, we find that the correction to the Newtonian potential explicitly depends on the space and time dependence of matter density. At late times when the Newtonian potential becomes time-independent, one obtains similar oscillatory behavior at the distance $\frac{M_{\text{Pl}}}{M^2}$, but this time at the time scale $\frac{M^4}{M_{\text{Pl}}^3}$, where M^2 is the ghost field velocity.

We also show that the speed of the gravitational wave is modified in a frequency-dependent manner at momenta close to $\frac{M_{\text{Pl}}}{\sqrt{|\sigma_1|}}$, where σ_1 is the coefficient of $\gamma^{ij}\nabla_i K_{lr}\nabla_j K^{lr}$ operator in the unitary gauge action.

Primary author: ASHOORIOON, Amjad (School of Physics, Institute for Research in Fundamental Sciences (IPM))

Presenter: ASHOORIOON, Amjad (School of Physics, Institute for Research in Fundamental Sciences (IPM))

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