

Title:

**Exorcism of A Ghost: An Effective Theory  
with A Sextic Dispersion Relation**

Candidate:

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Venue:

**Farmanieh Seminar Room D**

Time:

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Abstract:

The current acceleration of the universe, believed to be driven by a new form of energy-momentum, known as “dark energy”, is a relatively recent phenomena in cosmological time scales. The phenomenon has stirred many investigations, trying to understand its origin. It has also proven to be a suitable platform to construct and test the models of theoretical physics. In this thesis, we introduced a generalization to a particular class of Effective Field Theory (EFT) for cosmic acceleration, known as “Ghost Condensation”. We discuss the Ghost Condensate theory, its construction, and its generalization. Noting the newness of the dominance of dark energy, the modes exiting our horizon since the onset of this acceleration phase have not yet reached the exact infrared (IR) limit. Considering this aspect, we reevaluate the plausibility of a ghost condensate serving as dark energy, characterized by a sixth-order dispersion relation. By examining the three-point function within this theoretical framework, we derive constraints on the coefficient of the sixth-order dispersion relation to prevent strong coupling. Remarkably, we observe that this constraint can be easily met, without requiring fine-tuning. If such a ghost condensate is coupled to standard model fields, it gives rise to a distance-independent, Lorentz-violating, and spin-dependent force, capable of exhibiting both gravitational or anti-gravitational effects. Finally, we show that the gravitational Newtonian potential exhibits an oscillatory behavior in the non-expanding or expanding (de Sitter) spacetime.

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