

Theory: Aspects of kinetic screening - UV completion and the two-body problem

Thursday, September 7, 2023 5:30 PM (15 minutes)

New light scalar degrees of freedom may alleviate the dark matter and dark energy problems, but if coupled to matter, they generally mediate a fifth force. In order for this fifth force to be consistent with existing constraints, it must be suppressed close to matter sources, e.g. through a non-linear screening mechanism. The focus of this talk will be shift-symmetric scalar-tensor theories that exhibit kinetic screening (k-essence). First, I will discuss the theoretical consistency of such theories. In particular, whether screening is compatible with the standard UV completion and what kind of breaking of the shift symmetry preserves screening. Second part of the talk will focus on the two-body problem in k-essence. I will show how the Helmholtz decomposition of the Noether current associated to the shift symmetry allows for the analytic understanding of the two-body problem in a good agreement with the numerical results. In particular, the fifth force is screened slightly more efficiently in equal-mass systems than in the extreme mass-ratio ones. However, systems with comparable masses also exhibit regions where the screening is ineffective. These descreened spheroidal regions (bubbles) could in principle be probed in the solar system with sufficiently precise space accelerometers.

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