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Search for Screened Scalar Fields with Tabletop Experiments & LLR

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The origin of dark energy is one of the greatest puzzles in modern physics. Amending general relativity by the so-called cosmological constant Λ allows to describe an accelerated expansion. However, such a procedure would lead to a severe fine-tuning problem with many unresolved questions. Consequently, the existence of new hypothetical scalar fields has been postulated, which couple to gravity and can account for dark energy. Those new scalars generically lead to new interactions, so-called fifth forces and are theoretically well-motivated irrespective of their role for dark energy.

Many high precision table top experiments are in principle able to detect these fields. The theoretical and numerical analysis needed for the detection of several prominent fields is provided, with a main focus on the environment-dependent dilaton that arises in the strong coupling limit of string theory. The very first experimental constraints on the parameters of this model are presented. For this, data from the qBounce collaboration and Lunar Laser Ranging (LLR) is used. Furthermore, the expected exclusion plots for the Casimir And Non Newtonian force EXperiment (CANNEX) soon to be realised in an improved setup are presented.

Submitted on behalf of a Collaboration?

No

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