

Could the Vera Rubin Observatory, Euclid, and SKA put string theory under serious pressure ?

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We explore the ability of future cosmological surveys to put strong constraints on string theory, through the Swampland program. String theory is sometimes thought to be unfalsifiable due to the incredibly large amount of low energy effective versions that can be derived in this framework. However, it is well known that constructing consistent solutions in a de Sitter background is tremendously difficult. This led to speculative conditions on the possible shape of the potential of the effective dark energy scalar field. This postulate is referred to as the “de-Sitter conjecture” and low-energy effective theories that do not satisfy it are said to live in the Swampland. Future experiments, such as the Vera Rubin Observatory, Euclid or SKA, will set strong constraints on dark energy and we investigated their potential conflict with the Swampland theoretical conditions. In particular, we show that the expected constraints on the equation of states of dark energy might be in severe contradiction with the de Sitter conjecture and could therefore put string theory under real pressure. Our study is carried out for many different quintessence potentials and a very wide range of initial conditions.

Author: BARRAU, Aurélien (LPSC)

Orateur: BARRAU, Aurélien (LPSC)

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