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Physical non-viability of a wide class of f(R) models and their constant-curvature solutions

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Abstract

Constant-curvature solutions lie at the very core of gravitational physics, with Schwarzschild and (Anti)-de Sitter being two of the most paradigmatic examples. Although such kind of solutions are very well-known in General Relativity, that is not the case for theories of gravity beyond the Einsteinian paradigm. In this article, we provide a systematic overview on f(R) models allowing for constant-curvature solutions, as well as of the constant-curvature solutions themselves. We conclude that the vast majority of these f(R) models suffer, in general, from several shortcomings rendering their viability extremely limited, when not ruled out by physical evidence. Among these deficiencies are instabilities (including previously unforeseen strong-coupling problems) and issues limiting the predictive power of the models. Furthermore, we will also show that most f(R)-exclusive constant-curvature solutions also exhibit a variety of unphysical properties.

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