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Chameleon mechanism in inhomogeneous astrophysical objects

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Observational evidence implying the accelerated expansion of the universe has been the motivation to develop various classes of modified gravity theories. One of them uses the so-called “screening mechanism”, which is successful in reproducing the observed gravitational behavior in large scales as well as being in agreement with tests of general relativity in the solar system. In this work, we investigate an example of scalar-tensor theories with screening mechanism, namely the profile of a chameleon field around inhomogenous astrophysical objects. According to [2], one can define two kinds of approaches applicable to the thin shell and thick shell regimes, that allow for a solution to the chameleon equation of motion. For sufficiently large objects, the scalar field can be assumed to propagate from a thin shell of the object instead of the whole body, which simplifies problem. On the other hand, this solution is not practical in small objects. We find that in inhomogeneous objects this is not necessarily true and at least one more factor, which turns out to be the density, can change the way of approaching this problem.

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