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Screening effect in f(R) gravity and solar system tests

The f(R) theories of gravity rely on the chameleon mechanism to pass the solar system tests. Methods used in the literature are based in a scalar-tensorial identification in the Einstein frame. This approach has a disadvantage because it entails the definition of new variables being the inversion of the old variables not always well defined. To avoid this problem, we develop a novel and selfconsistent method that departs from a simple but fully relativistic system of differential equations for a compact object in a static and spherically symmetric spacetime, with suitable linearizations for non-relativistic objects like the Sun. We show that under certain conditions there is a screening effect that can lead to a Post-Newtonian Parameter γ which is compatible with the observational bounds. To illustrate this new method, we analyze several specific f(R) models and show which of them are able to satisfy those bounds.

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