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Energy Conditions in Non-minimally Coupled f(R,T) Gravity

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In today's scenario, going beyond Einstein's theory of gravity leads us to some more complete and modified theories of gravity. One of them is the f(R,T) gravity in which R is the Ricci scalar, and T is the trace of energy-momentum tensor. A well-motivated f(R,T) gravity model, $f(R,T) = R + \alpha RT$ where α is the model parameter is considered here. In this work, we studied the strong energy condition (SEC), the weak energy condition (WEC), the null energy condition (NEC), and the dominant energy condition (DEC) under the simplest non-minimal matter geometry coupling with a perfect fluid distribution. The model parameter α is constrained by energy conditions and the equation of state parameter $\omega = p/\rho$, resulting in the compatibility of f(R,T) models with the accelerated expansion of the universe. It is seen that the EoS parameter ω illustrate the quintessence phase $0 \geq \omega > -1$ in a dominated accelerated phase, $\omega = -1$ pinpoint to the cosmological constant, i.e., ΛCDM model and $\omega < -1$ yields the phantom era. Also, the present values of $H0 = 67.9$ and $q0 = -0.503$ are used to check the viability of f(R,T) gravity. It is observed that the positive behavior of DEC, WEC indicates the validation of the model. In contrast, SEC is violating the condition resulting in the accelerated expansion of the universe.

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