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A Reconstruction Scheme for a Modified Gravity Model in the Perturbation Level and Checking its Compatibility in the Primordial Nucleosysthesis and CMB Constraints

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Modified theories of gravity, an approach alternative to the theories of dark energy (DE), have gained considerable attention in recent years to describe the late time acceleration of the expanding universe that was observationally established by Riess et al. [1] of the high-redshift supernovae search team and Perlmutter et al. [2] of the supernovae cosmology project through accumulation of observational data from the distant type Ia Supernovae. The discovery of [1-2] has been further established by other observational studies including more detailed studies of supernovae and independent evidence from clusters of galaxies, large-scale structure (LSS) and the cosmic microwave background (CMB).

The present study reports a reconstruction scheme for f(T) gravity considering the scale factor in the power law form. The equation of state parameter has been studied for this reconstructed model along with the deceleration parameter and the statefinder pair {r, s}. The statefinder trajectory has been found to interpolate between dust and ΛCDM phase of the universe. Cosmological evolution of primordial perturbations has been studied through scalar metric fluctuations and finally the reconstructed f(T) model has been tested for its consistency with the generic expansion of the universe. We have studied the cosmological evolution of primordial perturbations through scalar metric fluctuations characterized by two functions Φ and Ψ, and under the consideration of vanishing anisotropic stress it has been taken that Φ = Ψ.

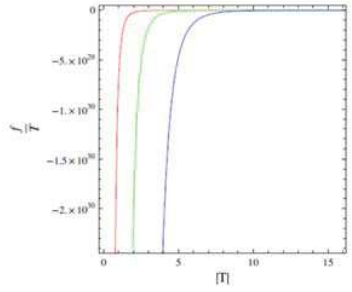

Fig.1. shows that f/T T gets very close to 1 as $|T| \to \infty$. This is compatible with the primordial nucleosynthesis and CMB constraints

Solving the scalar field background equation numerically in the perturbed equation of motion for the gravitational potential Φ in Fourier mode Φk, it is observed that Φk isincreasing with t. It has also been observed that as $k \to 0$, the scalar field φbecomes less. Considering the gauge-invariant variable ζ in a form suggested by [3] for f(T) cosmology, we observed that $\zeta_{\cdot k}$ is tending to 0 as k is tending to 0, which is consistent with the generic expansion of the universe..

1. A. G. Riess et al., Astron. J. 116, 1009 (1998).
2. S. Perlmutter et al., Astrophys. J. 517, 565 (1999)..
3. Y.-F. Cai, S.-H. Chen, J. B. Dent, S. Dutta and E. N. Saridakis, Class. Quantum Grav. 28 (2011) 215011.

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