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Holographic polytropic reconstruction model of f(T) gravity

The accelerated expansion of the universe is strongly manifested after the discovery of unexpected reduction in the detected energy fluxes coming from SNe Ia. Other observational data like CMBR, LSS and galaxy redshift surveys also provide evidences in this favor. These observations propose a mysterious form of force, referred as dark energy (DE), which takes part in the expansion phenomenon and dominates overall energy density of the universe.

Physical origin of DE is one of the largest mysteries not only in cosmology but also in fundamental physics. Holographic reconstruction of modified gravity model is a very active area of research in cosmology. Unfortunately, nature of DE is still not known and probably that has motivated theoretical physicists towards development of various candidates of DE and recently geometric DE or modified gravity has been proposed as a second approach to account for the late time acceleration of the universe. In literature, mostly reconstructed work has been done with polytropic EoS, family of holographic DE models, family of Chaplygin gas, scalar field models in general relativity as well as modified theories of gravity (in framework of $f(T)$ gravity).

The polytropic gas model can explain the EoS of degenerate white dwarfs, neutron stars and also the EoS of main sequence stars. The present paper reports a study on the cosmological consequences arising from reconstructing $f(T)$ gravity through new holographic-polytropic dark energy. We assume two approaches, namely a particular form of Hubble parameter H and a solution for $f(T)$. We obtain the deceleration parameter, effective equation of state as well as torsion equation of state parameters from total density and pressure in both cases. It is interesting to mention here that the deceleration and torsion equation of state represent transition from deceleration to acceleration phase. We study the statefinder parameters under both approaches which result that statefinder trajectories are found to attain ΛCDM point. The comparison with observational data represents consistent results. Also, we discuss the stability of reconstructed models through squared speed of sound which represents stability in late times.

Summary

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