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A Reconstruction scheme for f(T) gravity through interacting variable-generalized Chaplygin Gas form of dark energy and its thermodynamics

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Late time accelerated expansion of the Universe is well documented in the literature. An exotic matter, characterized by negative pressure is considered to be the driving force behind this late time acceleration of the Universe and it is dubbed as dark energy (DE). The negative pressure p leads to negative equation of state (EoS) parameter $w = p/\rho$, where ρ is the density of the Universe. In order the acceleration to occur, we require $w < -1/3$. If w is above -1 then we consider it to be quintessence and if below, then phantom. If there is a transition from quintessence to phantom, then we consider it to be quintessence. Although the cosmological constant Λ characterized by $w = -1$ happens to be the simplest candidate of DE, other models with time varying w have also been reported in the literature. These include scalar field models, Chaplygin gas models and holographic dark energy models. This study reports a study on a type of Chaplygin gas model, namely variable-generalized Chaplygin gas (VGCG) whose equation of state is $p = -A_0\, a^n/\rho$. In this study an interacting scenario is considered, where the VGCG interacts with pressureless dark matter (DM) and Q is chosen as $Q = 3H\delta\rho$, where ρ represents the VGCG density. Interacting VGCG has been studied for detailed cosmology and the EoS parameter has been observed. Attainment of ΛCDM fixed point has also been observed. Replacement of the scalar Lagrangean R with a function f(R) of the scalar curvature is the simplest way of modifying the Einstein's general relativity (GR). Another interesting sort of modified theories is the so-called f(T) gravity (T is torsion). In the second part of the study, a reconstruction scheme for f(T) gravity is demonstrated with power-law form of the scale factor. The EoS parameter corresponding to the reconstructed f(T) has shown quintom behavior. Finally, the generalized second law (GSL) of thermodynamics has been investigated under the purview of the reconstructed f(T) cosmology, where the universe is considered as a closed bounded system with future event horizon as the cosmological boundary. We have associated two different entropies with the cosmological horizons with a logarithmic correction term and a power-law correction term. We have studied the validity of the GSL for both of these corrections.

Author: Dr CHATTOPADHYAY, Surajit (Amity University, Kolkata)

Presenter: Dr CHATTOPADHYAY, Surajit (Amity University, Kolkata)

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