EVOLUTIONARY REGIONS OF THE UNIVERSE FROM THE ENTROPY-FUNCTION PERSPECTIVE

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We investigate the generalized second law of thermodynamics (GSLT) in $f(R,G)$ theory of gravity. On this purpose, the $F(R,G)=f(G)+R+\alpha R^2$ model including a quadratic form of the curvature scalar is considered. This definition shows an extended version of the modified Gauss-Bonnet theory, i.e. $f(G)+R$. In order to explain three evolutionary stages of the universe, (i) the early time inflation of the universe with the help of αR^2-term without making use of the curvature scalar term, (ii) the deceleration case with the R-term and (iii) the late time cosmic acceleration phase with the solution of $f(G)$, we discuss the validity of GSLT in a unified form. We follow the following steps: first we obtain Friedmann equations and get super accelerated solutions. Next, the corresponding solutions are used to verify the validity of GSLT and define the evolutionary regions (from starting of big bang singularity to the phantom phase) of universe in a unified form.

MOTION OF THE CHARGED SCALAR PARTICLES IN SPACE-DEPENDENT ELECTRIC AND MAGNETIC FIELDS

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Exact solutions of the charged spinless particles subjected to an electromagnetic field are obtained analytically. The four-vector electromagnetic potential results in orthogonal and parallel electric and magnetic fields. The quantized energy spectrum is determined with the usage of the solutions obtained for the motion of the particles and dependence of the energy on the strengths of the electric and magnetic fields is discussed. In order to investigate the relativistic effects we compare the results of non-relativistic and relativistic solutions of the spinless particles.